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Monitoring Times®

A Publication of Grove Enterprises

Volume 29, No. 7
July 2010

U.S. $6.95
Can. $6.95
Printed in the United States

Restoring Vintage Broadcast and Shortwave Sets

In this issue:

- Radio Pirates: The intriguing world of unlicensed broadcasters
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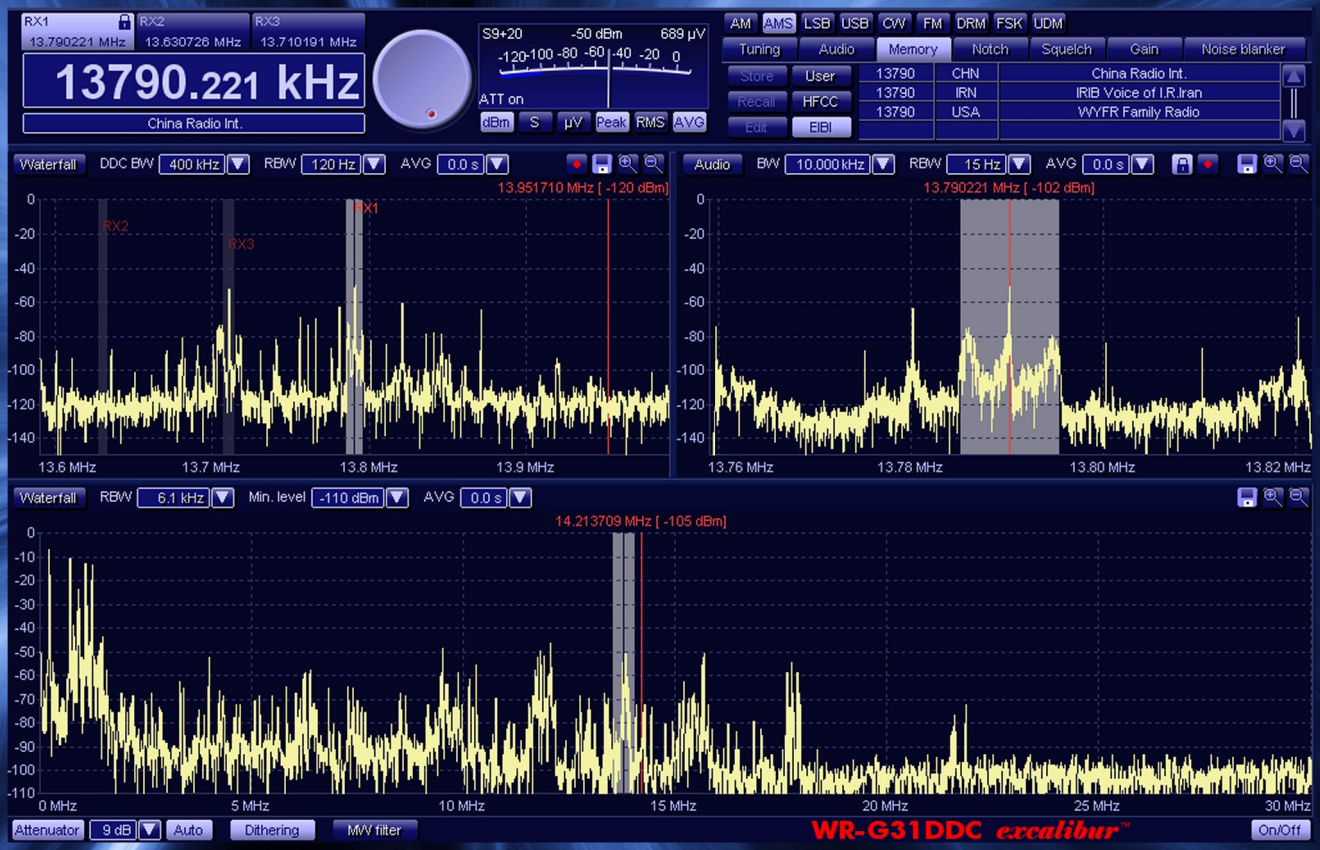

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Monitoring Times

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Restoring Vintage Broadcast and Shortwave Sets.....8

By Lin Richardson KJ6EF

Today's world of consumer electronics is totally disposable with few products designed to be repaired. Technology comes and goes faster than most Americans can keep up. Much of what is disposed of may still be functional but, through style or design, finds itself headed for the landfill before the shrink wrap comes off its faster, better, more powerful replacement.

Most bygone home electronics aren't worth saving. Bought a new 8 track cartridge recently? In the market for a new VHS recorder? Why bother! But, vintage broadcast and shortwave radios are in a league of their own. While there are still plenty of analog shortwave and medium wave broadcasts on the air, these radios retain their value.

These sets are not just museum curiosities. They're useful, daily sources of entertainment that also celebrate a time when radio was king of home entertainment and exquisite design and construction gave it pride of place in every home.

Lin Robertson has spent more than 16 years restoring these beautiful symbols of the radio art from the 1930s and 40s. Now he tells you how to find these gems and how to begin their restoration.

On Our Cover

Before and after shots of a Zenith 11-S-474 all band receiver. The finish is shot and the electronics a mess. It's a perfect candidate for restoration, in the right hands. (Courtesy: Lin Robertson KJ6EF)

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R E V I E W S

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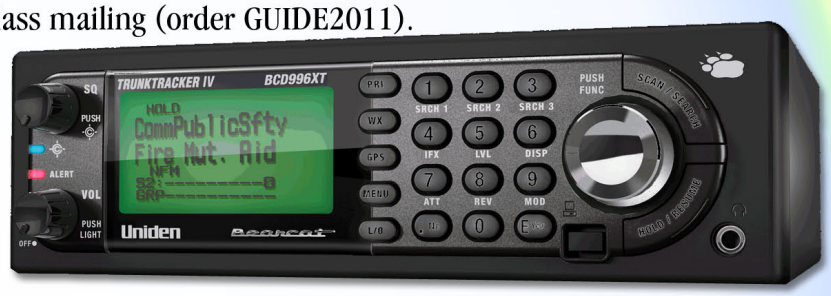
2011 Buyer's Guide

COMING SOON IN THE NOVEMBER ISSUE

Radio enthusiasts are on the leading edge of today's technology and *MT* readers want to know what's new and what's best. That's why they look to *MT's* team of seasoned writers to give them the inside track on shortwave radios, amateur transceivers, two-way portables, scanners, antennas and everything else related to monitoring the electromagnetic spectrum. Now, in a special 16 page insert to the November, 2010 issue of *Monitoring Times*, readers will have a concise guide to the best products available that they can refer to all year long.

All subscribers (print and MT Express) will receive the Buyer's Guide **FREE**. Single issues may be ordered for $5 including first class mailing (order GUIDE2011).



MONITORING TIMES (ISSN: 0889-5341; Publishers Mail Agreement #1253492) is published monthly by Grove Enterprises, Inc., Brasstown, North Carolina, USA.

Address: 7540 Highway 64 West, Brasstown, NC 28902-0098
Telephone: (828) 837-9200
Fax: (828) 837-2216 (24 hours)
Internet Address: ***www.grove-ent.com*** or ***www.monitoringtimes.com***
Editorial e-mail: ***editor@monitoringtimes.com***
Subscriptions: ***order@grove-ent.com***

Subscription Rates: $32.95 in US; $42.95 Canada; and $58.95 foreign elsewhere, US funds. Label indicates number of issues left. Renewal notice is cover sheet 3 months before expiration. *See page 76 for subscription information.*

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Postmaster:
Send address changes to *Monitoring Times*, 7540 Highway 64 West, Brasstown, NC 28902-0098.

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AR2300 "Black Box" Professional Grade Communications Receiver

Introducing a new generation of software controlled "black box" receivers!

Available in professional and consumer versions, the AR2300 covers 40 KHz to 3.15 GHz*

With the new AR2300 "black box" receiver from AOR, up to three channels can be monitored simultaneously. Fast Fourier Transform algorithms provide a very fast and high level of signal processing, allowing the receiver to scan through large frequency segments quickly and accurately. All functions can be controlled through a PC running Windows XP or higher. The AR2300 features advanced signal detection capabilities which can detect hidden transmitters. An optional external IP control unit enables the AR2300 to be fully controlled from a remote location and send received signals to the control point via the internet. It can also be used for unattended long-term monitoring by an internal SD audio recorder or spectrum recording with optional AR-IQ software for laboratory signal analysis. The AR2300 appeals to federal, state and local law enforcement agencies, the military, emergency managers, diplomatic service, news-gathering operations, and home monitoring enthusiasts.

Discover exceptional performance, state of the art specifications and a receiver with a menu of optional extras that can be configured to your own needs and specifications.

- Receives AM, wide and narrow FM, upper and lower sideband, CW modes, and optional APCO-25
- Up to 2000 memory channels (50 channels X 40 banks) can be stored in the receiver
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- Operated by a Windows XP or higher computer through a USB interface using a provided software package that controls all receiver functions
- An I/Q output port that allows the user to capture up to 1 MHz of bandwidth onto a computer hard drive or external storage device
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- The triple-conversion receiver exhibits excellent sensitivity across its tuning range.
- Powered by 12 volts DC (AC Adapter included), it may be operated as a base or mobile unit.
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COMMUNICATIONS

by Ken Reitz

AMATEUR/SHORTWAVE

Senate Report: Cuba Media Campaign a Flop

According to an article in the Washington *Post* from May 4, a U.S. Senate report showed that money spent on Miami-based Radio/TV Martí, the U.S. funded, anti-Castro radio and television service beamed into Cuba but consistently jammed by Cuban authorities, is a waste of taxpayer's money. The report argued that the nearly $30 million/year message was not getting through.

According to the article, the General Accountability Office indicated that in 2009 fewer than 2% of Cubans tuned in to either service during any given week. The report also stated that journalistic standards on the two services were not up to Voice of America (VOA) standards and advised moving the offices of Radio/TV Martí to VOA headquarters in Washington, D.C.

DRM in the News

An announcement on the Voice of Russia web site said that the Russian government will draw up plans in the next two years to make the Euro-based Digital Radio Mondiale (DRM) the national digital radio standard throughout Russia. The Voice of Russia has been transmitting DRM on shortwave to Europe since 2003.

Russian DRM portable radio (Courtesy: Voice of Russia)

The *Times Now* of India noted that the Indian government had budgeted some $350 million towards the digitalization of much of that country's broadcast services including FM and medium wave. Shortwave upgrades of All India Radio to DRM were not mentioned.

Meanwhile, a 600 kW medium wave DRM transmitter was installed in mid-March by Al-Arish, the state broadcaster for Qatar. The station broadcasts on 675 kHz.

And, finally, Continental Electronics, manufacturer of DRM transmitters, introduced the crowds at the April National Association of Broadcasters (NAB) convention to the wonders of DRM long distance transmitting. On hand for the presentation, Ruxandra Obreja, chair of the DRM consortium and head of digital radio for BBC World Service, explained that "with 600 hours of DRM broadcasts already on air, DRM is set to revitalize radio markets across the globe."

ARRL Debuts New-Look Web Site

After a couple of fits and starts, the American Radio Relay League's (ARRL) new web site is up and functioning. The new site sports a new look but maintains its huge fountain of information about amateur radio operating, technology, education, and public service.

It also features a multitude of items in its online store, including League publications and amateur-related items for purchase. While League members have access to considerably more archived articles from League publications, there's plenty for non-members to explore, including a call sign and name search as well as information on how to use *Logbook of the World* and how to get your amateur radio license. For more information go to: **www.arrl.org**.

BROADCASTING AM/FM/TV

TN Floods Hit Nashville Broadcasting

Deadly flooding that swept through the state of Tennessee and other states in early May forced many Nashville radio stations off the air, either through flooding of transmitter facilities or due to wide-spread power outages. Nashville-based *MT Broadcast Bandscan* columnist Doug Smith W9WI said that seven Nashville area AM stations, including the iconic WSM, and three FM stations had been knocked off the air.

"WSM was simulcasting NOAA weather radio for awhile, and had some serious studio-transmitter link issues. It was silent most of the time with the carrier on with 2-3 second bursts of programming. According to on-air announcers, they moved to the transmitter site to broadcast running music requests, most of which seem to be on the topic of flooding. It's amazing how many country songs fit the topic! The WSM studios are in the Opryland Hotel which, according to TV reports, was at one time under 10 feet of water." (*See Doug Smith's "Nashville Radio and the Great Flood of 2010" elsewhere in this issue – Editor*)

Pirate Cat Radio Gets Adopted

In our last exciting episode of Cats on the Radio, San Francisco's long running and very popular Pirate Cat Radio (PCR) had been forced off the air by the FCC with a Notice of Apparent Liability (NAL) issued its manager Daniel K. Roberts, also know as Monkey, a forfeiture in the amount of $10,000. As cats will, PCR retreated from the airways and licked its wounds as an on-line Internet radio station.

(Courtesy: KPDO-FM)

But, you can't keep a good cat down, and now Monkey and the whole crew at PCR are heard legitimately as of May 8 on KPDO, Pescadero, California, a low-power, noncommercial FM station operating on 89.3 FM on California's South Coast. According to a report in the San Francisco *Examiner*, the move is a result of an agreement between Pirate Cat Radio, which will also continue its full-time online webcast, and KPDO.

PUBLIC SERVICE

Texas City Shuts Out Scanners

Bragging that the new $6.1 million encrypted Motorola radio system for the city of Victoria, Texas, can't be heard by any radio scanner made today, the city's police chief, quoted in an article in the Victoria *Advocate* from late April, claimed criminals all over the city had scanners tuned to their old analog police frequencies. He denied that police wanted to keep their activities secret, stressing the opposite: that they were shutting the public out to keep the public safe.

EPIRB Saves Racing Yacht

Having an Emergency Position Indicating Radio Beacon (EPIRB) on board a boat isn't just for novice sailors, as seen in a report from the St. Petersburg (FL) *Times* in early May, detailing the story of a 47 foot racing yacht involved in a race across the Gulf of Mexico. The sailboat, skippered by a veteran sailor, encountered heavy seas, lost its rudder and was adrift for nearly two days some 400 miles south of Panama City, Florida.

A Coast Guard HC130 airplane from the Clearwater, Florida, Coast Guard Air Station was dispatched to search for the crippled boat, as was a second plane from Mobile, Alabama. The craft was eventually met by a 270 foot Coast Guard cutter on routine patrol in the Gulf and towed back to St. Petersburg. There was no mention why the yacht was not equipped with an HF transceiver, the use of which might have saved the Coast Guard a lot of Search and Rescue money.

The lesson for other boaters: Have a registered EPIRB on board, know how and when to activate it; have an HF transceiver on board

and someone in the crew with a ham license who knows how to use it.

Railroads to go to Narrowband

A new frequency assignment plan for the nation's railroads was announced by the Association of American Railroads (AAR) in order to comply with mandated narrowband channels set out by the FCC, which are to be implemented by 2018 and designed to accommodate digital technology. Radios manufactured in 2011 and after must be capable of digital communications and the narrower frequency spacing.

SATELLITE

USAF's X-37B Mystery Spacecraft

The U.S. Air Force launched a Boeing X-37B unmanned spacecraft in mid-April, 11 years in development and shrouded in mystery. The 29 foot long, 9.5 foot high, 11,000 pound spacecraft, built by Boeing and launched by a Lockheed-Martin Atlas V, is a reusable test vehicle originally designed by NASA but handed off to the Defense Advanced Research Projects Agency (DARPA), last heard from in the February issue of this column.

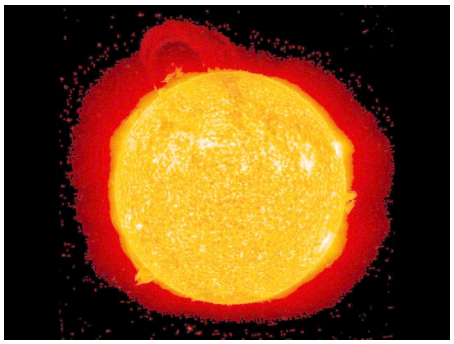
U.S. Air Force version of X-37B unmanned space plane 11 years in development. (Courtesy: U.S.A.F.)

But that's not the mystery. The mystery is the vehicle's classified payload and its ability to, as the *Christian Science Monitor* noted, "… loiter over the globe for nine months." That has led to speculation that the U.S. has entered into a new era of space weaponization. The Air Force declined to say when the craft would return.

Solar Eruption and Cable Satellite Mystery

NASA's Solar TErrestrial RElations Observatory (STEREO) satellite sees the Sun in 3-D and captured the first really massive eruption of solar cycle 24 over a nineteen hour period on April 12 and 13 (see photo). This particular eruption was apparently not responsible for the disabling of cable-TV satellite Galaxy 15 (133ºW). It's thought that solar wind from the first week of April caused a malfunction on that satellite, which made it so that the satellite would not accept commands from ground controllers.

Why it would affect only that satellite is part of the mystery. Curiously, all transponders appeared to be functioning well, but the satellite, without ground control, began to drift in the direction of nearby AMC11 (131ºW), also a cable-TV satellite. As of press time, G15,



Spectacular solar eruption as seen from NASA's STEREO spacecraft in extreme UV light on April 12-13 over a 19 hour period. The length of the prominence appears to stretch almost halfway across the sun, about 500,000 miles. (Courtesy: NASA STEREO)

which is now being called a zombie satellite by news outlets, continued to threaten AMC11, and controllers on that satellite planned to nudge it higher into orbit to let the errant G15 pass by. Meanwhile, a replacement bird for G15 was installed in its original orbital slot.

FCC ENFORCEMENT

Miami Station Fined for Privacy Violation

It's easy to imagine the hilarity when listeners tuned in to North Miami Spanish language station WXDJ-FM one morning to hear a phone call by a radio station employee, purporting to be calling from a hospital, to inform an unsuspecting victim that two loved ones were dead at the hospital. Naturally, for maximum fun, the victim was not informed that the call was being recorded. The station believed the bit was so funny they had to re-run it later in the afternoon.

The FCC was not amused, not because the prank was tasteless – that's a first amendment right – but because the station had violated the person's "legitimate expectation of privacy in connection with the broadcast use of telephone conversations." The FCC nailed the station for $16,000.

The station admitted that it had made the recording without the victim's permission, but said it had later received permission to air the prank and that the fine was too high. They argued that in prior cases the fine was lower for similar violations and that the FCC failed to take into account that the poor economy and a decrease in broadcast revenue in general warranted a reduction. Unmoved, the FCC stood by its fine.

FCC Nails UK-based Phonejammer.com

In 2008, responding to a complaint from a phone service provider in Carrollton, Texas, FCC agents confiscated a device from a beauty school, intended to jam cell phone frequencies and sold by a British-based online company called **phonejammer.com**. The company denied that they sold to U.S. customers, but the FCC produced an invoice making it clear that they did.

Then, in March of this year, investigating a similar interference case in Florida, the FCC came up with another Phonejammer customer, complete with sales receipt. It sounded like "willful and repeated" to the FCC which slapped the company with a $25,000 fine.

CELL FONE FOLLIES

Forgetful in Florida

A burglar in Bartow, Florida, smashed his way into a storefront travel agency, apparently looking for cash, put a bunch of things in a bag – including his cell phone – and accidentally left the bag at the store. He returned the next day to the travel agency, claiming he had lost his cell phone in the parking lot out front. Store employees alerted police, who had his cell phone, and led the suspect away in handcuffs.

Idiots in Illinois

A man in Chicago hijacked a cab forcing the driver out at gunpoint. So far, so good. But, in the exchange the suspect dropped his cell phone. But, wait! That's not what did him in. You see, the taxi was equipped with a GPS-based reporting system. The police easily located the suspect and his handgun nearby.

Meanwhile, in Springfield, Illinois, a woman saw a man burglarizing her car, making off with her phone. She alerted police, providing a description of the suspect and advised them exactly where the phone's GPS showed the suspect was. They went to the location and found a man fitting the description and holding the woman's phone.

Ignorant in Iowa

A man got drunk and apparently started burglarizing a number of homes and cars in Cedar Falls, Iowa. But, somehow he lost his cell phone in one of the cars he had broken into. Police apparently used the phone to ID the suspect and the rest was routine.

Police and Criminal Bungling

Police in Galveston, Texas had finally jailed a "serial burglar" but mistakenly released him due to a clerical error. So, the burglar went back to work, breaking into several area businesses but, you guessed it, left his cell phone behind in one of the businesses.

Stupid in Seattle

Two slackers were apprehended when one was caught breaking into a construction site allegedly to steal copper. Police found his cell phone nearby, which had a very recent text message from his female accomplice. She was waiting nearby, texting police movements to him and telling him she would pick him up. Police found the woman nearby with a phone that matched the number on the text message.

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

Some chassis are very complicated. Go slow, study your documentation and schematics, and think everything through before you do it.

Restoring Vintage Broadcast and Shortwave Sets

By Linton G. Robertson KJ6EF
(All photographs courtesy the author)

This speaker is not a hopeless wreck! Reconers can do wonders.

While there has been a lot of attention given to the restoration of classic "heavy metal" shortwave receivers of the tube era in recent years, not as much has been written in a general overview of those wonderful wooden sets from the 1930s and 40s that have multiple shortwave bands on them.

Lost Art of Radio Building

Some of these console and table sets look great, and have terrible shortwave performance. Others may look a bit less stylish, but have great selectivity, sensitivity, stability and freedom from birdies, spurs, etc. Some say, "For RF performance, give me a Philco, but for audio and looks, I want a Zenith." There's some truth in this, but only to a point. Sets and models varied greatly in this respect, even within the same year and brand.

Console types, the so-called "floor models," tend to be big, heavy, complicated to restore (some are almost half jukebox), and cumbersome to transport, especially in the current economic climate. Most shippers don't want to be responsible for anything at all. After reading their waybill exclusions, you'd feel better putting the set on a sledge and dragging it home yourself! Oh, but the audio…that will more than make up for having to handle these matters yourself, or buy the extra insurance. Once you hear a fully restored console's 12" electrodynamic speaker thunder into the room… but I anticipate.

A 1941 Philco model 41-285 the "McArthur Set", as some call it. The original finish bleached, breached, and rubbed with oil by a well-meaning person. Knobs gone and escutcheon warped beyond help. Good starting material, though.

There's no doubt about it, these old sets command plenty of respect. They represent a combination of effort that will probably never again occur in American life. These sets personify an era when radio was still young, the craftsman was still king, and a good radio technician or engineer was worth his weight in gold.

The broadcast sets for home use were a unique collaboration between the artists and designers who produced the cabinets, the engineers and technicians who designed the chassis, and the assemblers (mostly women, thanks, ladies!) who all came together to produce a radio set.

The set restored. Quite a difference!

Furniture was still made of actual wood back then, and it wasn't uncommon for a good radio set to have as many as six different types of hardwood veneer (or solid wood!) used in their construction. Many of these sets actually have ivory inlay! All these people made a product that found its way into every American home, and became the focal point of the living room.

Finding and Restoring Old Sets

But how can you acquire such a set today? And, having acquired one, how do you get it running properly? There are several methods and I'll try to list them in order of desirability in terms of your wallet.

Friends and relatives: This can be very auspicious, especially if you happen to have a large family! If any of them are living in the same house they've inhabited for a few decades, that's a likely spot to look indeed! Great-Uncle John might be very pleased to let you have that old mahogany wreck gathering dust up there in the attic, especially if you can restore it and make it play again! Check around, ask, and make yourself a pest. If they're your relatives, they're probably used to that already!

Radio amateur swap meets: These interesting affairs are usually held anywhere from once a month to once a year, depending upon the size of the ham radio community in your area. You won't find them listed in the Yellow Pages, so the best way to get a line on where the local ham club meets is to wander through your neighborhood until you find a house with a sufficiently bizarre antenna array, and ask the occupant if he's a ham radio operator. Failing this, try and find the nearest amateur radio equipment dealer. They are listed in the Yellow Pages under either "Radio Equipment Dealers," or, surprisingly enough, in some communities, under "Amateur Radio Equipment." The personnel at the store should let you in on any local swap meet information.

You're probably wondering what hams have in common with vintage shortwave sets... well, it's a great deal more than you might think. Many of today's older radio amateurs got their start when radio was still very young. Additionally, younger hams more often than not have older hams in the family. As hams generally have an absolute loathing to throw away any radio gear at all, they tend to keep stuff. The day usually arrives, when, under threat of condemnation by the health department or forced removal by their spouse, they reluctantly trundle

it off to the local ham swap meet to dispose of it. If you're very early on the scene, you just might make yourself one great acquisition! You probably won't pay a whole lot of money for it, either, especially if you have an attitude properly reverential towards the older gear; most of these people aren't in it for the dough. They've grown up with radio, and have eaten, slept and thought about little else for decades. I'm trying hard not to blush as I write this last line, but indeed, they might just make you a real good deal.

Estate Sales: This is promising, but usually only if it's going to be on a small scale. If there's too much publicity, e.g. public advertisements, etc.; the professional collectors may move in and jack the bidding up quite a bit. Still, they want to make a buck, so the price may not be as high as you might think. It's worth a shot, anyway. Check the local newspaper, but try to get there *before* the stuff goes up for auction. The auctioneers will usually let you in to look at the stuff before the sale actually starts.

General swap meets: These usually bear little fruit, but once in a great while you might find something, even if it's no more than a disconnected part or two. Maybe granny's old horn speaker from her 1928 Radiola, an old dial, or a few vacuum tubes. Sill, it's rare to find anything at all at these things. If you've got the time, well, put it on your list, but farther down toward the bottom. All in all, it's not too good a bet.

Retail Antique and Collectibles stores and "Malls": You can do very well in these, and you can get really hosed, too. A lot depends on whether the set is described as "working" or not; there are several levels of "working" sets ranging from, "It doesn't explode when you turn it on," to "Fully restored and guaranteed." Chances are, even if it's working, it's still going to need a recap and overhaul, unless you're a real daredevil. More on this in "Restoration."

Vintage Radio Dealers: They generally command high prices, but there are some reasonable ones. Look for guarantees, descriptions of work done (or not done) and note that, if there's a lot of work that has to go into the thing, you're going to pay for it. Also note there's a difference between repairs and complete restorations; these should be spelled out.

eBay: This can get quite tricky, and is usually the "highest price margarine," if you get my meaning. eBay is, essentially, a giant auction. You can get "deals," but, in recent years, it's been the exception rather than the rule in many collectors' experience. Keep in mind this in an auction, and that the guy in the auction room with the largest roll of cash is going to win.

Generally speaking, this is a higher-priced acquisition venue, and in my opinion, a place to sell, but a last resort to buy. You have to be very careful about the seller's reputation and be aware that there can be shipping problems with the sets as well. If you wind up in this venue, make sure whoever you buy it from does a good job of packing.

A Word about Shipping

Here's what you need to know about shipping. The shipping industry is going through some hard times, and things are not like they were even four years ago. Companies have merged, been acquired, and have put such stringent exclusionary language in their terms that, unless your item is initially valued at less than $500, some shippers just will not be responsible for it.

An unrestored, non-working Zenith 11-S-474. The finish is shot, electronics rotten.

However, some national firms will ship or crate it for you, and have franchises all over the U.S.; most seem to do a fairly decent job. All franchises are locally owned and operated, so check yours out first. They will then use the carrier their local office contracts out to. They do not, however, insure against internal damage caused by mishandling, so it's best to get some additional insurance. This can be had from a freight broker, or see if your homeowner's or renter's insurance policies apply while the radio is in transit.

If all this seems excessive, know that the value of even a partially functioning, unrestored vintage classic can run into four figures, depending on make, model, and scarcity.

On to the Restoration

But enough of the difficulties. Let's assume you've been successful, and have just walked through your front door with the thing under your arms (or, as is usually the case, with both arms more than full and a double hernia). You're going to ask yourself right off the bat, "OK, now what?" and, "What do I do with all this extra stuff I dragged home that comes with it? Yow! Look at all these tubes...what have I done?"

Well, first, let's approach the issue of restoration. I'm just going to address the main issues here, but you'll find them the most visited ones:

The Great Lesson: If you have found an old, unrestored radio that hasn't been played for years, do NOT plug that set in! I know, it's so hard, and so human, to want to turn that thing on! You could fry the power supply (which is doubtless completely pooped with dried-up electrolytics after lying dormant for God knows how long), and send the cost of restoring it way above what would be necessary if it were done properly first.

Quite an improvement and functional all through its shortwave bands.

These sets run on DC voltages in the power supply that are in the 200-450 Volt range (sometimes higher) and you can really screw a set up by yielding to the all-too-human instinct to just see if it works. So: Step 1: Restore the chassis. Step 2: THEN apply power! (And slowly, too...it should be done with a Variac, which can slowly bring the voltage up from 0 to full 120VAC.) Believe me, you'll have far fewer problems this way.

Oh, I can hear them now: "Well, I just plugged it in, and away I went! No problems!" I deeply sigh when I hear comments like this, or, "My set works sorta O.K. Why should I restore it?"

To begin with, operating a 70+ year-old piece of electronic gear that generates high voltage DC in a completely original condition is skating on very thin ice. After a short time of playing a "works-sorta-ok" set, there is usually a flash, a loud BANG! and the set falls dead, and/or starts smoking until someone pulls the plug. It's safe to say that the cost of restoration will now be a lot higher, especially if you fried the main power transformer. Play it safe and money-wise: restore it, then plug it in and enjoy it! Additionally, you'll be stunned at what the set acts like after restoration, no matter how good you thought it ran before. Here's a brief overview of restoration:

Is This Set Worth Restoring?

This is a very personal call, and can only be answered by the owner. If you're doing this as an investment, that's one thing. In general,

sets do appreciate rather well over time. If it was your father's or mother's set, that's another thing entirely. Again, the set may be one that really "put the hook in you" when you passed it. That's reason enough! No matter how exalted or how humble, I always say that you must like the set, regardless of its dollar value. No matter how valuable, if you hate the way it looks, you won't keep it long.

OK, we've got the chassis out of the cabinet, and turned it over gently. As you peek into the chassis, keep in mind that only about 5% of all sets attempted fail to respond to restoration; there are many reasons for this. First, concealed, non-reversible damage of non-generic and irreplaceable parts. Second, corrosive deterioration of the same category of parts. Finally, the most prevelant reason, previous substandard modification "hatchet jobs" performed by servicing personnel barely qualified to hold a soldering iron. Sets that have had their chassis hacked up by poor repair persons are often very difficult cases indeed. Some are just too far gone and it makes me sick when I see this.

To minimize wasted effort, tackle the chassis, power supplies and speaker assemblies first before starting the cabinetry and refinishing. You want to be sure you have a "runner" first before spending 40+ hours on restoring a large console cabinet, and yes, it can take that long, or even longer.

Components: Any wax-and-paper caps have to go. Sorry, but frankly, they were not that much good when they were made. The same goes for any resistors more than 20% out of tolerance. These things tend to drift upward with age; if they've been running hot, they're probably not even in the original value ballpark. Good, inexpensive replacements for caps are polypropylene or mylar types. Resistors come in many different varieties, but many will be carbon types. Replace these with carbon resistors whenever possible. Always get as close to the original value you can get. Often, a .05uF cap will be found in a set, and a .047uF can be used with little worry, as long as the voltage rating is as high or higher than the original. With the resistors, you'll get some whacky original values occasionally; just get that new carbon resistor as close in value as possible with modern day types, and make sure the wattage is the same or greater than the original.

Wiring: Around the late 1930s certain radio makers started replacing cloth-covered wire with rubber-covered wire. From a cost savings point of view, it may have been a great idea but, from our perspective, it was a horrible mistake. If your set has cloth-covered wiring that looks OK throughout the set, breathe easy. If you have rubber-covered wiring that has the flexibility of an Egyptian mummy and flakes off the wire at a touch, you're in for an adventure. Sorry, but it really should be rewired. On some late 30s or early 40s sets this is going to take a while, so just make your mind up to it. C'mon, you really didn't have anything to do this season, did you?

Tubes: Still very much available, although price varies tremendously. Try ham clubs (they often have stockpiles open to members), then retailers of vintage radio and hi-fi gear. AES (**http://www.tubesandmore.com**) in Tempe, Arizona seems to have a lot of stuff, and they generally have decent pricing, as well as good books on restoration.

Electrolytics: All these should be replaced as well. I have heard many tales of successfully re-forming these by slow and accelerating voltage application with Variacs, but for me, it's like playing Russian roulette with four chambers loaded; I just don't trust the things. When they go, they can drag your power transformer, your speaker's electrodynamic field coil, and a few other things down with them. Money, money, money. Play it safe, replace those too.

Replacement ethic: The general rule that has prevailed is that if your set looks original from the top of the chassis, component replacement on the underside is a secondary issue. Purists will melt old wax caps, chop off an end, put a new one in, put the end back on and reflow the old wax back on the cap to make it original. An electrolytic can on the chassis may be hollowed out and a modern unit put there, etc. It just depends on how much of a purist you're going to be.

Cabinets: As far as conservation goes, always try to protect and defend the conservable, if at all possible and practical. If a set has 85% of its finish intact, the usual approach is to try to preserve what's left, restore what's gone, and do the best to keep the set's original finish elements intact as best as humanly possible. If the finish is more than 40-60% gone, you may have to go for a full refinish. Ultimately, this is a judgment call by the owner and has to be arrived at through full reflection. Every set is unique, and requires a unique approach.

Restoration Ethics: When the vintage radio community started doing this sort of thing decades ago, some went for the "not a fingerprint to be found" approach. This was all very fine until someone walked in and said, "My! What a lovely reproduction!" Oops. They quickly realized we had gone a bridge too far. About the same time, I went to a car museum and had a chat with one of the restoration mechanics; he, too, had the same experience, and noted that everyone had been doing such an "over-the-top" job on everything that collectors were beginning to grumble that the cars looked "*too* new!" One visitor kept asking him how he made the fiberglass fenders on the 1908 Diamond Reo. Research into other fields of restoration revealed that a new ethic was taking hold there as well. It seemed that the proper thing to do was leave a bit of wear here and there to indicate that the article was, in fact, genuine, and not a reproduction. And so it came full circle.

When a set is completely refinished, it should not look like it was dipped in plastic; it should look like a set that has been very well preserved throughout its life, and has about 5-10 years of light wear on it. So, leave a small bump, a barely visible mar, and do it to standards that create a finish that looks like its original plus 5-10 years of good service in a well-kept home. It's called "preserving the provenance" and sometimes, the shinier they are, the phonier they look. Now, there will be cases where you have a complete ruin that looks like it's been lying on the bottom of the Atlantic for 70 years; then, you have no choice. Some sets actually came with a high gloss. But this is always a judgment call. Do your research, and don't "over do it."

Cabinetry vs. Refinishing: These are two separate disciplines, and, as one senior gentleman I knew who studied at the Academy in Paris once said, "In each, the first ten years are the hardest." There are plenty of books out there that go into detail about this aspect of radio restoration, an aspect too vast to be covered here. Suffice it to say that if you have structural cabinet damage, severe warping, or some similar issue, get a cabinetmaker to do the job. If the cabinet, veneer and trim are in good shape, but it just needs a good refinishing, you *can* do that. Very god results can be had with a modicum of effort.

Tools: Wire cutters, side cutters, a Luxo-type magnifying lamp, wire strippers, a 40 watt soldering iron, a signal generator, "solder suckers" and standard hand tools are a good start.

Safety: I have to say this: Keep your hands out of the set unless and until you know what you are doing. Most vintage radios have high voltage DC inside, and can run from 200 to 450 volts DC; this is more than enough to kill you if you put your finger on the wrong spot. Safety First! A rubber floor mat to stand on at your workbench is a must. Wear rubber-type shoes, and never put your hand inside a live chassis if you can help it. If you must, keep one hand in your pocket.

Summary: If it looks like something you want to do yourself, go for it. You'll be as happy as a clam. If it all looks like too much for you, and you just do not have the equipment, space, or time to acquire the knowledge, there are people out there who will restore or repair your set. There is a difference between the two. Whichever way you decide to go, remember this: Besides the personal reasons, you'll be doing future generations a huge favor. The radio communications art developed very quickly over a matter of a very few years. Technical discoveries promptly made last year's set obsolete, and many beautiful sets went into the landfill promptly, or as happened in one period, actually burned on a mass scale as a marketing ploy to get people to buy new radios. Really! It was called "Burn Your Blooper!" We just could never have too many saved sets brought back to life!

About the Author: Lin Robertson owns and operates American Radio Revival as well as American Radio Research at: www.moonlightsys.com/revival and www.moonlightsys.com/research He holds an Advanced Class license as KJ6EF and has been a ham for 30 years and a SWL since 1967.

MT

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Nashville Radio and the Great Flood of 2010

By Doug Smith W9WI

On April 28th, the National Weather Service Forecast Office in Nashville issued a statement:

"Middle Tennessee could be looking at a very wet weekend coming up this Saturday and Sunday. And, given the heavy rainfall received around the area last weekend, flooding could be a very real concern."

Nobody could have predicted what would actually happen. By the time the rain ended on the night of May 2nd, more than thirteen inches of rain had fallen. May is one of our wettest months in Nashville and by the time this storm was over, the city had shattered its record for the wettest May ever. Re-read the dates: The monthly rainfall record for May was shattered in the first two days of the month.

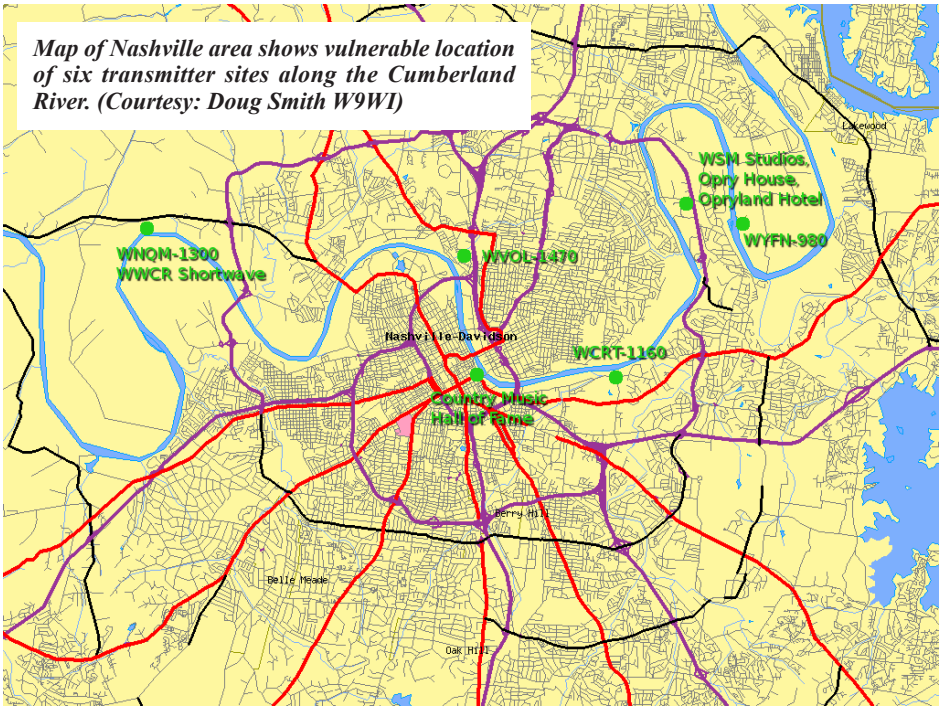
This rain had to go somewhere. It filled, and overfilled the creeks and rivers that cross the city. Low-lying areas, and some not so low lying areas, were inundated. Every major highway in the city was closed somewhere, at some point. Some remained closed for days. Homes and businesses were flooded. Utility substations were flooded, as was one of the city's two water plants. Thousands are still homeless; hundreds of businesses closed for weeks, many for months, if not permanently. More importantly, at least thirty people were killed.

As with most recent weather events, local TV was the prime source of information as the storms entered the area. Tornados and damaging straight-line winds had been predicted. In fact, there were two tornados reported, one of which caused significant damage in the Rivergate area north of the city. News crews were already on duty as the flooding began. But, nearly all area broadcast facilities were also, unfortunately, victims of the flood.

Radio & TV Victims

Ground conductivity is critical to efficient transmission of AM signals. And, since conductivity is higher in wet or "swampy" areas, AM towers tend to be built in such places. Unfortunately, these are precisely the places most likely to be flooded. And of course, flood waters and radio transmitters don't mix!

As the waters rose, a number of Nashville AM stations were forced off the air. At the height of the flooding, I counted six AM facilities off the air. WQSV-790, WYFN-980, WCRT-1160, and WNQM-1300, all transmit from sites adjacent to the Cumberland River. WMGC-810's transmitter is along the Stones River in Murfreesboro. WVOL-1470, the sixth



Map of Nashville area shows vulnerable location of six transmitter sites along the Cumberland River. (Courtesy: Doug Smith W9WI)

On stilts, but not high enough. Photograph taken on a dry day shows tower site for WQSV-790 AM, Ashland City, Tennessee in the flood plain of the Cumberland River. (Courtesy: Doug Smith W9WI)

AM victim, saw its tower field flooded with water. One station in Clarksville, WQZQ-1550, also transmits from a site along the Cumberland and was flooded out.

Even the two big guns, WSM-650 and WLAC-1510, were reported briefly off the air. TV video showed the WSM tower field full with water. Luckily the WSM transmitter building is elevated above the field and, to my knowledge, was not damaged. I don't know how WLAC escaped intact!

Unwanted silent periods were not limited to AM. FM stations WPLN-90.3, WRLT-100.1, WKDF-103.3, and WNRQ-105.9 share a tower south of town. They weren't flooded out, but they did lose commercial power when trees fell across the lines. A few hours later, the backup generator failed. Three of the four stations remained off the air most of Monday, May 3rd, until enough trees could be cleared to allow Nashville Electric Service to restore power. WKDF has a backup transmitter at a site downtown, and remained on the air, though without their HD-Radio signal.

TV stations weren't immune either. No station's transmitter was affected, but WTVF (channel 5) saw their downtown studios flooded. A temporary newsroom had to be established on the loading dock. WZTV (17) and their sister stations WUXP (30) and WNAB (58) have facilities in the Metro Center office park. This location is also along the Cumberland River. When officials discovered leaks in the levee protecting this area, the stations had to be evacuated. Newscasts on WZTV had to be suspended until Thursday, when the levee was declared safe. WPLN's studios are across the street from WZTV's and once WPLN's FM transmitter returned to the air, the station was still only able to carry National Public Radio material off the satellite until Metro Center was declared safe. Nashville's cable TV facility is

also in this area.

Even shortwave was affected. WNQM-1300 is co-owned, and co-sited, with WWCR. Both stations were off the air from May 2nd until Friday, May 7th. According to the WWCR website, all four shortwave transmitters were operated for most of the day on Friday but two shut down early Saturday morning. It took WWCR engineers nine days to restore all four shortwave transmitters and their one AM transmitter to the air.

Grand Ol' Opry Flooded

Transmitter sites weren't the only radio facilities flooded out. As mentioned above, three TV stations and Nashville Public Radio were evacuated from their studios/offices along the Cumberland River. WSM-650, with studios in the Opryland Hotel a few miles east of Nashville, is built on land that used to be the WSIX-980 transmitter facility. In fact, Cumulus Radio still has offices in the old WSIX transmitter building. If you remember, AM stations like to build their towers in wet/swampy/flood-prone areas. That means that the Opryland Hotel and the WSM studios are along the Cumberland. On the night of May 2nd, the hotel was evacuated. It would eventually flood with eight feet of water. Officials told TV stations the hotel is not likely to reopen until October.

WSM has at least temporarily moved their studio operations to their transmitter facility in Brentwood. Unfortunately, it's been reported that many historic recordings and other materials were destroyed at their studios in the hotel. While the studio was being evacuated, WSM arranged to rebroadcast KIG79, the National Weather Service weather radio station on 162.55MHz. At the time, the NWS station seemed to have abandoned normal programming, carrying only flood information.

The new Grand Ol' Opry House is also in this neighborhood, adjacent to the hotel. It, too, was flooded. It was with some pride that it was reported the historic WSM microphone stands and the section of stage floor transplanted from the "original" Opry House have been rescued intact. The show must go on, and since the flood the Opry has been broadcasting from alternate locations in Nashville.

The original Opry House, the Ryman Auditorium, is elevated above the river and was not damaged. Much of the downtown Nashville entertainment district was, however, flooded. 1st and 2nd Avenues and Lower Broadway, including the Wildhorse Saloon and Country Music Hall of Fame, found at least their basements submerged. Basement flooding in the Schermerhorn Symphony Center severely damaged a $2.5 million pipe organ and destroyed two concert grand pianos. The famed Music Row neighborhood is well above the river and escaped damage.

Radio & TV Help

The news from broadcasters was not all bad though. Four broadcasting companies representing at least twelve stations carried telethons, raising millions of dollars for flood relief. A May 4th event, run by Clear Channel, aired on WLAC-1510, WNRQ-105.9, WRVW-107.5, WSIX-97.9, and WUBT-101.1. On the same day, Cumulus stations, WWTN-99.7, WNFN-106.7, WQQK-92.1, WSM-FM 95.5, and WRQQ-97.1, aired a similar radiothon. Channel 2, WKRN-TV, aired half-hour telethons on May 6th and 7th while channel 4, WSMV-TV, aired a 3-1/2 hour telethon on Friday, May 7th. This latter event was simulcast in Memphis, Chattanooga, and Knoxville, as well as nationally on The Weather Channel. Organizations benefiting from these fund-raising events include the Nashville Rescue Mission, the Red Cross, and the Salvation Army.

Fundraising is not the only area in which broadcasters have assisted. Hundreds of hours of airtime have been dedicated to providing up-to-date safety and recovery information. Everything, from how to clean up a flood-ravaged home without running afoul of displaced rattlesnakes; how to apply for FEMA aid, and how to get around town without running into closed roads, has been broadcast.

Complaints

Comments on the performance of broadcasters in light of this disaster have not been universally positive. A number of forums contain criticism of stations and media both in Nashville and elsewhere. Radio is accused of sitting on automation or the satellite and leaving the job of providing up-to-date information to television.

I will admit to being way too busy during the storm to listen to any radio until we entered recovery mode, by which time they were doing a pretty good job. I think we can forgive WSM for any shortcomings while their studio was being evacuated and, in my opinion, by the time I was able to listen on Monday they were doing a very good job.

National media have been accused of ignoring the story until well into the week. But, I didn't have the opportunity to watch, so I can't judge for myself.

A medium that I did listen to, and that did fall down on the job, was the Tennessee Department of Transportation (TDOT) Highway Advisory Radio. TDOT has a network of stations on 1680 AM spread around the city. The stations were broadcasting uselessly old information, with no mention of the complete closure of several freeways that had been underwater for at least 24 hours. As you might imagine, traffic jams were horrendous. They were impossible to avoid without current information.

In other disasters, the question always comes up: Did the Emergency Alert System (EAS) work? In this case, I think we can say it did. That may be because of the meteorological nature of the disaster. The Weather Service has a well-defined plan for activating EAS for events under their jurisdiction such as heavy rain and flooding. They activated it, we were alerted. I can't promise it would have gone as well for a disaster that didn't involve the Weather Service.

Sgt. Caleb Bucy and Ashland City Assistant Fire Chief Brian Biggs offload crates of water in a residential area of Ashland City that has been cut off due to severe flooding. (Courtesy: Tennessee Emergency Management Agency)

Continuing issues

As of May 9th, a week after the disaster, four stations remained off the air: WYFN-980; WCRT-1160; WQZQ-1550; and WQZQ's FM translator on 101.9. I suspect WQZQ will not return, at least not on 1550 and not from Clarksville. The station holds a construction permit to change frequency to 830 and move to Goodlettsville, Tennessee, using one of the WPLN-1430 towers.

I've become aware of a bewildering number of complaints of digital television reception failing after the storms. Viewers who claim to have had good reception before May 1st say they've lost one or more channels. They insist their antennas have not been damaged (most are using indoor antennas) and there has been no tree damage in their areas.

What should be done differently?

So, how did Nashville's broadcasters fare with the storm? Generally, quite well. Nobody could have foreseen more than thirteen inches of rain in two days. Most of the AM stations that were knocked off probably would have remained on the air if they transmitted from higher ground. On the other hand, they'd also have significantly less coverage. Studio locations near the river may not be a good idea, but downtown Nashville is where much of the news happens. If you want to cover the news, you have to be where it happens!

What could individual citizens have done to mitigate this disaster? Listen to public officials! Over and over, we were told, "Turn around, don't drown," "Don't drive into floodwaters," and "Don't play in flooded creeks." Yet, at least nine people died while driving through flooded areas; one little girl had a narrow escape from a flooded ditch; and a teenager is still missing after trying to tube down a rushing creek.

Finally, don't give up on good old-fashioned over-the-air broadcasting. Two of my coworkers live in one of the most heavily affected areas. While their homes were not flooded, the underground utility lines in their neighborhood were. They'll be without telephone, internet, or cable TV service for weeks. Remaining informed will depend on a decidedly old-fashioned service: free, over-the-air broadcasts.

MT

Radio Pirates: The Intriguing World of Unlicensed Broadcasting

By Ken Reitz KS4ZR

The earliest days of radio were a broadcasting free-for-all with commercial, amateur and military services popping up wherever they felt like it, with whatever power level they could muster. The chaos led congress to establish the Federal Radio Commission in 1926 which eight years later became the Federal Communications Commission (FCC) and the oft-quoted Communications Act of 1934. It's behind that authority that the FCC has stood ever since, issuing policy, licenses, and fines while it has governed virtually every kind of communications system operated within U.S. borders, adapting as the technology changed. But, since those early days on various frequency bands, AM, FM and shortwave, are found those who refuse to comply with FCC rules, flying various flags of independence, protest, and unbridled humor.

They're called radio pirates and what all have in common is the belief that the FCC is either in league with commercial interests and therefore against the best interests of the people, or that it oversteps its jurisdiction by imposing a federal authority where the legitimate authority belongs to the individual states. Inevitably, a conflict occurs when the free-market economy and constitutionally endowed freedom of speech run headlong into the arcane world of FCC rules, enforcement and the ultimate threat: massive fines, confiscation of equipment and the possibility of a prison sentence.

While the very rules enforced and rebelled against actually allow unlicensed broadcasting on the AM and FM bands, under what's known at Part 15 Devices, the famously slow response from the FCC to any unlicensed broadcaster lulls many into believing they are legally in the right or, at best, that being unlicensed just doesn't matter.

Piracy on the High (Frequency) Seas

For the last several decades the hottest pirate radio action has been in the late afternoons and evenings on the shortwave bands, most notably between 6 and 7 MHz and specifically 6.925 kHz plus or minus 50 kHz where a fleet of HF pirates denounce and/or lampoon everything from the FCC to other pirate broadcasters. Until the beginning of this year *MT* published a monthly column called Outer Limits which was written by George Zeller, a long-time HF monitor of unlicensed HF broadcasting. The column detailed the comings and goings of this tight-knit radio community and featured loggings, QSLs and details on how to obtain QSLs from the various pirates.

SSTV image from Cinco De Mayo Radio on 6925 kHz 0200Z (Courtesy: Author)

Radio GaGa's SSTV tribute to recording artist Lena Horne following her passing in mid-May on 6925 kHz at 2135Z. (Courtesy: Author)

The best known of the early HF pirates was Allen Weiner whose well documented, decades-long, running battle with the FCC was chronicled in his 262 page book, "Access to the Airwaves: My Fight for Free Radio," published in 1997 by Loompanics, Unlimited. While the book is currently out of print, copies are available from Amazon.com. His struggle culminated in the founding of WBCQ "The Planet," a private, commercial shortwave radio station, which finally signed on legally for the first time September 8, 1998. WBCQ continues today and is heard nationwide transmitting a wide variety of programs, including ones on pirate radio, on 5.110, 7.415, 9.330 and 15.420 MHz. A full schedule of WBCQ programming can be found on their web site **www.wbcq.com.**

Today HF pirate radio is as active as ever with the usual suspects popping up on the more popular frequencies with most of the activity on the weekends and centered around various holidays, though they can be heard any weekday from about 2000Z until quite late. As an example, this past May 5th I logged WEAK Radio on 6.925 MHz at 0000Z which appropriately ushered in *Cinco de Mayo* (May 5) with a solid 57 signal playing WAR's song "Cinco de Mayo," followed by a station ID. Then, in typical HF pirate fashion, the station simply disappeared. But, hanging around the frequency netted a couple of more pirate broadcasts including an SSTV image (see photo) from Radio Ga Ga with appropriately politically incorrect graphic. While writing this on a Monday, and monitoring 6.925 at 2112Z, I heard Radio Ga Ga with a tribute to Lena Horne who had just passed away. The broadcast lasted about 20 minutes, featured several of her hits and ended with an SSTV tribute image to the entertainer (see photo).

Many HF pirate operators use amateur radio transmitters and transceivers (it's often supposed that many are hams) and sophisticated audio mixing. Some like Radio Ronin and WHYP, which I easily picked up on an old Grundig Classic 960 reproduction radio with 10 feet of wire hanging out of the antenna jack, are known for their big signal and excellent AM audio. A few became legendary for their major league levels of power. One such station was Radio Metallica Worldwide which boasted on their QSL card, "10,000 watts of pure awesome audio power." There was no way to confirm the claim, but hearing is believing and the needle-pinning strength and superb audio made me believe it. According to HF Underground, the station was heard throughout the U.S. as well as overseas.

HF pirate transmissions are mostly audio art with interesting mixes of music, sound effects and other audio sources often blended in a humorous vein. They're unscheduled, for obvious reasons, and typically short, often less than 15 minutes, sometimes as short as a few minutes. Some, WBNY, Commander Bunny, Outhouse Radio and "Ultraman" on MAC Shortwave I've heard runing considerably longer. The reason most HF pirates keep it short is that long broadcasts allow FCC investigators to locate the source of the transmissions which could result in a raid.

Such an occasion appears to have happened this past April when one long-time HF pirate attempted a test broadcast of a new 1 kilowatt transmitter. It wasn't long before he received a visit from an FCC agent. According

to a post on The Grapevine Pirate Shortwave chat room (**www.frn.net**), while the conversation was lengthy and friendly, the "underlying tone was very clear: sin no more."

Unlike their FM counterparts, HF pirates confirm reception reports with well done QSL cards that reflect the irreverent and humorous nature of their broadcasts. Their avant-garde designs are a graphic homage to their individualism and are widely collected by avid pirate monitors. Some pirates broadcast email addresses during their programming and may respond with e-QSLs the next day. As with any shortwave station, send your report with the date, time, frequency, program content and signal strength. To help them understand their signal contour, include details about your listening post. If you're lucky you can hear five or six such stations on a weeknight; you just have to keep scanning the band.

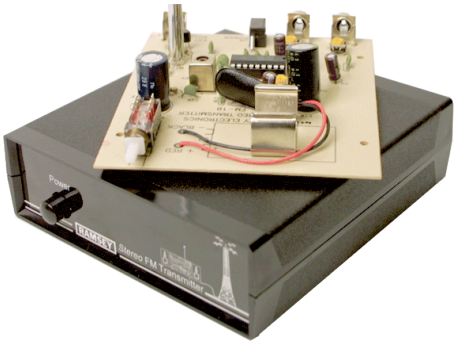
Hi-Fi Pirates go FM

There seems to be a difference in intent between HF pirates and those on the FM band. While HF pirates broadcast sporadic transmissions aimed at a wide geographic shortwave audience, FM pirate broadcasters, and a few AM pirates, seem to be more content oriented and running scheduled programming, often for hours at a time, targeted at communities or neighborhoods in the cities in which they operate.

There are AM and FM pirates from the left and right of the political spectrum; Free Radio Berkeley (FM) and Liberty 1640 (AM) for instance, that have distinguished themselves with their political agendas, and both of which have been visited by FCC agents. Other FM pirates, particularly those found in large East Coast cities such as Miami and New York, see themselves as public service radio stations catering to ethnic minorities totally ignored by local commercial broadcast interests. Still others with no apparent political ax to grind or ethnic audience to serve are just in it for the music and the fun of running their own stations.

Regardless of how they got on the air or what audience they serve, all FM broadcast pirates share a common complaint against broadcast consolidation, enacted over the last twenty years, that has swept aside previous rules regarding how many stations a single corporation could own in a market. This winner-take-all policy has resulted in what's seen by many as an unsalvageable blandness in programming and a reason for mistrust in news content. There is also a complaint against FCC policy in limiting the number of station licenses, even the proposed low-power licenses, allowed in any given market. They believe that this forces those who want a broadcast voice in their own city to round up millions of dollars to buy their way onto the air through existing licenses, a point Allen Weiner made nearly 40 years earlier.

Throughout the years, though, various attempts have been made to allow a cheaper and legitimate way onto the broadcast bands through the establishment of low-power, non-commercial FM licenses. But, the "windows" for such license applications are so short, so far between, so limited in number and the pace of the licensing process so slow, that hundreds of potentially legitimate broadcasters take the pirate route and their chances at being found.



Ramsey Electronics' FM10C Part 15 transmitter (Courtesy: Ramsey Electronics)

DIY Transmitters

According to the FCC's own web, they receive "tens of thousands of inquiries annually from individuals and groups wishing to start a 'low power' or 'micro power' radio station for local broadcasts (AM or FM)." To aid this wave of interest in broadcasting the FCC has put together a publication detailing what can and can't be done with a Part 15 radio station (see resources below).

There are several ready-made, FCC-approved, Part 15 FM transmitters available for about $60. The mail-order radio company C.Crane makes one that's easy to use: enter the frequency, plug in the audio source, adjust the gain and you're on the air legally, with all the power (250 microvolts at 3 meters) that the law allows. That translates to anywhere from 50 to 200 feet depending on the transmitter's location and obstructions around the transmitter site.

Most serious FM pirates need more power to cover their neighborhoods and opt to construct their own transmitters, usually from kits offered by Ramsey Electronics such as their FM10C ($45). The company had marketed assembled and tested units until the FCC issued a $25,000 fine in 2006 for doing so. Ramsey is considered the largest seller of AM and FM transmitter kits in the U.S.

Free Radio Berkeley (FRB) in Berkeley, California offers hands-on, four day DIY seminars on building your own 10 or 40 watt FM transmitter. They also have extensive on-line video tutorials on the subject.

The States Step In

The FCC has claimed sole authority regarding broadcast rights in the U.S. But, some states, Florida and New Jersey in recent years, have sought to add their own legal weight to the cause of enforcing activities on their states' airwaves. In 2004, reacting to an invasion of FM pirate broadcasters, most notably in the Miami area, the State of Florida made it a felony to engage in broadcasting without an FCC issued license. At the time there were said to be some 60 unlicensed FM stations on the air in the greater Miami area. In 2006 a Miami-based company was trying to make money by scanning the airwaves seeking FM pirates for state prosecution, but that company has apparently thrown in the towel. There is no evidence that Florida's law has reduced the number of unlicensed broadcasters in that state. Meanwhile, the proposed New Jersey law was withdrawn.

Now there's a new wrinkle in the way other states might look at unlicensed broadcasting. A bill introduced in the Oklahoma state legislature in January of this year, known as House Bill 2812 and called the Communications Freedom Act, makes a legislative declaration that "…certain radio transmissions not causing harm or interference are not to be considered interstate commerce or subject to federal regulation."

Of course, it will be left to the courts to see who prevails, the states or the FCC, but a ruling by a federal judge in California this past January refused a preliminary injunction by the FCC intended to stop Free Radio Berkeley from broadcasting. According to the FRB

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AN FM PIRATE IN D.C.

Washington, D.C. is home to the headquarters for the FCC, dozens of local AM, FM, and TV stations, various national and international broadcast networks, and studios for the likes of the Voice of America and XM Satellite Radio. As D.C.'s traffic creeps along its infamous beltway, drivers can tune in an amazing array of radio distractions including WSQT 88.1 FM, a low-power, unlicensed station broadcasting 30 minute studio-produced news from somewhere in the shadows of the monuments of power during randomly picked afternoon rush hours.

Programming on WSQT, aside from its opening pirate radio theme song, is mostly news and features from an extreme left perspective. A spokesperson for the station told *MT*, "We continue to broadcast coverage opposing foreign wars of aggression and domestic campaigns of gentrification and population displacement. We see these as merely different battle fronts in the same war, the global war between the rich and poor." And, they're in a pretty good place for it; many official D.C. license plates, the ones that don't say "Diplomat" on them, read, "Taxation without Representation."

The station attracted FCC attention, and even made it on CNN News, when they ran on-air promos to protest President Bush's second inauguration in 2005. They also gained FCC attention, "when someone at FEMA didn't like our 'Mad Max beyond Superdome' on-the-ground reports sent out by activists in New Orleans after Katrina." WSQT spokesperson said they have no interest in obtaining a legal low-power FM license. Like other FM pirates, they play a cat-and-mouse game with the FCC and remain a pain in the ear for Washington's power elite.

All about Antennas Part 4: Choosing Antennas

By Bob Grove W8JHD (all graphics courtesy the author)

The term "polarization" refers to the relative position of the electric component of the radio wave with respect to the earth's surface. A vertical antenna, often referred to as a "Marconi" (or "whip" if short), has its element(s), and therefore its electric field, perpendicular to the earth. A horizontal antenna, variously called a "Hertz", "flat top" or "Zepp" (after the trailing antennas on the Zeppelins), has its element(s) and electric field parallel to the earth.

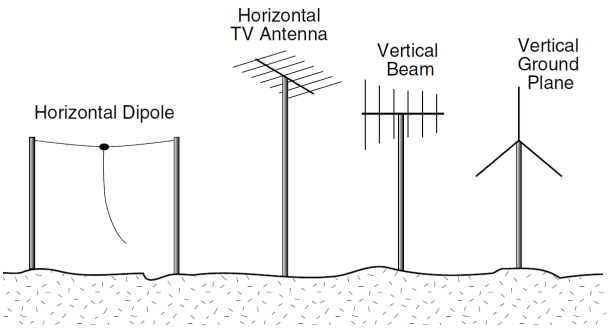
Neither polarization is inherently superior. The choice is made on a basis of practical considerations such as the likelihood of a horizontal antenna causing television interference (TVI); the possibility of interaction with nearby metallic masses in the same plane; a desired pattern; reduction of noise pickup from power lines and accessories; the area available, or ease of mounting.

Vertical antennas have only one mounting point and, properly placed, radiate uniformly toward the horizon in all compass directions; their low angle of radiation favors distant communications.

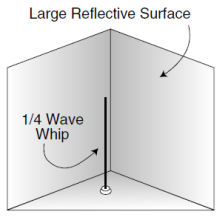
Horizontal wire antennas must be elevated at least a half-wavelength above the earth for a low angle of radiation and reception; they utilize at least two suspension points, and radiate primarily at right angles to the wire axis. It is more practical to make a long horizontal antenna than a tall vertical antenna because of the support requirements.

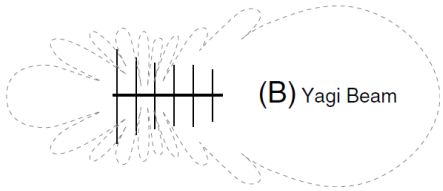
At high frequency (shortwave), there is little difference in performance between properly installed horizontal and vertical antennas. Distant signals arrive with mixed polarization from multiple reflections, and sometimes even the compass direction (azimuth or bearing) is unpredictable.

For VHF/UHF, vertical polarization is the rule since mobile communications dominate this part of the spectrum, and it is easiest to mount a whip antenna on the vehicle. Except in the city where buildings reflect signals, short range VHF/UHF communications retain their original polarization.



The polarization of an antenna is simply its relationship to the surface of the earth.





The gain of an antenna may come from increasing its aperture (A) or narrowing its pattern(B).

Dipoles

The most common basic antenna is the half-wave dipole, a length of wire at low frequencies, or tubing at VHF/UHF, which is cut at the center and connected to a transmission line. Such an antenna matches coax well for about +/-5% of its design center frequency, but the impedance steadily rises beyond that, requiring an antenna "tuner" (transmatch) for transmitting.

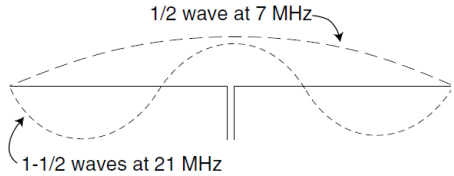
On odd harmonics (3rd, 5th, etc.) of the fundamental design frequency, the impedance lowers again, making the antenna multiband even without a tuner.

A half-wave dipole is a half-wavelength long only at one frequency; that same length is a full-wavelength at twice the frequency, and a quarter-wavelength at half the frequency.

The theoretical length in feet of a half-wave dipole in free space is found by dividing 492 by the frequency in megahertz. But support insulators and wires at the ends ("end effect") makes the antenna about 5% capacitively shorter. Divide, instead, 468 by the frequency in megahertz; Thus, a 7 MHz, half-wave dipole would be 67 feet long.

Since it is more convenient at VHF and UHF to calculate in inches, divide 5616 (468 times 12 inches) by the frequency in megahertz. Thus, a 146 MHz dipole would be 38 inches long.

At its design frequency and below, the radiation and receiving pattern is perpendicular to the element, but as the harmonic multiple increases, the pattern changes, and the lobes now favor the ends of the antenna with resultant gain. This should be taken into consideration for wide frequency applications.



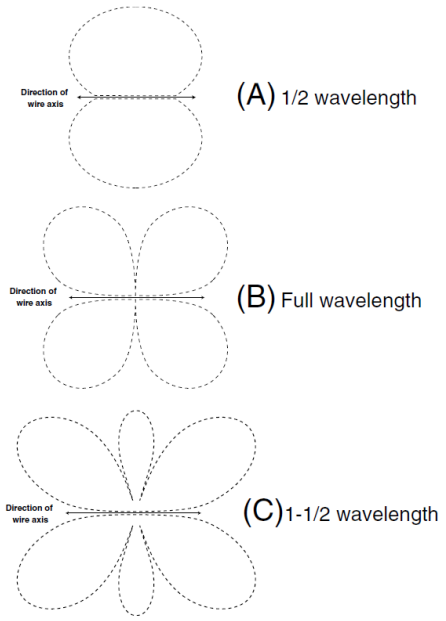
A 67-foot dipole is half-wavelength at 7 MHz, but 1-1/2 wavelengths at 21 MHz. As the frequency increases, wavelength decreases.

Such an antenna can be erected to favor ground-wave communications at the lower frequencies, and sky-wave DX at higher frequencies.

While it may be tempting to erect the longest dipole we can, consistent with available real estate, a quarter-wave dipole captures only 3 dB (half and S-unit) less than a half-wave dipole. We won't hear much difference. For transmitting, if properly matched, the radiated power is virtually identical.

The "Longwire"

Many shortwave enthusiasts mistakenly refer to a random wire antenna as a "longwire," but it doesn't qualify unless it is at least one full wavelength long at its operational frequency. Thus, a 150 foot antenna is just a half-wave dipole at 3 MHz, but it is a longwire above 6 MHz.



A halfwave dipole (A) as seen from above has a classical figure-eight pattern at right angles to the curve. The same antenna at twice the frequency, now a full wavelength, has a cloverleaf pattern.

So why doesn't a long, horizontal shortwave antenna make a great scanner antenna? For one thing, as you use a given length antenna at higher and higher frequencies, it has large

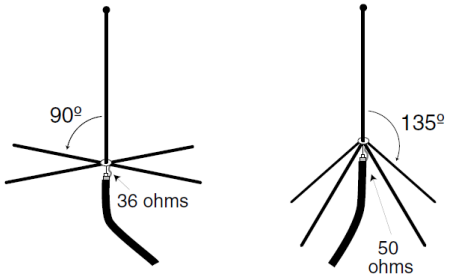
numbers of lobes and nulls, making it very directional. Not only that, but most VHF/UHF signals are vertically polarized.

Even if it were suspended vertically, the longwire antenna pattern would favor VHF/UHF signals off its ends—above and below, not off its sides. And finally, impedance mismatch would cause considerable signal loss in the transmission line at VHF and even more at UHF.

Ground planes

The ground plane antenna may be thought of as a vertical dipole in which the bottom element is replaced by an array of horizontal (or nearly so) elements, or even a sheet of metal, simulating a perfectly conductive earth.

Like the dipole, a ground plane designed for a specific frequency will experience an increase in feed-point impedance and radiation angle toward its ends as the applied frequency increases, reducing effectiveness on harmonic operation, except for working or monitoring overhead aircraft and orbiting satellites!



The angle of the radialelements affect the feed point impedance of a ground plane vertical.

Mobile Antennas

In an automotive environment, the vehicle body is the ground plane; its contours and antenna placement influence the radiation (and reception) pattern of the signal. Directivity generally favors the mass of metal—a roof-mounted whip has a basically omnidirectional pattern, while a rear-bumper mount favors the forward direction of the vehicle.

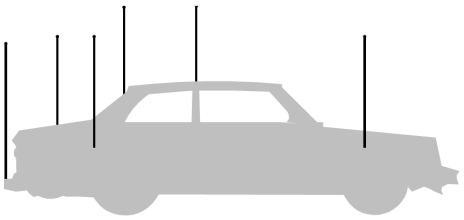
At frequencies above 10 MHz or so, the surface area of the vehicle and the length requirements for a vertical antenna are practical for efficient operation; a quarter-wave whip is resonant, exhibiting a feed point impedance of about 36 ohms, a good match for conventional 50-ohm cable.

But as frequencies lower, the electrically-short antenna possesses less and less radiation resistance (less than one ohm at 2 MHz) and more and more capacitive reactance which must be cancelled by a series inductance (loading coil).

Base-loading the whip requires less inductance than center- or top-loading because the upper whip section's capacitance with the car body reduces its own capacitive reactance; but the radiation resistance remains low (in some cases a few ohms), so that coil and transmission line resistances contribute a proportionately-higher loss.

Raising the position of the loading coil changes the current distribution along the antenna, increasing the radiation resistance, but the longer loading coil requirement introduces more resistive loss. A position approximately 2/3 the way up the whip may be an optimum compromise.

But as the frequency of operation lowers, choosing a high-power-rated coil with low resistive loss becomes increasingly important, even for receiving and low-power transmitting.



The mobile radio enthusiast has a number of antenna location choices with rooftop the best. Other spots include rear bumper, trunk lid, rear and front cowls, and rear window.

When all resistive losses are kept low and the reactances are tuned out, the typical input impedance of an HF mobile antenna remains in the 10-20 ohm range. A broadband impedance-matching transformer is recommended for transmitting.

In a poorly-designed mobile antenna installation, resistive losses may be high enough to match the impedance requirements of the radio and coax, negating the need of a matching network—but the performance is awful!

Grounded Antennas

It is actually possible to connect one end of an antenna to a solid earth ground with excellent results. This is the principle behind the Beverage antenna.

Why doesn't the ground trickle off all the signal voltage? Because of standing waves. We are dealing with high frequency alternating current, not DC. The element is long enough to utilize reflected signal voltage to cancel any short-circuiting to ground.

Just as with a dipole or vertical in which one element set is connected to the grounded shield of the coax transmission line, this antenna detects the voltage difference between the elements, and that is what is sensed by the receiver as a signal.

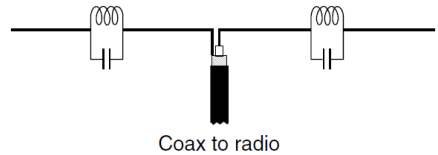
That is why a car body, in spite of the fact that it is "grounded" to the frame, and thus to the radio, can be used as an antenna at VHF and UHF frequencies. Arriving radio waves create standing waves – voltage points that can be tapped for their energy and fed to a receiver, or reciprocally, will accept energy from a transmitter and radiate it into space.

However, the unpredictable signal patterns as well as interference from ignition noise and automotive electronics make the car-body antenna a poor choice.

Traps

For multiband operation, a trap (a coil and capacitor in parallel) may be placed between sections of an antenna to provide automatic selection of appropriate lengths for given frequencies. The trap is high Q (sharply tuned) to the resonant frequency of the length closest to the feed point, providing several hundred ohms impedance isolation from the adjoining section(s).

At other (non-resonant) frequencies, the coil simply adds slight electrical length between the adjoining elements, all of which now add to the total antenna length. In this manner, a combination of elements and traps allow resonant operation on several bands without the need of
a transmatch. The sections are arranged in frequency order with the highest frequency closest to the feed point.



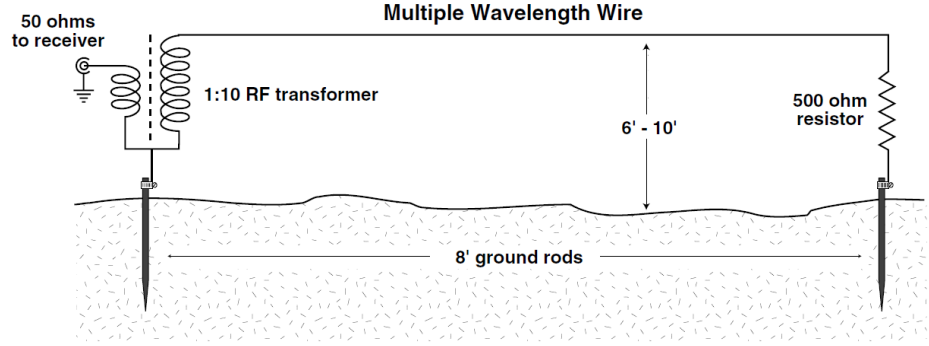
Traps are used to isolate antenna element lengths for multiband operation.

If a transmatch is available, a trapped antenna is undesirable since it suffers from the traps' resistive losses, gaps in frequency coverage, more components to fail, and higher cost than a simple dipole.

Active or Passive Antennas?

With one singular exception, all antennas are passive; that is, they have no amplifying electronic circuitry. They simply reflect, refract, radiate or conduct the electromagnetic

continued on page 74



The Beverage is an example of a high performance, low frequency, grounded receiving antenna.

Amateurs Can Be Professional: Ott Fiebel, W4WSR

By Bob Grove, W8JHD (All photos by author)

Most of us think of amateur radio as a hobby, a distraction from everyday repetition. But to Ottmar "Ott" Fiebel, W4WSR, radio has been a lifestyle, a constant challenge with continuous gratification. He treats it with respect and affection.

I first met Ott through our local ham radio club. From the start, he had a professionalism that stood out in the crowd. I would occasionally give talks on various technical aspects of radio, and Ott had no compunctions correcting me when he found it necessary!

Ott claims to have been fascinated by radio since his early childhood, admitting that he was fond of bootlegging on the broadcast band and on 10 meters until he finally got his Novice and Technician Class licenses when he was 17 years old.

A former AT&T engineer who contributed substantial effort to the early years of the NASA space program, Ott later opened his own manufacturing plant in Jupiter, Florida. His well-made microwave linear amplifiers under the Hi-Spec label (shown in the accompanying photo) helped other hams explore the higher frequencies. His amplifiers were designed to put out 200 watts when fed with a 10 watt transmitter on 902, 1296 or 2300 MHz.

Ott and his wife enjoy retirement on a mountain top in the friendly community of Hayesville, North Carolina. They wake up each morning overlooking a vista of beautiful mountains, valleys, lakes and streams.

A Busy Antenna Tower

Ott's broad-spectrum approach is immediately obvious to even the most casual visitor; his tower supports a dazzling array of directional antennas as shown on the accompanying photos. The high-gain, directional antennas can not only be rotated in the azimuth (horizon), but tilted in elevation as well.

Why hand-crank a tower when you can build an electric gear drive?

The cluster includes a Mosley TA33 tri-band beam for 20, 15, and 10 meters, an 11 element Yagi for 222 MHz, four 5-element beams on 144 MHz, four 19-element beams as an array on 432 MHz, 33 elements on 902 MHz, and 45 elements on 1296 MHz!

The tower (made by U.S. Tower) is kept in its telescoped position; after all, why elevate it when you're already above the neighboring mountains? But it is rigged to be extended to 51 feet by Ott's rugged system of chain and gear drives, shown in the accompanying photo.

Rather than having to climb the compressed tower to work on the antennas, an additional motorized pulley system allows the entire tower to be tilted over for convenient access.

Sure, it can be cranked up to 51 feet, but why bother when you're already above the mountain tops?

The "Shack"

The clean layout of his operating position looks too simple for the capability of his equipment. While most of us have favorite bands picked from HF, VHF or UHF, Ott has continuous ham-band coverage from 1.8 through 10,000 MHz (10 GHz), and he operates on all of them!

When he operates on 10 GHz, he feeds a 2-meter signal into a Down East Microwave transverter which multiplies the harmonics up to 10,000 MHz. During thunderstorms he uses the reflective weather conditions to make contacts up to 700 miles away using only 3 watts of power! He explains that the phenomenon is analogous to how radar signals are reflected to make TV weather maps on the evening news.

On the Air

Ott keeps regular schedules with fellow hams on VHF, UHF and microwave frequencies which are susceptible to ever-changing propagation conditions.

One of Ott's favorite modes is meteor scatter, an erratic mode relying on the ionization of the upper layer of the atmosphere by meteor impact. These events create brief (often only fractional-second) skip capabilities, extending many hundreds of miles on VHF. Since our atmosphere is constantly bombarded with meteors, there are continuous opportunities for short but erratic conversations, best conducted on single sideband (SSB) in the early morning hours.

Tight coordination and pre-planning are necessary for successful contacts; hams listen or transmit by agreement during several-second segments of each minute. The details are often

Ott Fiebel, W4WSR, takes pride in the clean layout of his ham shack.

These Hi-Spec microwave linear amplifiers are handsome reminders of Ott's former manufacturing operation.

worked out on line using "Ping Jockey" (**www.pingjockey.net/cgi-bin/pingtalk**). Calling frequencies are on 6 and 2 meters: 50.26 and 144.14 MHz. Users enter their schedules and frequencies into a continuous logging program, typically reporting their listening/transmitting schedules.

Ott is also set up for moon-bounce (Earth-Moon-Earth, or EME) communications on 2 meters. High-gain beams and decent power levels are required for corresponding amateur stations when they aim their beams at the lunar surface to work each other.

An interesting anomaly of EME is Faraday rotation, a phenomenon by which the polarization of the signal is shifted by the changing magnetic fields of the earth and moon. Hams often solve this dilemma by using dual-polarized antennas.

Ott also maintains a licensed, continuously transmitting beacon on UHF for propagation studies. It affords listeners the ability to communicate with hams in that location on adjacent frequencies. Since the beacon is at a site shared with other communications towers, the emission mode is continuous-carrier, frequency-shift keying (FSK). This avoids key-click interference from on/off keying which might be imposed on the sensitive receivers of his site neighbors.

Occasionally, Ott drops down to the lower (shortwave) frequencies to work a little DX. When he does, he uses a conventional ham-band transceiver connected to a multiband G5RV dipole tuned with an MFJ transmatch.

Do it Yourself, but Do it Right!

Adjacent to Ott's ham shack is a well-equipped workshop. You can see for yourself in the accompanying photos that he keeps it well organized. The shop is conveniently compartmentalized into the test bench and the tool bench.

The impressive array of Hewlett-Packard test gear dates from decades ago, but it is kept in like-new condition. Most important, it is superb-quality equipment.

The heartbeat of a test position is the accuracy of the instrumentation. Ott prefers to synchronize all of his test equipment with a single, 10 MHz time-base oscillator. He uses a "disciplined frequency standard" which derives its name from the method by which it extracts and utilizes a time base signal from a Global Positioning Satellite (GPS).

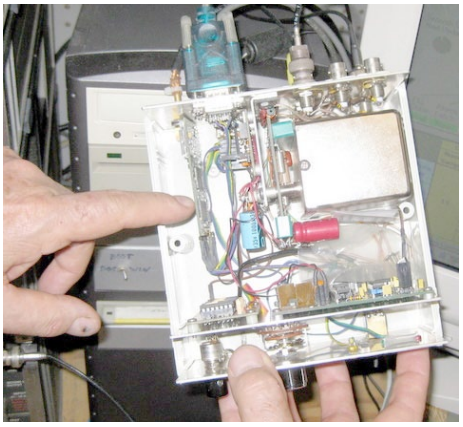
The GPS 1-pulse-per-second signal is integrated into a lab-standard 10 MHz time base oscillator which is divided down to 1 Hz. A comparator corrects the generator to an astounding 45 picohertz (45 x $10^{-12}10^{-12}$ Hz) accuracy! The GPS receiver board is pointed out in the accompanying photo which also shows the rest of the time base circuitry.

Visible on the wall at the left side of the test-bench is another secret of a well-managed test position: universal test cables. It makes no difference what piece of equipment is to be tested, there's a cable there with the appropriate connectors.

Roll Your Own

It's unusual to see a small home workshop equipped with a professional sheet-metal brake and shear as shown in the photo. But Ott came by these with considerable luck, by being in the right place at the right time.

Old timers will remember the Lysco transmitters of the 1950s that were made in New Jersey. But the influx of low-cost, Japanese-made electronics forced many American manufacturers out of business. When Tom Lysco finally closed his operation, Ott was given the opportunity to purchase these tools at a fraction of their cost, and he did. The wisdom of that decision is reflected in the fine craftsmanship exhibited by his home-brew gear.



This Global Positioning Satellite (GPS) receiver provides the time base for all his test equipment.

Need a chassis or an angle bracket? It's a cinch when you have a professional hand brake.

And you think your parts are organized in plastic bags and a cardboard box?

"Do it right the first time" is an adage we've all heard. Ott Fiebel W4WSR, believes it, and the craftsmanship of his ham shack, as well as his professional operating demeanor, are shining examples of that ethic.

Classic test equipment and a technical library outfit Ott's lab.

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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Looking for the Easy Button

How much scanner do you really need? Can you hear local activity with an older scanner or do you need a new model with all the latest trunking and digital features? This month we take a look at a relatively new digital protocol, and print letters from readers who are quite successful using old analog models, then finish up with a brief mention of some new scanners designed for simplicity.

❖ Vernon Parish, Louisiana

Hi Dan,

I recently purchased a Uniden BC340CRS scanner but only know of one frequency (Vernon Parish Sheriff's Office). Can you help me with other frequencies in the Vernon Parish area of Louisiana?

Linda

Vernon Parish is located on the western side of Louisiana, bordering Texas, and is home to the Fort Polk U.S. Army base. It has a population more than 52,000 in an area of about 1,300 square miles.

The Uniden BC340CRS, introduced in 2005, is a base station-style scanner with a built-in alarm clock and AM/FM radio. It can store 100 channels in 10 memory banks and has a "service search" feature to help locate activity in one of five categories. It also has the ability to scan weather broadcasts from the National Oceanic and Atmospheric Administration (NOAA).

In addition to the standard AM and FM broadcast bands, the scanner covers the following frequency ranges: 25 to 54 MHz, 108 to 174 MHz and 406 to 512 MHz. Although not as useful now that television has moved to digital, the unit also covers twelve of the old TV audio channels, specifically channels 2 through 13 at 59.75, 65.75, 71.75, 81.75, 87.75, 179.75, 185.75, 191.75, 197.75, 203.75, 209.75 and 215.75 MHz.

The BC340CRS is a conventional scanner, meaning that it cannot automatically track trunked conversations. It is also unable to demodulate digital voice activity, so it cannot monitor APCO Project 25 transmissions. While these limitations make the scanner less desirable in many urban areas where trunking and digital radio systems are more prevalent, it is still useful in more rural areas, including Vernon Parish.

Check the following conventional (non-trunked) frequencies for activity.

Frequency	Description
154.055	Vernon Parish Police Jury
154.265	Vernon Parish Fire (Dispatch)
154.400	Leesville Fire (Fireground)
154.7925	Rosepine Police (Dispatch)
154.8825	Leesville Police (Dispatch)
155.175	Leesville Fire (Dispatch)
155.655	New Llano Police (Dispatch)
158.835	Vernon Parish Sheriff (Dispatch)
159.1275	Vernon Parish Sheriff
453.275	Leesville Emergency Operations Center
458.2375	Vernon Parish Sheriff (Mobile Repeaters)
854.9625	Leesville Police (Dispatch)

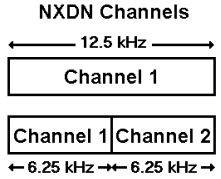
Unfortunately, some of these frequencies may have migrated to a new trunked radio system that cannot currently be tracked by any consumer scanner, even the newest digital models.

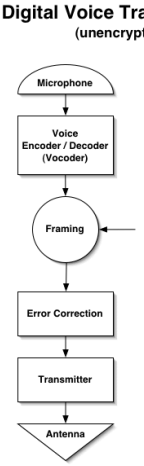
❖ NXDN

The Vernon Parish Communications District operates a radio system from Kenwood that uses a relatively new air interface called NXDN, originally developed by Kenwood and ICOM. The Kenwood product is called NEXEDGE and the corresponding ICOM trademark is IDAS (ICOM Digital Advanced System).

NXDN was designed to provide a relatively low cost radio system for business and public safety users that meets the January 2013 narrow banding requirement set by the Federal Communications Commission (FCC). The requirement for narrow channels, initially 12.5 kHz wide and eventually 6.25 kHz, will allow radio systems to use existing radio spectrum more efficiently and thus be able to fit more users in the same amount of space.

NXDN defines a basic radio channel as either 12.5 kHz wide or 6.25 kHz wide, to meet the FCC requirement. A 12.5 kHz channel may contain two 6.25 kHz channels, each of which may carry either voice or data. NXDN systems support the use of older analog radio equipment, allowing customers with conventional systems to slowly migrate to narrow channels without having to replace all of their radios at once.

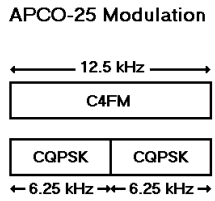




NXDN channels carry either analog or digital traffic; however, the digital mode is not compatible with APCO Project 25. The digital mode uses a voice encoder/decoder (vocoder) called AMBE+2, licensed from Digital Voice Systems, Inc.

For the more technically minded, NXDN transmits information at 4,800 bits per second using a modulation technique called four-level frequency-shift keying (FSK). The vocoder converts sound from the microphone into a stream of data bits at the rate of 2,450 bits per second. Error correction bits are added to protect this stream during transmission, bringing the rate to 3,600 bits per second.

Having a data stream allows additional information to be carried between radios along with the digitized voice. NXDN supports the inclusion of telemetry, Global Positioning System (GPS) location data and even short text messages at the rate of 800 to 950 bits per second.



Additional framing and control bits bring the data rate to 4,800 bits per second. The four-level FSK modulation maps two of these information bits at a time to a specific frequency offset ("shift"), according to the following table:

Information Bits	Frequency Offset
01	+1050 Hz
00	+350 Hz
10	-350 Hz
11	-1050 Hz

The transmitter adjusts its frequency offset according to the information bits in the data stream. The receiver detects these offsets and converts them back into information bits.

Radio channels are separated from each other via Frequency Division Multiple Access (FDMA), just like traditional analog channels, and give radios the ability to communicate directly with each other (sometimes called "talk around") when a repeater is not available. This keeps the system simple in comparison to other

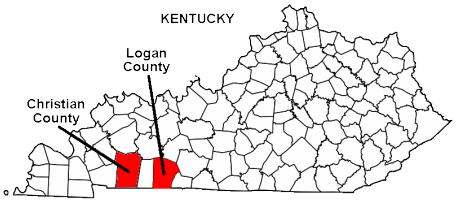
systems that use Time Division Multiple Access (TDMA), where a single channel is simultaneously shared among two or more transmitters.

NXDN supports both conventional and trunked operation, although there appears to be a question as to whether the Kenwood trunking is entirely compatible with the ICOM trunking implementation.

What all this means is that it might be a challenge to monitor the Vernon Parish NEXEDGE system. It operates on the following frequencies: 453.3125, 453.3500, 453.4375, 453.5875 and 453.7375 MHz. You may want to try adding each of the frequencies to a memory bank and scanning them in case some analog traffic can be heard.

❖ Christian County, Kentucky

Despite its origin as a less expensive business radio system, other local government agencies are using NXDN. Christian County, located in southwestern Kentucky with a population of about 80,000, operates a Kenwood NEXEDGE trunked radio system. A number of public safety agencies use the system, including the County Sheriff, Fire, and Emergency Medical Services Departments, the County Emergency Management Agency, Hopkinsville Police and Fire, Oak Grove Police and Fire and the Crofton Police.



Several sites, licensed under multiple call signs, provide geographic coverage for the county:

Site	Frequencies
Medical Center	451.5000, 452.1000, 452.6500, 453.2000, 453.5250, 453.6750, 453.8750, 460.0500, 460.1875, 460.4625
Hopkinsville Tank	453.1750, 453.4125, 453.5750, 453.7000, 453.8375
Greenville Road	453.2000, 453.2500, 453.6375, 453.6875, 453.7625, 453.8375, 460.1625, 460.3875, 460.4625, 460.6000
Oak Grove	453.2250, 453.3500, 453.5000, 453.7625, 460.1250

The following conventional frequencies may still have activity in Christian County, whether as simulcast, backup, or for paging messages to firefighters.

Frequency	Description
153.245	County Fire
153.890	County Fireground ("Green")
154.130	County Fireground ("Black")
154.355	County Fireground ("Yellow")
154.445	County Rescue and Fire (West)
154.785	Hopkinsville Police (Dispatch)
154.875	County Jail
155.115	County Sheriff (Dispatch)
155.160	Emergency Medical Services (statewide)
155.340	Emergency Medical Services to Hospital
155.400	Yellow Ambulance (Dispatch)
155.790	Oak Grove Police (Dispatch)
453.075	Oak Grove Fire (Tactical)
460.600	Hopkinsville Fire (Dispatch)
460.625	Hopkinsville Fire (Tactical)

❖ Logan County, Kentucky

In November 2009, nearby Logan County contracted with Kenwood for a half-million dollar NEXEDGE digital radio system. The new system will operate with higher transmit power from one repeater site in the town of Russellville.

The county claims their existing radio system is 11 years old and overloaded. It also has coverage gaps in certain areas, preventing public safety personnel from reliably reaching a dispatcher. There are also interoperability shortcomings, hampering direct communication between police, fire, and the county's Emergency Communications Center.

Until the new system is in place, Logan County will continue operating their Logic Trunked Radio (LTR) public safety radio system on the following frequencies. Remember that LTR frequencies must be programmed in Logical Channel Number (LCN) order.

LCN	Frequency
01	453.3625
05	453.6125
10	453.8125
14	453.9250

The system is also licensed for two additional frequencies, 453.1000 and 453.8000, although I do not have information about activity on them.

The following talkgroups have been monitored on the system:

Talkgroup	Description
0-01-050	County Sheriff (Dispatch)
0-01-051	County Sheriff (Channel 2)
0-01-052	County Courts
0-01-053	County Sheriff (Supervisor)
0-01-054	Russellville Police (Dispatch)
0-01-055	County Sheriff (Channel 3)
0-01-058	Logan County Mutual Aid
0-01-059	County Fire (Dispatch)
0-01-060	County Fire (Tactical)
0-01-061	County Rescue Squad
0-01-062	County Detention Center
0-01-064	County Emergency Medical Services (Dispatch)
0-01-235	County Sheriff (Channel 4)

The following conventional frequencies may have activity when the LTR system is down for maintenance or other reasons, so you will want to include them in your Logan County programming:

Frequency	Description
154.445	County Fire Dispatch (Simulcast)
155.325	Lewisburg Fire/ Emergency Medical Services
453.8375	County Emergency Operations Center (Backup)
460.175	County Sheriff (Backup)
460.425	Russellville Police (Backup)
463.1500	County Emergency Medical Services (Dispatch)

❖ Maine

Dear Dan,

To let you know that by 2012, all public service radios in the State of Maine will be digital,

but the present frequencies will continue to be used. I understand that this is being done in a number of other states.

I have enclosed an up-to-date frequency list of the Belfast, Maine area. I use a Radio Shack PRO-46 receiver which is most adequate at present.

A couple of caveats - the Belfast and Moosehead Railroad no longer exists but there is a strong movement to re-establish this line. Also, Central Maine Power has an 800 MHz trunked system. The PRO-46 cannot receive trunking so I entered all 14 frequencies into two banks. Then, when the power went off here in a storm, I monitored just those two banks. I picked up the CMP on two frequencies with the exciting announcements of ... pole numbers! Nothing else!

73, Bob in Maine

BELFAST AREA SCANNERS

Frequency	Description
33.70	Islesboro Fire
47.22	State Highway, Augusta headquarters
47.32	State Highway, Belfast-Brunswick 1
47.34	State Highway, Belfast-Brunswick 2
47.68	State Sand and Gravel
121.500	Air Distress
122.000	Flight Watch, weather
122.800	Belfast Airport
122.900	Islesboro Airport
123.025	Helicopters
123.050	Blimps
123.100	Aircraft Search and Rescue
123.150	Airshows
123.300	balloons, gliders
123.400	Airshows
123.450	plane to plane
123.470	plane to plane
125.300	Bangor Control, low altitude
126.200	Military towers to civil planes
134.950	Augusta Control, high altitude
143.625	International Space Station
146.520	Ham, national call
146.850	Ham, Dixmont repeater - SKYWARN
147.165	Ham, emergency, local
147.270	Ham, Knox repeater
151.805	Viking Lumber
153.125	Mathew Brothers
153.950	Waldo County Fire, north tower
154.145	Morrill Fire
154.175	Northport Fire
154.310	State Fire
154.355	Belmont Fire
154.385	Waldo (town) Fire
154.710	State Police, emergency
154.860	Islesboro Police
155.055	State Police, Waldo County
155.130	Belfast Police (and Sheriff link)
155.295	Med-Flight
155.355	Waldo County Hospital to Ambulance
155.760	Maine Emergency Management Agency (MEMA)
155.805	Belfast Fire, Ambulance
155.905	Belfast municipal repeater
156.030	Waldo County Sheriff
156.035	Searsport Fire, Police, Ambulance
156.300	Marine Safety and Call
156.400	Belfast Harbormaster
156.400	Searsport Harbormaster
156.425	boat races
156.450	Penobscot Bay Pilot and Tugs
156.500	Penobscot Bay Pilot and Tugs
156.550	ship to ship
156.650	Ship Intentions
156.800	Marine Distress and Call (Marine Channel 16)
156.875	tankers
156.950	Maine State Ferries
157.100	Coast Guard broadcasts, NMF-44 (6:35 am and pm)
157.175	Coast Guard working
157.425	fishing boats
158.745	Islesboro Rescue
159.135	Waldo County Fire, south tower
159.405	State Forestry
160.140	MEMA, Civil Defense
160.385	Belfast and Moosehead Lake Railroad, repeater
160.710	Belfast and Moosehead Lake Railroad, primary
162.400	NOAA Weather, KEC-93, Ellsworth
463.300	Belfast Taxi
463.325	Ellsworth Building Supply
464.375	Whitecap Builders
856.3375	Central Maine Power (trunked)
857.3375	Central Maine Power

The PRO-46 is a handheld scanner introduced in 1993. It can store 100 channels in 10 banks and covers the following frequency bands: 29 MHz to 54 MHz, 108 to 174 MHz, 406 to 512 MHz, 806 to 956 MHz (less cellular). It is not able to follow trunked conversations or monitor digital transmissions, but Bob continues to use it with great effect.

❖ Fast Food Monitoring

Hello Dan,

I read your column in the April 2010 issue of Monitoring Times *regarding fast food radios.*

In Phoenix, a number of chains use the same UHF frequency: 457.5125 MHz.

Krispy Kreme, In 'N Out Burgers, KFC, McDonalds, and Del Taco, among others, appear to use the same transceivers. If I ascend one of our hills, I hear a DXpedition style pileup on this single frequency.

Both 154.515 and 154.540 MHz also have a large number of users across the city.

The Dairy Queen near my apartment uses 921.800 MHz, but with wide 100 kHz FM – and uses extremely low power. The signal barely makes it out of the building, and I can't hear it just across the street.

In the past, I monitored some windows using 33.400 and 35.020 MHz, but the restaurants must have upgraded their equipment.

Some of our local restaurants use the Spirit GT series of two-way radios.

464.600 MHz Old Country Buffet

I have never had any problems with people disturbed by my small scanners. I just use an earphone, and keep the radios quiet. So many people use cell phones and text messaging, no one pays attention any more. I found it useful to dress like I am going to work – or even wear a bright fluorescent T-shirt along with khaki pants and work boots. Along with the radio, people think I am with a construction crew, and ignore me as I go about logging frequencies. People ask more about the shirt than the radio.

The Yaesu VR120D and VR500 offer a number of automatic Smart Search logging functions, so I can simply set them and forget them, copying the catches later on. To make the radios even harder to notice, I bought a bunch of Radio Shack race-style stub antennas that are currently on clearance, and they seem to be tuned to the 450 MHz UHF range. They are not sensitive, of course – but that prevents the Smart Search from snagging intermodulation.

73 Robert KB7AQD

❖ New Scanners from GRE

General Research of Engineering (GRE) has been building electronic products for nearly 50 years, including receivers and scanners marketed under the Radio Shack name. Recently GRE began marketing a new family of scanners under their own name, including the popular PSR-500 and PSR-600 digital trunking units.

At the Dayton Hamvention in May, GRE demonstrated their latest unit, the PSR-700. This handheld unit, called the "EZ Scan-SD," is intended to make scanning easier for beginners. It has a vastly simplified control panel, similar to an MP3 music player, and holds frequency and talkgroup information on a removable memory card. The card is large enough to hold all analog trunked systems in the United States as well as many conventional frequencies. By selecting your state and county, the PSR-700 can automatically scan for activity in your area without needing you to program anything. Updates to the frequency information and the scanner firmware can be done over the Internet. The PSR-700 does not track or monitor digital APCO 25 systems, although GRE says they have a new digital model in development that they hope to have ready by next year.

The PSR-700 is similar to the Radio Shack iScan, also manufactured by GRE, with a simpler interface and more memory. The scanner covers the following frequency bands: 25 to 54 MHz, 108 to 174 MHz, 216 to 512 MHz, 764 to 797 MHz, 806 to 960 MHz (less cellular), and 1240 to 1300 MHz. It runs on two AA batteries and can be powered via a USB connection.

If you are looking for an easy-to-use scanner and don't need to monitor digital systems, the PSR-700 at a street price of around $230 looks like a great choice.

Other new GRE units with simplified operating controls include the handheld PSR-310 and the base/mobile PSR-410, each offering an "Object Oriented" user interface, analog trunk-tracking, expanded memory storage and a high speed PC interface.

That's all for this month. Enjoy the summer, but if you do find yourself near a computer, you can check my website at **www.signalharbor.com** for more detailed information on scanners, frequencies and other radio-related material. I also welcome your questions and reports via electronic mail at **danveeneman@monitoringtimes.com**. Until next month, happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

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Q. *Why do fractal antenna designs only seem to be for professional uses and not for hams, SWLs and scanning enthusiasts? (James Rubin, KC2LMH, Forest Hills, NY)*

A. The primary advantage of a fractal antenna is its ability to be reduced to as much only 1/4 the size of a conventional dipole or loop antenna at any given frequency without a substantial reduction in gain, and while still maintaining reasonably wide bandwidth.

They are more difficult to design and manufacture than a conventional antenna, so unless there is a critical application requiring the fractal approach, there's no reason to replace the conventional antenna. The popular log-periodic dipole array is actually a fractal design, but why replace it with the more elaborate design for amateur radio applications?

The fractal geometry is difficult to support in real life applications, so its commercial applications are primarily in the UHF/microwave region of the spectrum where it can be etched on a substrate. That's quite likely another reason we don't see them on the lower-frequency bands.

Q. *Does a random long-wire antenna receive signals from the sides of the antenna or from its ends? (Rene Puente, San Diego, CA)*

A. The term "long wire" is frequently misused; it actually means a wire longer than a full wavelength at its operating frequency. Thus, a half-wavelength wire on 10 MHz is actually 1-1/2 wavelengths long at 30 MHz.

Antennas shorter than a full wavelength receive signals off the sides (broadside to the wire), but the higher the receive frequency the more that pattern drifts toward the ends. The same description applies to the transmitted signal from that antenna as well.

Q. *In my apartment I'm limited to an indoor antenna, but I can run an antenna wire along a 120-foot roof truss. Should I also wrap it back around several times like a giant loop? Do I need a tuner? (Jerry Rivet, email)*

A. If the wooden roof-truss system doesn't have large metal masses like heating/air conditioning ducts or electric wires running parallel within a few feet of it, it should work just fine.

If your main interest is AM broadcast up through shortwave, then you really don't need more than about 50 feet of wire. If you use considerably more than that, you won't really hear any advantage; signals may be slightly stronger, but so will the background noise, so you won't really gain anything.

Don't worry about the gauge of the wire, or whether it's stranded or solid; anything will work well. But do connect the end of the wire to the center conductor of a coax cable down-lead to your receiver; otherwise you are likely to hear a lot of electrical interference from household appliances and accessories.

For most receiving applications, a tuner (transmatch) is unnecessary.

Q. *A local AM radio station on 1350 kHz has a strong third harmonic on 4050 kHz, but not on the second harmonic, 2700 kHz. Shouldn't the second harmonic be stronger than the third? (M.B.)*

A. Odd harmonics (3 x fundamental frequency) are normally stronger than even harmonics (2 x fundamental frequency) because the impedance match to the antenna system is closer on odd harmonics, so the line-loss efficiency is better.

Q. *What is the advantage in using a passive multicoupler to attach two scanners to one antenna rather than just a simple "T" connector? (John Mongan, email)*

A. While a T does, indeed, couple both radios to a single antenna, it doesn't provide any isolation between the radios; thus, various oscillator products from one are likely to intrude into the other, locking up its scan sequence and even blocking some channels. Even when that doesn't happen, the scanning "ticks" from one scanner are often heard on the other.

The simplest solution is to try the T and, if either or both of the scanners is/are plagued with interference, use the multicoupler!

Q. *How can a receiver radiate a signal that is heard in another nearby radio? I've heard of "birdies," harmonics, and I.F., but what are they? (Eric Hopkins, Ayer, MA)*

A. All modern receivers – pocket portables, communications receivers, radar detectors, FM – are of the superheterodyne design; that is, they convert radio frequencies downward to an intermediate frequency (I.F.) where they are easier to process. These receivers have an oscillator injecting a signal into a mixer, and it's the oscillator and its harmonics (whole-number multiples of the fundamental frequency) that can be detected on a nearby receiver as the oscillator circuit radiates some of its energy through the unshielded cabinet of the radio.

For instance, If you want to hear a 150 MHz signal on a receiver with a 10.7 MHz intermediate frequency, here are two ways the receiver may achieve it:

With "high-side" injection, the oscillator injects a 160.7 MHz signal into the mixer where it blends (mixes) with the incoming 150 MHz signal, resulting in four signal frequencies – the original 150 MHz, the oscillator's 160.7 MHz, and their sum and difference frequencies, 311.7 and 10.7 MHz.

With 'low-side" injection, the oscillator injects a 139.3 MHz signal into the mixer where it blends with the incoming 150 MHz signal, resulting in four signal frequencies – the original 150 MHz, the oscillator's 139.7 MHz, and their sum and difference frequencies, 289.3 MHz and 10.7 MHz.

Tuned circuits select the 10.7 MHz (the intermediate frequency or I.F.), but if the incoming radio signal is strong enough, it can produce and even mix with harmonics of the oscillator to produce multiple images of the desired signal which can be detected at various parts of the tuning range. These are the "birdies."

By calculating these different frequency combinations, you can "use" the images to hear out-of-band signals if those signals are strong enough to get through the receiver's filtering circuits which are designed to eliminate those spurious products.

Q. *What is the difference between the earth's magnetic poles and geomagnetic poles? Why do the poles wander over time? (Eric Hopkins, Ayer, MA)*

A. The magnetic poles are the north and south points on the earth's surface where a distant compass would point. The geomagnetic poles are the north and south poles of the earth's magnetic nickel/iron core, deep under the crust and mantle.

The reason the poles wander several miles per year is that molten magnetic core material circulates.

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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Making Sense of ALE Addresses

ALE stands for Automatic Link Establishment. Regular readers of the *Utility Logs* know how common ALE has become in high-frequency (HF) radio. Its gurgle-gurgle-gurgle sound is all over the bands.

In fact, ALE has spread far past its original military applications to become something of a world standard for autolinking on HF. Its wide acceptance, along with better understanding of near-vertical skip and other techniques, is a major factor in the revival of terrestrial radio communication. Radio spectrum that had been given up as obsolete is once again in wide use, not only by military units, but also by governments, non-governmental organizations (NGOs), and even hams.

The first widely adopted ALE standard was developed in the 1980s. The idea was to automate much of the grunt work done by HF radio operators with regard to frequency selection, calling, and establishing contact. It worked. Personnel with less specialized training were able to use HF with about the same effectiveness as satellite communication.

Today, ALE uses several official standards. Tech geeks can find these online and plow through their hundreds of pages.

The US standard which really refined ALE into an interoperable system was adopted in 1986. It is MIL-STD-188-141A.The Federal standard is FED-STD-1045. These define what is now known as second-generation (2G) ALE.

A third-generation (3G) standard, MIL-STD-188-141B, was adopted in the late 1990s. Something similar exists for the North Atlantic Treaty Organization (NATO), with STANAG (STAndardization AGreement) 4538.

3G is backwardly compatible with 2G, and both are in common use. For our purposes, the differences are slight. They relate largely to synchronous signaling within networks, and general tweaking for speed and accuracy. Mostly, you'll notice that 3G networks can link with much shorter calls. Monitoring, however, is the same.

Even five years ago, it was still possible for listeners to keep on top of the identifying ALE "addresses" being heard on the bands. This is no longer the case, as mysterious new nets pop up weekly. Today, half the fun is the detective work required to sort through ALE's ever-thickening alphanumeric soup.

❖ What's An Address?

In ALE nomenclature, an "address" is the name used to identify a particular station's radio controller in a network. It's ALE's version of the Selective Calling (selcal) identifiers found in older modes like Telex and HF oceanic air traffic control.

Some stations use their actual assigned calls, typically rearranged a bit to fit better, for their address. Most, however, do not. Sometimes it's easy to spot the logic behind a net's addressing system. Just as often, though, it can appear to outsiders as absolute gibberish.

ALE addresses were originally limited to three characters. We still see addresses like this, especially among such early ALE adopters as the ground control stations in the SCOPE Command (System Capable Of Planned Expansion) net built by the US Air Force. These early players retain easily-remembered addresses like ADW, for Andrews Air Force Base, which is the control point in Maryland. There's also OFF (Offutt AFB, Nebraska), MCC (the old McClellan in California), HIK (Hickam AFB, Hawaii), and so on.

However, this small address space quickly became inadequate, as ALE spread throughout the world. Subsequent tweaks have greatly expanded it, allowing very long character strings. This was done in kind of a clever manner, by passing the address in two sections. The first three characters are still in the "official" ALE address field, while everything else is sent in a subsequent data field.

❖ Truncated Addresses

We need to look at some more history to understand why breaking up the address should concern us at all. Our tale starts in the year 2000, when the utility scene was revolutionized by PC-ALE, a breakthrough sound card program for the Windows PC.

At the time, ALE was the cutting edge of military-spec gear costing millions of dollars. Suddenly, here was a totally free, downloadable, functioning, ALE controller, written by G4GUO, a UK ham aptly named Charles Brain. Talk about power to the people!

Several people continue to hack PC-ALE's code. It's evolved into one version popular with hams, and another used by the US Military Auxiliary Radio System.

Both of these continue to show one failure mode perhaps inherent to ALE. If the data field gets mucked up by noise or fading, your decoded address is likely to drop everything after those first three characters that we mentioned.

One gets used to this, but it's a source of confusion. For example, there's FC8FEM, an address known to be used by Region 8 of the US Federal Emergency Management Agency (FEMA). This one often shows up as just FC8. Is this intentional, or is it truncated? Only context tells us for sure.

MARS has resolved this ambiguity in a rather clever way. It constructs ALE addresses by reversing the prefix and suffix of its assigned call signs. For example, the Navy/Marine Corps MARS station NNN0WWL is often seen with an address of WWLNNN. A truncation to NNN would make the address meaningless, since all of this branch's stations begin in NNN0. This way, though, the suffix identifies the station.

❖ Elementary, Watson

Often one has to think like Sherlock Holmes to figure out the address scheme of a particular net. It's not only a good mental exercise, but it makes it easier to identify new players found on the air.

Some use sequential numbers or letters. Others use letters from the station location, vessel name, or military unit.

Sometimes, addresses that look sequential really aren't. One finds these all the time on COTHEN, the US government's Customs Over-The-Horizon Enforcement Network. For example, many numbers such as "500" and "718" actually derive from the last 3 digits in the voice callsigns or numbers of Coast Guard aircraft.

Sometimes one has to apply platespeak (PL8SPK), the abbreviated language of personalized license plates. An example from this month's log is TRPFMOSHP. This seemingly random string is a contraction of Troop F, Missouri State Highway Patrol (MOSHP).

The "MO" gives another good clue for US agencies. State-based ones often use the post office abbreviation for that state, while regional ones might incorporate the region number or name. The US Civil Air Patrol's new system uses both. We have addresses such 0135ORCAP (Oregon), and 060PCRCAP (Pacific Coast Region).

The real brain-busters are the foreign names. People spend hours plowing through lists of Algerian pipelines, Mexican oil platforms, Venezuelan military bases, and ever so much more. Google gets a real workout here.

One way to get involved, then, is to join other people trying to puzzle out all the character strings from ALE addresses copied on the air. This is becoming an interesting sub-hobby in itself.

❖ SDO Sees First Light

In astronomy, first light is the traditional unveiling of a new instrument by using it for an actual observation rather than a test. Usually the quality of the data will get better as components are tweaked in. The first time, though, is always exciting.

SDO, the newly orbited Solar Dynamics Observatory, had one of the most astonishing first lights ever. Its awesome array of high-resolution telescopes, spectrographs, and magnetometers returned some absolutely jaw-dropping data. These included images and graphics from one of the largest solar prominences ever observed, at unprecedented resolution. One scientist saw these, and said something to the effect of, "Well, there went another theory."

Indeed, SDO's first light comes at a perfect time. Solar Cycle 24 is finally underway. After several months, we can say this positively, definitely, absolutely, and for sure. SDO's minimum mission of five years will therefore coincide with pretty much the entire rise of this new cycle.

Everything about SDO is amazing, and it promises a whole new ball game for solar-terrestrial physics as it relates to radio propagation. In the previous cycle, the hot setup was the SOHO (Solar and Heliospheric Observatory), with one image every 12 minutes. This time SDO returns an image every second, with four times the resolution, 24 hours a day and 7 days a week.

SDO does this over a radio bandwidth that's huge by space communication standards. Its high-gain transmitting antenna works with two dedicated receiving dishes in New Mexico, to achieve a sustained 150 megabits per second. That's one CD's worth every five seconds, or an IMAX frame's worth every ten, for at least five years.

Therefore, Cycle 24 promises to be the best-observed one ever. You can keep track of SDO at **sdo.gsfc.nasa.gov** . SOHO, still a very viable spacecraft, is at **sohowww.nascom.nasa.gov** . STEREO, a stereoscopic pair of solar observation spacecraft, can be followed at the same link.

ABBREVIATIONS USED IN THIS COLUMN

AFB ..... Air Force Base
ALE ..... Automatic Link Establishment
AM ..... Amplitude Modulation
CAMSLANT ..... Communications Area Master Station, Atlantic
CAMSPAC ..... Communications Area Master Station, Pacific
CAP ..... US Civil Air Patrol
CW ..... On-off keyed "Continuous Wave" Morse telegraphy
DSC ..... Digital Selective Calling
E10 ..... Israeli machine "female," phonetic letter groups
EOC ..... Emergency Operations Center
FAX ..... Radiofacsimile
FEMA ..... US Federal Emergency Management Agency
FSK ..... Frequency-Shift Keying
HFDL ..... High-Frequency Data Link
HF-GCS ..... High-Frequency Global Communication System
LDOC ..... Long-Distance Operational Control
LSB ..... Lower Sideband
M08a ..... Cuban CW/MCW numbers, cut to ANDUWRIGMT
M18 ..... Russian local time (UTC+4) in changing CW strings
MARS ..... US Military Auxiliary Radio System
MCW ..... Modulated CW, with tone or AM
Meteo ..... Meteorological Office
MX ..... Generic for Russian single-letter beacons/ markers
NASA ..... US National Aeronautics and Space Administration
NAT ..... North Atlantic oceanic control, families A-F
NTCN ..... US National Telecommunications Coordination Network
PACTOR ..... Packet Teleprinting Over Radio, modes I-III
PR ..... Puerto Rico
RTTY ..... Radio Teletype
Selcal ..... Selective Calling
SHARES ..... Shared Resources, US Federal frequency pool
STS ..... Space Transportation System ("Space Shuttle")
UK ..... United Kingdom
Unid ..... Unidentified
US ..... United States
USAF ..... US Air Force
USCG ..... US Coast Guard
V02a ..... Cuban "Atencion" numbers, 3-message format
Volmet ..... Scheduled aviation "Flying Weather" broadcast

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in brackets ().

18.1 RDL-Russian military, non-scheduled strategic broadcast using Russian "BEE" synchronous FSK, at 1634 (MPJ-UK).
1890.0 Ijmuiden Radio, Netherlands, maritime broadcast at 2150 (Michel Lacroix-France).
2598.0 VBQ-Canadian Coast Guard, Rivière-au-Renard, Quebec, weather in English and French, parallel on 2749, at 0443 (Lacroix-France).
2642.0 ICB-Genoa Radio, Italy, weather at 2025 (PPA-Netherlands).
2720.0 SPS-Witowo Radio, Poland, weather at 1348 (Lacroix-France).
2804.0 D09IDOT-District 9, IL Department of Transportation, working IL5, IL State EOC, Springfield, ALE at 1307 (Jack Metcalfe-KY).
2830.0 SVK-Corfu Radio, Greece, weather at 2141 (Lacroix-France).
2971.0 LH441-Lufthansa Boeing 747 registration D-ABTH, answered selcal BF-LQ, given new frequency of 3476 by Shanwick, at 0452 (Lacroix-France).
3016.0 Shanwick-NAT-A, selcal and position with Air India 9002, at 0140 (Prez-MD).
3150.0 PCD2-Israeli intelligence (E10), AM null-message format, parallel on 4270, at 1935 and 2001 (Ary Boender-Netherlands).
3256.0 "P"-Russian CW channel marker, Kaliningrad, also on 3291, 3327, and 3837; at 2043 (Boender-Netherlands). "P" switching to FSK Morse for 5-figure group message, parallel on 3291, at 2205 (MPJ-UK).
3299.0 AFA4RA-USAF MARS, FL, Region 4 4S1 Net, at 0116 (Mark Cleary-SC).
3320.5 NNN0GBS-US Navy/ Marine Corps MARS, SC, Region 4 4G1B South Carolina Net with NNN0JOP, at 0106 (Cleary-SC).
4026.5 Control-UK Royal Navy FOST (Flag Officer Sea Training), working Kilo Kilo, at 0019 (ALF-Germany).
4032.9 AAM3TMD-US Army MARS, Region 3 Net in LSB, at 1103 (Cleary-SC).
4073.0 Unid-Russian military "clock" station (M18), possibly Kazakhstan, 4-figure CW time strings at 1927 (Boender-Netherlands).
4146.0 OMC-Bratislava Radio, Slovakia, taking short messages from river vessels at 0435 (ALF-Germany).
4393.5 AFA2BQ-USAF MARS, working AFA2AC at 0001 (MDMonitor-MD).
4426.0 NMN-USCG CAMSLANT Chesapeake, VA, voice synthesized weather at 0349 (MDMonitor-MD).
4469.0 Tennessee CAP 41-CAP, net with Southeast CAP 43, Florida CAP 44, and Mockingbird 502; at 0100 (Cleary-SC).
4490.0 KNY97-NTCN, CT, calling KNY95 (AK), KNY87 (WA), and KNY58 (AL), ALE at 1115 (MDMonitor-MD).
4553.5 ZLST-German Customs Control Post, Cuxhaven, calling ZRUE, Customs Boat *Rügen*, ALE at 1419 (Lacroix-France).
4585.0 Kitty Hawk 16-NC CAP net with Kitty Hawk 201 and 291, at 1207 (Cleary-SC).
4593.5 AFA2BQ-USAF MARS, taking net check-ins at 2320 (MDMonitor-MD).
4604.0 Red Fox 17-IL CAP, radio check at 2332 (MDMonitor-MD).
4703.0 OWB-Karup Rescue, Denmark, working Rescue 41, at 1900 (PPA-Netherlands).
4721.0 266168-USAF C-17A, dialing an ALE autopatch at 1911 (PPA-Netherlands). 230601-USAF C-17A, calling ADW, Andrews AFB, MD, ALE at 2244 (Cleary-SC).
5045.0 T24JCCC1-US National Guard, working T60TN1, probable TN National Guard, ALE at 1510 (Metcalfe-KY).
5063.5 HOLLYWOTF51-Probable US Army Joint Task Force 51 (special emergency ops), working WIDOWMATF51, ALE at 1332 (Metcalfe-KY).
5192.0 VA78CTSCSP-Possible CT State Police, calling 2104CTSCSP, ALE at 1930 (MDMonitor-MD).
5211.0 T69ME1-Unknown US Army, also on 4490, 6766, 6800, 6985, 6997, 9106, 10493, 10816.5, 11217, 11608.5, 13242, 13568.0, 14395.5, 14653, 15094, 16338.5, 17548.5, and 17487; ALE at 0038 (Metcalfe-KY). T43DE1-Same net, ALE sounding at 1302 (MDMonitor-MD).
5250.0 UHC-USCG Cutter *Decisive*, calling LNT (CAMSLANT), ALE at 1323 (Cleary-SC).
5270.0 BG Control-Italian Navy Patrol Ship *Comandante Bettica* (IABG), working BF Control, Patrol Ship *Comandante Borsini* (IABF), at 1004 (ALF-Germany).
5320.0 CAMSLANT-USCG, VA, radio check with Sector Delaware Bay and Sector Hampton Roads, at 1510 (Cleary-SC).
5435.0 ART-E10, group count and 5-letter phonetic message, parallel on 6986, AM at 2030 (Boender-Netherlands).
5455.0 HBM46-Swiss Army, data orderwire with BM12, at 0955 (ALF-Germany).
5505.0 Shannon-North Atlantic Volmet, aviation weather with volcanic ash warnings and restrictions, at 0130 (Prez-MD).
5517.0 A6-ECJ-Emirates Airlines flight EK771, selcal GS-PR with Mogadishu, at 2100 (Patrice Privat-France).
5520.0 N424TM-US Challenger 300 bizjet, selcal PQ-CR and position for New York, at 0319 (ALF-Germany).
5526.0 Cayenne-French Guiana route control, working unid flight in French, at 0200 (Prez-MD
5541.0 N120DL-Ryan International Airlines Boeing 767, selcal KM-EG, working Stockholm LDOC at 2029 (Lacroix-France).

5616.0 Mexicana 159-B767 registration XA-MXN, answered selcal GJ-CQ from Reykjavik, Iceland, at 0818 (Lacroix-France).
5680.0 Kinloss Rescue-UK Aeronautical Rescue Coordination Centre, Scotland, working Navy 193 and Navy 177, at 1052 (MPJ-UK). Rescue 177, possibly same operation, working Kinloss at 1753 (Lacroix-France).
5696.0 Coast Guard 2128-USCG HU-25 Falcon, departing Gitmo and setting guard with CAMSLANT, at 1308 (Cleary-SC).
5708.0 ADW-USAF, Andrews AFB. MD, calling tanker 470122, ALE at 1253 (Cleary-SC).
5717.0 RESCUE 307-Canadian Coast Guard, patch via Halifax Military to Rescue Coordination Centre, at 0130 (Cleary-SC).
5775.0 AKALJ1-Petróleos Mexicanos (PEMEX), Akal platform in Cantarell field, Bay of Campeche, ALE sounding at 0227 (ALF-Germany).
5780.0 *Freedom Star*-NASA Booster Recovery Vessel, came from 10780 for STS-131 launch, at 0320. BRD-NASA Booster Recovery Director, working *Freedom Star* at 1037 (Allan Stern-FL).
5785.0 CAGLIARI-Italian Financial Police, working ROMA, Rome, ALE at 1922 (PPA-Netherlands).
5810.0 Cuban MCW "Cut Number" station (M08a) in progress with message UIDUA (47341) in 5-letter substituted groups, at 0611 (PPA-Netherlands).
5876.4 WCY9062-US registry sailing vessel *Silver Bullet*, calling KZN508 (SailMail, SC) in PACTOR-I, at 0440 (ALF-Germany).
5883.0 Cuban AM female voice (V02a), 5-figure group message in progress at 0721 (PPA-Netherlands).
5909.5 Juliet 43-USCG MH-60T Jayhawk, securing guard with CAMSLANT at 1355 (Cleary-SC).
6215.0 Cutter *Kingfisher*-USCG, calling Fishing Vessel *Erica Lynn*, at 0112 (Cleary-SC).
6340.5 NMF-USCG, Boston, FAX 36-hour North Atlantic pressure chart, at 1935 (Prez-MD).
6362.0 MGJ-UK Royal Navy, Forest Moor, RTTY channel status marker at 1122 (MPJ-UK).
6391.0 AQP4-Pakistan Navy, Karachi, CW marker at 1843 (PPA-Netherlands).
6460.0 Kostan 26-Unknown station working Lawa 02, Nagan 28, and others, in Russian, at 0505 (ALF-Germany).
6482.9 9MR-Malaysian Navy, Lumut, RTTY marker at 1926 (PPA-Netherlands).
6649.0 Dakar-South Atlantic Area 1 Control, Senegal, selcal HR-MQ and position from KLM 792, Boeing 777 registration PH-BQE, at 0137 (Prez-MD).
6673.0 San Francisco-Pacific oceanic air control, giving American 161 primary frequency 11282 and backup 5547, at 0201 (Prez-MD).
6697.0 "1-O-Z"-UK Royal Air Force, working MKL, Northwood (transmitter at Crimond), at 1931 (PPA-Netherlands).
6712.0 G-VRED-Virgin Atlantic A340 "Scarlet Lady," flight VS003J, HFDL position for Reykjavik at 1026 (MPJ-UK).
6715.0 Pathfinder 34-Canadian Forces CP-140, working Halifax Military for relay to Regional Joint Operations Centre, Atlantic, at 1124 (Cleary-SC).
6721.0 JNR-USAF, Salinas, Puerto Rico calling 160020 (a C-5B), ALE at 0808 (Cleary-SC).
6749.0 ARA-Romanian Police, Arad, calling NHD, ALE at 1919 (PPA-Netherlands).
6761.0 RUH955-US Army 1-228 Aviation, calling SKYWAT (Skywatch, US Army, Honduras), also 7350, ALE at 0112 (Cleary-SC).
6815.0 SV1TEST-Greek amateur experimental beacon, slow CW at 2237 (ALF-Germany). *[Also reported on 500 kHz and 2 meters since 2007. -Hugh]*
6836.0 "5-W-I"-British military, calling "any station this net," no joy, at 0827 (ALF-Germany).
6933.0 V02a, AM message in progress at 0721 (PPA-Netherlands).
6955.0 TXX-Probable Spanish Guardia Civil, Madrid, working TWBG1, Gerona, at 2054 (MPJ-UK).
6973.0 RIT-Russian Navy Northern Fleet, Severomorsk, CW traffic for RLO, at 1008 (ALF-Germany).
7477.0 RACES4-Radio Amateur Civil Emergency Service, working VA78CTSCSP, possibly CT State Police, ALE at 1649 (Metcalfe-KY).
7527.0 500-USCG HC-130H (Coast Guard 1500), calling Z14, ALE at 0020 (MDMonitor-MD).
7632.0 NNN0TFH-US Navy/ Marine Corps MARS, controlling Southeast Region SHARES net with Goldenrod 595 and many others, at 1602 (Cleary-SC).
7633.5 Reach 1048-USAF Air Mobility Command, patch via AFA5RS to Hilda Metro (Scott AFB), at 2054 (Cleary-SC).
7635.0 Southeast CAP 44-CAP national net, with North Central CAP 54, others, at 1401 (Cleary-SC).
7739.0 SP20Z2-Sonatrach Petroleum Corporation, Algeria, pumping station for OZ2 pipeline, LSB ALE at 1945 (PPA-Netherlands).
7802.0 TRPFMOSHP-MO State Highway Patrol Troop F, working 431FEM, FEMA Auxiliary Station WGY9431, also on 5140, ALE at 1557 (Metcalfe-KY). M42-Mexican Green Angels highway assistance, calling mobiles 175 and 308, ALE at 2330 (MDMonitor-MD).
7932.0 IL5-IL State EOC, Springfield, working D09IDOT, IL Dept. of Transportation District 9, ALE at 1315 (MDMonitor-MD). IL5, working STATEEOC2, IL State EOC alternate location, ALE at 1521 (Metcalfe-KY).
8040.0 GYA-UK Royal Navy, Northwood, FAX surface analysis for Eastern Mediterranean, at 2212 (Prez-MD).
8047.0 L060AN-LA Army National Guard, calling HQ703N (Readiness Center, VA), possible oil spill activity, ALE at 2345 (MDMonitor-MD).
8050.0 PASTOR-Possible Mexican military, calling PASTOR5, ALE at 0200. (MDMonitor-MD).
8058.0 Reach 4853-USAF, patch via Offutt AFB to Scott AFB Metro, at 1247 (Cleary-SC).
8104.0 *Saint Jude*-Probable fishing vessel, calling *Sea Language* and *Destiny*, at 2102 (Metcalfe-KY).
8113.0 VMW-Wiluna Meteo, Australia, voice-synthesized "male" with coastal forecasts, at 2139 (Prez-MD).
8140.0 CVF-Chilean Navy, ALE and data with CCC, at 0205 (ALF-Germany).
8156.0 C6EM-Royal Bahamas Defence Force, ops-normal to Coral Harbour Base, at 1136 (Cleary-SC).
8282.0 A8OY7-Liberian registry container ship *Zim Jamaica*, radio check with WLO, Shipcom/Mobile Radio (AL), at 1543 (Cleary-SC).
8297.0 ZLM-Taupo Maritime Radio, New Zealand, weather at 0359 (ALF-Germany).
8330.0 RJH25-Russian Navy, online-encrypted CW message for RMUE, at 2340 (ALF-Germany).
8337.6 Shark 25-USCG Cutter *Venturous*, working Shark 06 (Cutter *Seneca*), and Delta 32, at 2232 (ALF-Germany).
8765.0 MORTON25-Polish Army, working IGIELIT37, also on 8805 and 12183.8, ALE at 1302 (MPJ-UK).
8861.0 Kirensk Volmet, aviation weather in Russian, at 2000 (Lacroix-France).
8864.0 Gander-NAT-A, Newfoundland, position from US Air Force Reserve tanker DeeCee 94, at 1323 (MDMonitor-MD).
8891.0 Air France 062-B777 registration F-GSPC, working Reykjavik at 1214 (Lacroix-France).
8912.0 KVQ-USCG Cutter *Nantucket*, calling TSC (US Customs Technical Service Center, FL), in ALE at 1826 (Cleary-SC).
8918.0 New York-Caribbean air control, working Cactus 1060 (USAir), at 2101 (MDMonitor-MD).
8957.0 Shannon Volmet, Ireland, formatted aviation weather at 2100 (MDMonitor-MD).
8971.0 Tiger 01-US Navy P-3C, calling Fiddle, FL, clear and secure at 1335 (MDMonitor-MD).
8977.0 G-VMEG-Virgin Atlantic A340 "Mystic Maiden," HFDL log-on at 1038 (MPJ-UK).
8983.0 Swordfish 14-USCG HU-25, position report for CAMSLANT at 2022 (Cleary-SC).
8992.0 LA05A-US Navy P-3C, requesting patch via Andrews HF-GCS to Fiddle (USN, FL), at 1346 (Cleary-SC).
8995.0 S1B-Lithuanian Navy, ALE and data with P1G, at 1740 (MPJ-UK).
9016.0 Ascot 2510-UK Royal Air Force, requesting patch via Andrews to McGuire CP (NJ) at 2251 (Cleary-SC).
9025.0 Reach 341-USAF, patch via Elmendorf to Bangor International Airport, at 0453 (Cleary-SC).
9031.0 Ascot 2500-UK Royal Air Force VC-10 registration XV101, selcal BL-HJ with Kinloss, at 1531 (Lacroix-France).
9075.0 RIW-Russian Navy, Moscow, encrypted CW message for RAL48, at 1713 (MPJ-UK).
9106.0 KNR50-NTCN, calling KGD34 (SHARES Master Control, VA), and KNY90 (NTCN), ALE at 1400 (MDMonitor-MD).
9145.0 RIW-Russian Navy, listening on 8326 for RGV82, CW at 1433 (MPJ-UK).
9218.0 HQ4-Great Man-Made River Authority, Benghazi, Libya, calling ALWAOW, ALE at 1450 (ALF-Germany).
9270.0 USDAEOC2-US Department of Agriculture, alternate EOC location, MD, ALE sounding at 1539 (Metcalfe-KY).
9317.0 Andrews-USAF, patch with Succulent at 2009 (Cleary-SC).
10024.0 Lima-South American route net, Peru, selcal and position with Aeromexico 018, at 0108 (Prez-MD).
10057.0 San Francisco-Pacific oceanic air control, advising Alaska Air 875 unable for higher altitude due to traffic, at 0137 (Prez-MD).
10101.8 DDK9-Deutsche Wetterdienst (Hamburg/ Pinneberg Meteo), Germany, copyright notice followed by SYNOP (Synoptic) codes, RTTY at 1835 (Prez-MD).
10538.6 Sector Key West-USCG, FL, calling Shark 41 at 0147 (Cleary-SC).
10540.0 RAL48-Russian Navy warship, working RIW, CW at 1715 (MPJ-UK).
10543.0 RCV-Sevastopol Naval Radio, CW, weather at 1440 (MPJ-UK).
10588.0 WGY904-FEMA Region 4, GA, working WGY901, Region 1, after ALE as FC4FEM with FC1FEM004, at 1249 (MDMonitor-MD).
10780.0 Cape Radio-Cape Canaveral Air Force Station, FL, going to 5780 for NASA Booster Recovery Vessel *Freedom Star*, at 0200 (Stern-FL).
10962.0 TARIQ-Pakistani Naval Ship *Tariq*, ALE to unknown station at 1347 (ALF-Germany).
11090.0 KVM70-Honolulu Meteo, FAX forecast chart at 0715 (PPA-Netherlands).
11175.0 Offutt-USAF HF-GCS, Offutt AFB, NE, radio check with S4JG (USN P-3), gave frequency 11220 for any further, at 1258 (MDMonitor-MD). Reach 850-US Air Force, patch via Offutt HF-GCS at 1400 (Lacroix-France). Andrews HF-GCS, working Otis 11, US Marine Corps KC-130J, at 1544 (Stern-FL).
11220.0 Halloween-US military, patch via Offutt HF-GCS, at 2209 (Cleary-SC).
11232.0 Bandsaw Kilo-Back end of USAF E-3, patch via Trenton Military to Best Deal, at 1355 (Cleary-SC).
11300.0 Khartoum-Oceanic air control, Sudan, working British Airways Speedbird 64, at 2146. (Prez-MD).
11345.0 Alitalia-Missed flight number, calling Stockholm LDOC at 0858 (Lacroix-France).
11409.0 Unid-Russian military, coded message in FSK Morse, at 1111 (MPJ-UK).
11418.0 RMP-Russian Navy, Kaliningrad, 56-group CW message at 1836 (MPJ-UK).
11494.0 Coast Guard 1718-USCG HC-130, ops-normal for CAMSPAC Point Reyes, CA, at 0200 (Cleary-SC).
12362.0 VMW-Wiluna Meteo, Australia, weather at 0731 (Lacroix-France).
12365.0 VMC-Charleville Meteo, Australia, weather at 1339 (Lacroix-France).
13215.0 ICZ-USAF, Sigonella, Italy, calling AED, Elmendorf AFB, AK, also on 15043, ALE at 1403 (MPJ-UK).
13257.0 Canforce 2590-Canadian Forces CC-130, patch via Trenton Military to operations, at 2031 (Cleary-SC).
13312.0 Omaha 295-US Customs P-3A working Hammer (March Air Reserve Base, CA), at 2127 (Cleary-SC).
13907.0 PCR-USCG Cutter *Dallas*, ALE sounding at 1919 (Cleary-SC).
13927.0 AFA9AY-USAF MARS, CA, morale patch with Reach 529 at 0010 (Stern-FL).
14396.5 NCS 202-SHARES net control, taking weekly net check-ins, at 1535 (Cleary-SC).
14405.0 AFA9PF-USAF MARS, CA, Transcon Space Support Net at 1506 (Cleary-SC).
14635.0 T040NN-TN National Guard, calling HQ703N, VA, possible TN flood traffic, at 1800 (MDMonitor-MD).
14780.0 GWPWN33-Brazilian Navy, Natal, calling GWPWIN (Frigate *Independencia*), ALE at 2215 (MDMonitor-MD).
14902.0 Iowa CAP 4-CAP, national net with Goldenrod 595, others, at 1515 (Cleary-SC).
15010.0 Gold 91-USAF tanker, patch via Offutt HF-GCS to Brickyard, at 1655 (Cleary-SC).
15867.0 N04-USCG HC-144A, calling MUD (USCG Cutter *Diligence*), ALE at 1523 (Cleary-SC).
16338.5 K070SN-Possible National Guard, calling K071SN, ALE at 1920 (MDMonitor-MD).
17458.5 I10ODN-National Guard at Idaho State EOC, Boise, calling HQ703N, ALE at 1825 (MDMonitor-MD).
17519.0 FC8FEM-FEMA Region 8, CO, ALE sounding, also on 15708, at 1900 (MDMonitor-MD).
25350.0 718-USCG HC-130H Coast Guard 1718, ALE sounding at 2127. J16-USCG HH-60J Juliet 16, ALE sounding at 2134 (Hugh Stegman-CA).

DIGITAL DIGEST

DIGITAL MODES ON HF

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The Strange Case of the Mystery Pulser

This month I want to cover something that has been widely discussed on the #wunclub Internet Relay Chat (IRC) Channel for a number of months, because it's unusual, and – like many aspects of shortwave utility listening – quite intriguing. (See the Digital Digest of July 2009 for details of how to use IRC to help your monitoring activities.)

❖ High Seas Station KMI

But first, I want to thank reader Richard C, who took the time to write from famous (well, in this column anyway!) Dixon, CA, home of Naval station NPG. I guess he'd read the columns where we covered the US Naval fleet broadcasts (see Digital Digest columns in January and February 2010). He mentions the other famous station, KMI, an AT&T "High Seas" facility that originated at the same site. KMI shut down in 1999, but is still remembered by many.

❖ More US Naval Frequencies

Since writing the articles referred to above, a few new frequencies have come to light. These are as follows:

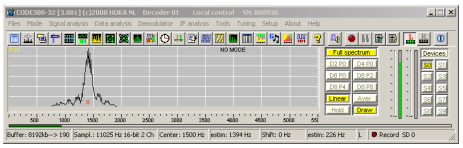
4550 kHz 50bd/850 likely NKW Diego Garcia4466 kHz 50bd/850 likely NSY Sigonella5306 kHz 50bd/850 likely NCN Okinawa6853 kHz 50bd/850 NAR Saddlebunch Key, FL7535 kHz 75bd/850 UNID Location7537 kHz 75bd/850 UNID Location13870 kHz 50bd/850 likely NAR Saddlebunch Key, FL17460.6 kHz 75bd/850 likely NAR Saddlebunch Key, FL17987.7 kHz 75bd/850 likely NCN Okinawa22471 kHz 50bd/850 likely NKW Diego Garcia22490 kHz 50bd/850 likely NKW Diego Garcia

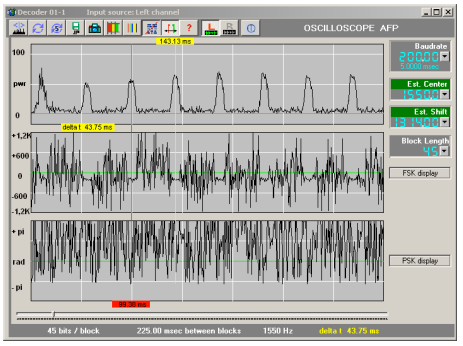
Please let me know if you come across any more channels or can confirm any locations.

❖ The Pulser

Sometimes mystery signals turn out to have a simple explanation like a spurious emission from another transmitter, but this one appears to have a lot more going on and has so far defied explanations of this kind.

In August of 2009, IRC listeners Jon-FL, TheWeb, and Token (who is based in California) noticed an odd pulsing signal on approximately 13881 kHz. The signal stayed on air for many hours at a time. In Figure 1 below, you can see the typical frequency spectrum of the signal, and in Figure 2, the stream of pulses. In this case, the signal is centered on 13881.2 kHz and uses an 8ms wide pulse at a repetition frequency of about





47ms. See Resources for audio clips of the pulser.

To date, I've yet to hear anything like it on the bands. Most intriguing is its odd habit of changing center frequency by 100 Hz or 200 Hz at a time in a single jump, and also varying the pulse repetition frequency in the same way. Pulses at 11, 22, 33, 43 (possibly 43.666), 55, 76, and 88ms have all been heard.

For example, a pulser will maintain the same pulse width and rate, jump 100 Hz lower for 7 pulses, and then back for 3 pulses, before jumping 100 Hz higher to continue. A pulser may also slowly drift over time, but again keep the pulse width and rate the same.

If the pulser moves to another channel and returns to the one from which it was drifting, it essentially starts off at exactly the place that the drift would have reached, had it stayed on the same channel. It may also switch off, activate another channel for a few seconds, and then return to the original channel.

As one might expect with such an interesting signal and listeners' attention drawn to it, more frequencies were found quickly after the original discovery. At the time of writing, the signal can be heard (at various times of the day and night) on the following frequencies:

6081, 7431, 7481, 9531, 9581, 9631, 9831, 9881, 10031, 11631, 11681, 11831, 11881, 11981, 12031, 13881 and 15381 kHz

Notice that many frequencies appear to be "paired," with one pulser at XX31 and the other at XX81 kHz, so this list is no doubt incomplete. Three or four of these signals are usually active at any one time, but it's also been that case that all channels are active simultaneously.

Token and I have taken bearings to the signal several times, and it appears to originate in the direction of Cuba or Southern Florida. To add to the mystery, the signal was recently being covered on at least three channels by a very distinctive jammer called "The Grinder," often associated with Cuban jamming of the US-backed propaganda station Radio Marti.

So, if the location of the pulser is Cuban, it wouldn't make sense for them to jam their own signal, and cross-modulation between transmitters on the same site is unlikely to explain three channels all simultaneously jammed. Perhaps this is a US located signal beamed at Cuba? But, for what purpose? Are you the one who knows?

❖ Iraqi Military on HF

As can be expected, the large military presence in Iraq and recent handovers of power from U.S. to local forces has also resulted in a lot of HF communications, much of it using MIL-188-141A ALE and sometimes MIL-188-110A high speed modems for data transfer. Many of the ground forces frequencies of both Naval and Army units have been well-known for a number of years. Here's a quick run-down of the main organizations, channels and identifiers to look out for:

ARMY
5538, 5582, 5583, 5597, 5634, 6385, 6389, 6390, 6485, 6519 kHz USB
1D, 10D, 11D, 2D, 2DV, 3DV, 43B, 4BED, 4D, 5D, 7BDE, 7D, 8D, 9D, 14D, ANB, BAS, BDE12, IG2, IGF, IGNET, IGQ, KRB, MO2, MOD, MOQ

NAVY
5583, 5800, 6389, 10002 & 11043 kHz USB
AOT, BOT, MOD, NAY, NAY1, NAVYNET

SPECIAL FORCES
6393, 7566 kHz USB
BASRAH, BASRAH1, CTCNET, DUH, DYALA, FBR, FIT, MOL, MOSULBS, HH1, HH2, IS1, ISOF1, RAMADIBS, RA7, RA8, SED

BORDER ENFORCEMENT
6509, 6514, 6519, 6594.5, 6629, 6634.5, 6664.5, 6669, 7614.5 kHz USB
BRG, DB1, DB2, DB3, DB4, DB41, DB44, DB5, DBE, DYA, FAW, HAJ, KZE, MAY1, MER, NAN, SID, SUH, SUL

That's it for this month. Enjoy your digital listening and please feel free to email or write with your continued suggestions for future articles and points of interest.

RESOURCES

Audio Clip of Pulser **http://dl.dropbox.com/u/301213/Pulser10031kHz.wav**
Audio Clip of Pulser with Jamming **dl.dropbox.com/u/301213/11881-Puls-**

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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

New Tricks for an Old Dog

I would like to begin this column with a bit of what any ham would see as momentous news. You see, I sat down to write this column last evening… but then… TEN METERS WAS OPEN! TEN METERS WAS OPEN!! TEN METERS WAS OPEN!!! It has been several *years* since I was able to say that with anything like authority. I postponed my scribblings to have a whole series of wonderful ragchews with OMs and XYLs up and down the Eastern Seaboard. Everyone on the air was experiencing the same giddy excitement as this wonderful turn in the sun spot cycle was long awaited. By the time you read this, I hope we can find this remarkable band opening becoming a commonplace thing. Okay, enough of that.

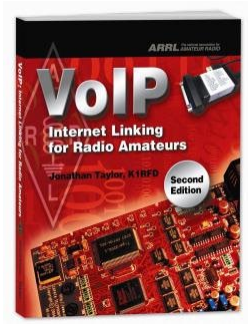
Now, any of you who have followed this column for any length of time, know that I am most clearly a bit of a ham radio Luddite. "Old School" does not begin to describe my preferred station set up. If the FCC relegated our service to only the CW Mode, I wouldn't miss a beat. I begrudgingly keep a microphone handy for emergency service communications. I'd probably use Spark Gap if it was still legal.

Get the picture? So while I study and fully understand the more modern aspects of electronics, including computer based digital systems, most of them remind me too much of work. I twiddle and diddle digital audio and computer systems all day to feed my family, so when I play radio, I want to get as far away from those things as I can. But, every once in awhile, I find it necessary to let a little bit of the modern world creep in to my personal amateur radio activities.

Such was the case when The American Radio Relay League (ARRL) announced that it would begin to transmit its regularly scheduled CW Bulletins and CW Practice Sessions via the online communications system known as Echolink. Given the vagaries of propagation, I can't always get the clearest signal from League HQ at the time of day that it is convenient for me to sit down and copy the messages. Getting up to speed via the code practice and then copying the nightly bulletin (at 18 WPM) is a great way to stay sharp with CW. The Echolink process seemed like a great way to get things going without needing to worry about band conditions.

❖ Do you hear an echo?

Okay, so just what is this Echolink thing? Echolink is one of several "Voice Over Internet Protocol" (VoIP) systems gaining popularity with hams. Put simply, it is one of the ways hams can use the internet to improve their communication. The actual "Echolink," if you will, is an Internet audio connection between two computers.



Does that make it radio? Well… no, not as such. Radio comes into play when you allow these links to be controlled via a ham station such as a repeater. For example, you might call into your local Echolink friendly Repeater System and enter commands via your DTMF keypad to access any other station on the network. So you could be driving down the road in New Jersey and link through to a repeater system in the United Kingdom and have a chat with a ham using a handi-talkie on a London street. It is just about that simple.

It is also possible for two hams to talk "computer to computer." While that is not really a radio transmission, the folks who established Echolink only allow licensed amateur radio operators access to the system. Non-hams have lots of ways to talk over the internet. (Skype for example.) Echolink is just for us hams.

So it's radio… and at the same time… It's not radio. Confusing? Now you know why I stick to CW!

I'll go you one better. Is it a digital mode or not? Hmmm… Let's see now. All communication via Echolink is voice. The part of the signal that travels over the internet is digital, but the radios on either end of any QSO (if used) are usually using good old fashioned FM Phone.

❖ Getting Started

Okay, so my reason for interest in Echolink, at this time, is to get a clean signal from League HQ. Not hard at all. Let me walk you through the steps.

First, you have to get yourself into the game. Web on over to **www.echolink.org/** and start off by reading the general FAQ sections. You will learn if your personal computer system is able to use the software and if your connection is fast enough. Echolink's primary software is Microsoft Windows based, but compatible software also exists for Mac and even Linux based systems. It will work with Windows all the way back to Win 95, but the Echolink folks strongly recommend you run Windows 2000 or later. Echolink will run on a 56K dial up modem but a broadband connection is preferred. The Echolink site addresses many common setup and PC system questions. It goes without saying that your system needs a sound card with audio input and output jacks.

Once you are sure your system is up to the task, download and install the Echolink software as directed by the site. You will be prompted for your Callsign and a valid email address. These are important because they will play a part in the validation process. The first time you fire up the Echolink program, you will be notified that your callsign needs validation. The long and short of it is you have to get a copy of your current Amateur Radio license into the hands of the Echolink folks.

Some folks chafe at this, but those are the rules of the game. If you want to use the Echolink system, you have to show them your ticket. The easiest way to do this is the make a scan of your license and upload it to **www.echolink.org/validation**. Once this is done, you will have a brief e-mail exchange with the Echolink folks, after which your software will let you log in and join the party. Also, if you are a participant in the ARRL "Logbook of the World" system, your LotW digital certificate can serve as validation.

If you are going to use Echolink from a personal computer, obviously you will need a mike and speakers compatible with your PC's soundcard. Since I use the Skype system for some phone conversations, I had the hardware handy. Nothing elaborate is needed, but audio improves with the quality of the microphone you choose.

So I set up the software, received my validation e-mail from Echolink, I was ready to rock… Wrong! I couldn't get my system to connect. Hmm again. Back to the FAQs.

The first thing I discovered I had to check was whether or not my computer's firewall was getting in the way. This was easily solved by making sure the program saw the Echolink package as friend and not foe. Ready to go now… NO! Something else was standing in the way. Back to the FAQs again.

It turned out that my broadband router was getting in the way. Well-designed routers block information over any ports that are not assigned specific tasks. This is an important security function. Open ports lead to people sneaking in where they don't belong. Echolink likes to see the TCP port destination set to 5200 and UDP ports 5198 and 5199 open in both directions. If this Network/Internet gibberish sounds like… well… gibberish, get thee to your service provider's manual and all should be revealed.

My broadband provider fixed me up with a Westell modem/router and very good directions to set the ports. Simple! I made the setting adjustments as directed and fired up Echolink again and… Still no joy! I had done everything that the FAQs had directed me to do, or so I thought.

Before I chucked the whole idea into the bit bucket and headed back to my Vibroplex, I decided to do a quick web search. I entered the words Echolink and Westell and, thankfully, found David KB3KAI's step by step write-up on setting up the Westell router to play Echolink. What I was missing was that I needed to set the ports individually and not in a range. A quick trip back into the router's settings and I was large and in charge on my Echolink connection having a nice QSO with Fred KK2DX in NY. I then spent a fun evening chatting with folks all over the world. Yes, I still say it's not really radio, but I have to admit it was a lot of fun.

❖ Taking it further

A brief word about the Echolink Software package itself. I found the software so simple to use that a brief scan of the general information and a glance through the drop down menus gave me all the information I needed to get on the air once I got that router matter resolved. You can pick a station from the existing list or enter the callsign and "Node" number of any station you are interested in talking with.

If you want to get more advanced in your Echolink experimentation, you can proceed to set up the software in "Sysop" mode. This is where you connect a transceiver to Echolink via your soundcard and a simple interface such as the West Mountain Radio Rig Blaster.

A great feature of Echolink that has many uses for hams is the Conference Server system. A Conference Server allows for multiple stations to connect and discuss topics in roundtable fashion. You will find the various active Conference Servers in the station listing that comes up when you open the Echolink software package.

But let's get back to the original reason for getting myself into the Echolink game in the first place. I wanted to hear the ARRL CW Bulletins. I found the W1AW "Node" in the Region 1 listing and clicked on the link. I found it busy the first few times I tried (no surprise there). Eventually I got through and had the pleasure of hearing sonorous CW sounds emanating from my PC speakers.

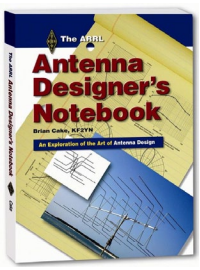
❖ Radio or not – it's still fun

Echolink, other services such as the Internet Radio Linking Project (IRLP) and Wide-Coverage Internet Repeater Enhancement System (WIRES), and even true digital radio systems such as D-STAR are beginning to blur the boundaries between radio and internet communication.

It wasn't all that many years ago when hams had to lobby to get to use the ASCII character set over the Baudot character set when operating RTTY. We even had to raise some dust against "Ma Bell" to make use of DTMF keypads. Computer augmented radio communication is just another tool in the box. While it will never outpace my love for CW, I am glad I have it to support emergency communications in a truly worldwide way regardless of the vagaries of propagation. After all, it isn't every day that I can shout TEN METERS IS OPEN!

❖ Designing Hams

Every now and again I like to tell you about a book that is a bit more advanced. Something that might make the average ham's brain sweat a bit. Most of us can probably recall the basic formula for a simple dipole. (In case you forgot: 468 divided by the frequency in MHz) But there is a lot of other math and design that goes into optimizing antennas for other purposes. If you want a great companion to the ARRL ANTENNA BOOK, look no further than:



THE ARRL ANTENNA DESIGNER'S NOTEBOOK
An Exploration of the Art of Antenna Design
By Brian Cake KF2YN
ISBN# 978-0-87259-147-9
$34.95 ARRL Order # 1479
The American Radio Relay League
225 Main Street
Newington, CT 06111-1494
www.arrl.org/shop
1-888-277-5289

Antenna design under real world conditions can be a daunting task. Up until recently, hams have only had a few simple formulas combined with a lot of cutting and trying to perfect their antenna systems.

Again, the personal computer revolution brought the ability to model more complex antenna designs into the hands of folks that live outside of the engineering laboratory. Brian KF2YN guides us through the best practices of modern antenna design, including the latest mathematical modeling to help hams understand not just basic designs, but more sophisticated designs that might provide better gain and coverage under any individual's personal circumstances.

The book has an emphasis on Long Boom, FZ and Boxkite Yagis, best suited for VHF/UHF work. However, Brian did not leave those of us interested in HF antennas out of the game. The book also goes into exhaustive analysis of several HF designs, including one that has piqued my interest called a C-Pole, a ground independent vertical. Big Loops are also discussed, reminding me of the work of the late great L.B. Cebik, W4RNL.

Many other designs are discussed and each design is given a complete theoretical breakdown with more charts and math than you can shake a rubber duckie at. I admit to being a techno-geek, but this book is actually fun reading. Sometimes it is great to just sit back and pick a design at random and think about it for awhile. It might not be just the ticket, but the thought might lead you down the road to a great antenna solution for your station.

To help you with your personal antenna ruminations, the book includes a CD with EZNEC models of all the published antennas as well as an extensive presentation on Boxkite Yagi antennas. This is a book that should get any ham thinking about antennas in new and different ways.

Well, folks, as I began this month's column, it is clear that the bands are starting to come back. Enjoy the great opportunities the new sunspot cycle is bringing to us. While you're at it, this is a great time to start to get new folks interested in the great hobby of the world. I'll see you at the bottom end of 40 meters, unless, of course TEN METERS IS OPEN!

GETTING STARTED

THE BEGINNER'S CORNER

Ken Reitz, KS4ZR
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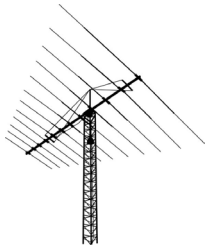
A Beginner's Look at Shortwave and Ham Antennas

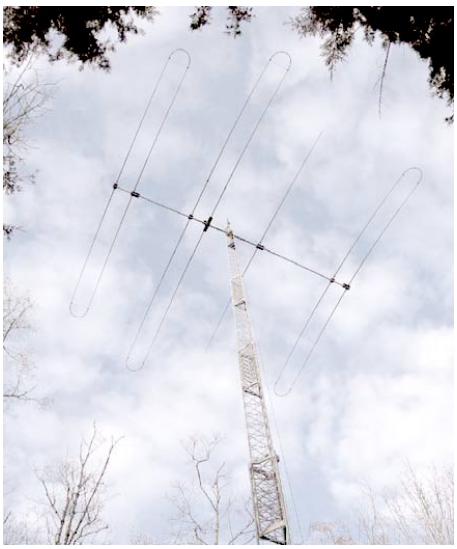
I always marvel at those with the money to pursue their antenna fantasies. The sky is literally the limit, and the bank book has to be at least as high. But, they really work. You'll know their signals when you hear them on the air, as the signal strength meter on your radio ventures into the 20, 30 and 40 over 9 region that's more typically reserved for signals from international broadcasters. If you have the money, there's really no reason for a new ham not to put up such a band master.



Hy-Gain LP10009 log periodic ($1,500) offers tight beamwidth and seamless 13-30 MHz tuning would make a great ham and SWL antenna. (Courtesy: Hy-Gain)

But, you have to remember that the antenna itself is actually just the beginning. It will do you little good to have such an impressive beam as the SteppIR Dream Beam ($4,300), Hy-Gain LP10009 ($1,500) or CushCraft X7 Big Thunder series ($1,100), if you don't also have a tower to support them. Even modest towers in the 30-50-ft. range will be expensive to put up, expect to pay $2,000 to $10,000.

Heavy duty towers in the hundred foot range can cost $25,000. But, that's just the catalog price. You'll have to pay for the shipping, usually by truck freight, and installation charges could run into many thousands for concrete, rebar, guy wires, riggers and/or crane operators who can professionally install such antennas. You'll also need a heavy duty antenna rotor, which can cost at least $1,500. And, don't forget the cost of antenna cable and rotor control cable which has to make it all the way from your shack to the top of the tower.



SteppIR Dream Beam ($4,300) antenna could be the ultimate beam antenna. (Courtesy: SteppIR)

❖ Less Expensive Alternatives

Is there a way to put out a big signal without topping the $10,000 to $50,000 mark? Easily. One way is to add a linear amplifier. Compared to massive antennas and towers, a small 600 watt amplifier such as the Ameritron AL-811 is only $750 and turns your 100 watt transceiver into a signal everybody can copy. The problem is that, unlike a beam antenna, it does nothing toward improving your receive capabilities. The result is that you become an "alligator," all mouth, no ears.

Another way is to start with the smallest beam you can afford, such as the CushCraft A3S. The advantage of a beam is that you literally aim the energy from your antenna in one direction so that, instead of having it go in all directions (as with a vertical antenna) or going in two directions (as mostly happens with horizontal dipole antennas), most of the signal is concentrated in one direction. But, the advantage of a beam is not just in transmitting. It also enhances reception.

The A3S, at $600, is actually cheaper than a linear amplifier, though to be fair, it's only useful for 10, 15 and 20 meters, whereas the amplifier can be used on any of the HF bands. But, adding to its advantages, the A3S uses no electricity and, unless a tree falls on it, it won't need repairs and will give you many years of trouble-free satisfaction.

The problem with the A3S is that, like its more expensive brothers, you'll need a tower to mount it. But, unlike the others, you need very little in the way of a tower to make it useful. I use just three 10-foot lengths of standard antenna mast fixed to the side of a two story section of the house, on top of which is mounted an A3S. The mounting brackets are not clamped tightly, so as to allow the mast to rotate. One nut is installed on the bottom mounting bracket, so that by loosening that one nut I can rotate the antenna by hand in the direction needed, and tightening the nut holds antenna and mast in place. This is known sarcastically by many as an "Armstrong" rotator, and it isn't a lot of fun to operate in the winter or a pouring rain, but it works very well and the entire tower mount system can be had for under $100.

Ameritron AL-811 ($750) puts out a big signal with relatively little cost. (Courtesy: Ameritron)

One reason this works so well is that the antenna is about 10 meters above the ground, which is a half wave of the lowest frequency for which the antenna is cut. In other words, it's about the minimum you want to put a beam antenna to get the most out of the beam characteristics. If you're putting this on a one story high wall, you'll need to have some guy wires to keep the mast from flexing too much in the wind at 30 feet.

Finally, if you add a small amplifier to your A3S you'll really be able to put out a good signal that can break through the pileups or overcome the QRM. You won't be a "big gun," as the moneyed set consider themselves, but for less than $1,500 you'll be heard with a most respectable signal.

❖ Don't Overlook the Wire

Still, even the cheapest beam antennas don't make the best shortwave listening antennas. Because shortwave broadcasting falls outside the frequencies to which most ham beam antennas are maximized, the most versatile antenna for shortwave listening is a wire. That's where simple antennas, such as the G5RV, really shine. They're relatively cheap (usually under $100); typically require no more complicated mounting system than a couple of trees; can be used in a stealth mode in locations where antennas are frowned upon; are relatively low noise and have the added benefit over shortwave listening wire antennas of

MFJ's G5RV ($45) all-band wire antenna makes a great beginner ham and shortwave listening antenna. (Courtesy: Universal Electronics)

being able to transmit as well as receive. Best of all, you can do it yourself!

I don't think anyone can beat the price of the MFJ 1778 G5RV (see photo). At less than $50 you get a ready-made antenna that can be easily put up and last many years. At 102 feet long it's longer than most SWL antennas but shorter than some amateur transmitting antennas. If you want to make your portable shortwave radio really perform, just attach this or any similar wire antenna and you'll be amazed.

I've used a similar antenna for many years in reviewing a broad range of portable shortwave radios and I encourage you to try it. The addition of a good, outdoor wire antenna will totally change the way you listen to shortwave radio. And, if you decide to get your General Class ticket, you'll be set to work the world on HF using just about any modern amateur radio transceiver.

❖ DIY Wire Antenna

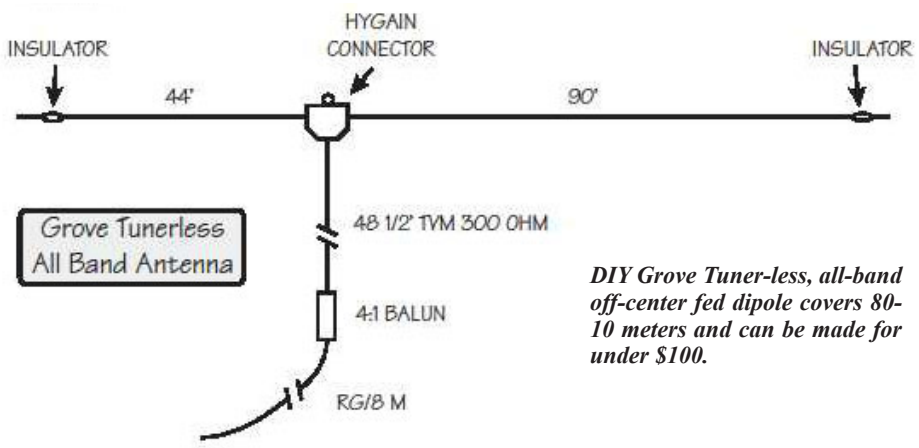
As you look through the ham radio wire antenna literature you'll find dozens of books and hundreds of pages for wire antennas. Some are specially designed for certain bands or to make the signal directional or serve other purposes and all are proven performers. But, if you're looking for one relatively small, easy to build, inexpensive, wire antenna that will give you all-band reception (including medium wave and 160 meters) and transmitting capabilities on 80 through 10 meters, the Grove Tunerless All-Band antenna is tough to beat.

The antenna was designed more than 25 years ago by *MT*'s fabled answer-man and all-around radio guru, Bob Grove, and is based on the G5RV in that it is an off-center fed dipole. A diagram for construction is found on this page and a list of parts and estimated costs is also found on this page.

I've written about this antenna before, but it's been a few years since I last put the construction details in the magazine (the diagram is from the October 2000 *MT*), and a couple of things have changed. It used to be that you could get most parts at any Radio Shack store in the U.S., but now I recommend getting all of the supplies from Universal Radio. They are reliable, quick, have good prices (and they're an *MT* advertiser!); it's no-lose, one-stop shopping.

Constructing the antenna couldn't be easier. Cut the wire and 300 ohm ladder line to the lengths shown in the diagram. Attach an end insulator to one end of each of the legs of the dipole antenna wires. Attach the other end of the two dipole antenna wire to the center connector. Remove an inch or two of insulation from the 300 ohm wire and place it in the center insulator. Attach one side of the 300 ohm wire to the left leg of the dipole and the other side to the right leg (soldering if possible, using wire nuts if not). Remove an inch or so from the other end of the 300 ohm antenna wire and attach one side to the left side of the 4:1 balun and the other side to the right side of the 4:1 balun. Now you're ready to mount the antenna.

There are as many ways to mount an antenna as there are ham operators and shortwave listeners. The fact is that each listening post is unique. If you live in an area with restrictive covenants, or other anti-antenna rules, you'll have one set of problems to overcome. If you live on a small lot, less than the length of this antenna, there's another problem. If you don't have trees high enough to make a difference (one half-wavelength of the lowest frequency band you want to listen to), as is the case in new developments or many places out west, you've got to overcome that issue. If you have big power lines running across your property you'll have to try to align your antenna 90º to the power line to minimize the interference (you'll also have to be extra careful not to involve those power lines in your installation!).



DIY Grove Tuner-less, all-band off-center fed dipole covers 80-10 meters and can be made for under $100.

But wait, there's more! This antenna has 48.5 feet of 300 ohm line that needs to be above ground. Unless you can put your antenna up above 50 feet you'll have to drape it off to the side and hold it in place so that you can attach the coax. The coax may need to be buried in the ground or run along an exterior wall, and then it has to be put through the wall to get to your radio. Using a compass, determine what is north, south, east and west. Know that this antenna will radiate most of its power along the sides not the ends of the antenna. Place it where it will give you the most advantage in reception and/or transmitting. Most times you won't have a choice on any of this and you'll just have to take what you get.

On paper this looks like a lot of work, and it is, but once you have your antenna in place it will give you 10+ years of listening and transmitting pleasure. Build it right, make sure the connections are mechanically and electrically secure, and you're set for the next ten years!

Finally, here are a couple of notes from one who has used this antenna, among others, for the last 22 years. The reason it's called a "tunerless" all-band antenna is that, by the offset design and the use of 300 ohm wire between the off-center point and the balun, you'll get a reasonable (3:1 or better) Standing Wave Ratio (SWR) with which to transmit on all bands from 80 through 10 meters without the use of an outboard tuner (or inboard for those more modern rigs). For listening-only purposes this is irrelevant.

I've found that, while this antenna receives well on 160 meters, it does not load up on 160 (though by using a tuner, running very low power, and operating CW, during the peak of winter, I've worked a number of states and Canada on 160 meters!). The WARC bands (50, 30, 17 and 12 meters) came into our use after this antenna was designed and you'll need some help from an inexpensive tuner to get a decent SWR on those bands. I continue to be impressed with the low noise quality of this antenna, compared with a 3 element tri-band beam and, with the increase in cycle 24 just minutes or years away, you'll be glad you put this antenna up when the propagation finally hits.

PARTS LIST

Universal Radio part number (estimated price less shipping):
134' Antenna wire #2588 ($27)
1 Ladder-line center connector #5461 ($13)
2 Jetstream end insulators #5269 Black ($1.60)
50' 300 ohm ribbon wire #2647 ($17)
1 Unadilla W2AU 4:1 balun #1888 ($25)
RG/8U 50 ohm coax #2248 (sold by the foot at $.59/foot)
Total cost for antenna (less coax lead-in): $83.60

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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Meandering through the 49 Meter Band

The internet has become such a big part of many of our lives. Some days not just some of my listening, but all of it has been via the "world wide web". It's terribly handy to have "on demand" audio, or to download a podcast to listen to at a later time of my own choosing. And, yes the audio is in near stereo quality, the speech and music are clearer, but sometimes it's not such a bad thing to just step away from the computer, fire up the radio receiver and see what the ether is offering up this evening.

Not everyone is hooked up to (or is it hooked on) internet audio so for this month, the Programming Spotlight will shine on programming one can hear most evenings on the 49-metre band. Also, we'll take a quick look at Alastair Cooke's legacy and Genealogy on the air revisited.

On a recent stormy evening, with lightning dancing around the area, the computer was safely shut down, the trusty Grundig YB400PE was loaded with fresh batteries, and an evening excursion around the 49-metre band began.

The first thing one notices, sliding up and down the band, is how much it has changed in the last 10-20 years. Back in the bad old days of the Cold War, the shortwave bands were so crowded that some people speculated that all shortwave transmissions would have to be made using Single Side Band (SSB) by some time in the 1990s. 49 metres was no exception. For most of the last 30 years or so, certain frequencies were signposts. One could always find the BBC on 5975 and 6175 kHz. Canada boomed in on 5960. Radio Netherlands made a nightly appearance on 6165 kHz. Deutche Welle was heard on a number of frequencies. These and many other stations and programs have abandoned the 49 metre band, but that does not mean that it is free of interesting programming.

Most of the programming to be discussed can also be heard online, but all of it can be accessed with a simple portable radio.

The 49-metre band is a favourite destination in North American evenings. Listeners in other parts of the world will have different listening experiences. Why not let us know what you are hearing in your part of the world, by email at the address in the heading of this column, or by snail mail to Monitoring Times at the address listed elsewhere in the magazine.

5755 kHz – **Scriptures for America** was heard wrapping up at 0345 UTC, on presumed **WTWW**. Christian Identity preacher Pete Peters with his "unique" views cloaked in scripture and patriotism. Another program followed.

5890 kHz – **WWCR** with programming over the course of the evening featuring the aforementioned Mr. Peters, the long running **Unshackled** program and Brother Stair.

5935 kHz – **WWCR** heard again with Dr. Gene Scott, and his widow Dr. Melissa Scott, continuing his ubiquitous ministry. Gene Scott used to fascinate this listener. I'd listen for hours, but I never did figure him out. He would start talking about something really interesting and then he'd flip out on his followers who weren't calling and pledging enough, or he'd "teach" using some highly unusual materials about the Bermuda Triangle or some such topic, which he never did seem to finish. No doubt it was to hook the listener in a non-traditional way. He was anything but traditional.

His wife on the other hand seems to be a bit more of a traditional preacher. Recordings of Gene Scott are interspersed with her sermons. Although he died in 2005, he continues to dominate many frequencies, no doubt commanding his followers in his booming voice to "get on the telephone!" He was a fascinating character in his own right.

5950 kHz – **Radio Taiwan International (WYFR Relay)** Thanks to the powerful WYFR transmitters, one can hear the nightly broadcasts of RTI at 02 and 03 hours with "armchair copy". RTI, featured in a recent column, has a wide variety of enjoyable programs each day. Genial hosts like **Andrew Ryan, Ellen Chu and Shirley Lin** present enjoyable programs such as **Hear in Taiwan, Instant Noodles** and **We've Got Mail.** A recent **Hear in Taiwan** program looked at the issue of capital punishment, and the use of Facebook in the workplace. RTI has a more relaxed presentation style than China Radio International, which is appealing. **Family Radio** programming can be heard earlier in the evening on this frequency.

5960 kHz – **Radio Japan** in Japanese via Canada from 02-05 UTC.

5970 kHz – **Radio Habana Cuba**. The revolution lives here. Cuba can be heard in English and Spanish throughout the evening on multiple frequencies. In spite of the propaganda, RHC is worth a listen thanks to the great Cuban music one can hear during the broadcasts.

5985 kHz – **WYFR** heard around 0300 with Harold Camping really "sounding" his age with his phone-in program, **The Open Forum,** presumably recorded earlier. Mr. Camping has predicted the end of the world at least once, but we're still here. Despite his faulty prognostication, he's always had an interesting take on things. **WYFR** is also a source of good programming and music on other frequencies and times.

6000 kHz – More **Cuba**

6020 kHz – **China China Radio International** can be heard for much of the evening on this frequency. Also heard on this frequency is a rather exciting, relatively new program called **The Beijing Hour**. Upon first tuning in, it was not clear to me that this was not the **BBC** or **Radio Australia**. Instead it turned out to be **The Beijing Hour**, hosted by **Susan Osman**. Osman, who began her career as a teacher of English and Drama, had a long career in British radio and television, as a reporter and presenter for both the BBC and ITV. The program is a daily hour-long newsmagazine style program, which wouldn't sound out of place on the BBC.

Susan Osman (host of The Beijing Hour)

Heard at 01 and 05 hours UTC on this frequency.

It features news, and reports from China and the World. For listeners of a certain vintage, it's remarkable to listen to some aspects of this program from China. This is especially true of the Business reports, featuring live reports from the NY Stock Exchange. No "capitalist running dogs" to be found anywhere. World weather forecasts included Ottawa and Toronto. Curious to listen to a program originating half a world away in Beijing, via a relay station in the Americas to hear my local forecast! This program is well worth a listen.

At other times, one can hear the usual fare from China, which in itself is quite interesting and informative. The Cultural Revolution, its rhetoric and those funky Mao jackets have been locked away in the closets of history by all appearances.

6030 kHz – **Radio Marti** was heard with a strong signal (in Canada anyway). Years ago, if memory serves me, one could hear **AFRTS** programming here.

6055 kHz – **Spain** One of the "holdovers" from the "old" days, Radio Exterior de Espana can be heard in English (at 0000 UTC) and Spanish each evening. Programs such as **Cultural Roundup, Rock in Spain** and **Airwaves** (every second UTC Thursday) can be heard in the English broadcasts.

6060 kHz – **Cuba**, again (Spanish most of the evening, English later)

6080 kHz – **China Radio International** Apparently **CRI** did not get the memo that shortwave is a dying medium. They can be heard here each evening as well as 6020. (01 and 04 UTC)

6090 kHz – **Dr Gene Scott** is back, booming in from Anguilla

6110 kHz – More Spanish from **Cuba**

6175 kHz – **Vietnam The Voice of Vietnam** broadcasts on 6175 kHz for most of the local evenings, in English, Vietnamese and Spanish. The Vietnamese language has a certain musical sound to it. And it's rather interesting to hear programming from this part of the world.

This is just an example of what one can hear, without a terribly sophisticated receiver, over the course of a few hours on a typical evening. It's not meant to be a comprehensive list, but a sampling of what's out there. In just one evening a new fantastic show was discovered (**The Beijing Hour**), some old friends (**Dr Scott, Harold Camping**) were heard and some

entertaining and exotic programming was heard from Taiwan, Japan and Vietnam.

So often we look at the bands and think shortwave is dead because it's "not like it used to be". Well it's not like it used to be. But having said that there is still lots of interesting programs to listen to. At the risk of sounding like an old Monty Python sketch ("'e's not dead, 'e's resting'!"), shortwave is not dead by a long shot. It's just different now. One of the many changes brought on by technology (the internet) and governmental budgetary restraint. Shortwave still "tastes great" it's just "less filling".

❖ Alastair Cooke's Legacy

For over five decades, Alastair Cooke presented **Letter From America** in which he mused about life in the United States. It was a staple of the BBC World Service (and the Home Service). When Mr. Cooke died the program was never replaced but it spawned imitators on other radio stations.

Letter from Prague is one such program. As the name suggests it is a production of Radio Prague. Each week a Radio Prague personality (there doesn't seem to be a permanent host) gives a short talk about life in the Czech capital. Many of these presenters, like Cooke himself, are from outside the Czech Republic and so have an interesting viewpoint on life in the city and the Czech Republic.

Whether it's reflecting on the first beer of summer, park life, or dog watching, these little essays give one a revealing glimpse of life in Central Europe. **Letter from Prague** may be heard on UTC Sundays after **Mailbox** at 0000 UTC on 9790 kHz, and at 0100 and 0300 on 7345 kHz. Or go to the **Radio Prague** website at **www.radio.cz/en/current/letter** One of the really cool things about **Radio Prague** is that virtually every story on their website, going back years, has the audio attached and available to listen to. They recently "fixed up" the website, however I find it less user-friendly than it once was. In spite of that, it's still one of the better radio station websites around.

Radio Polonia, now **Polish Radio External Service** had a similar program in the late 90s and early part of the new century. The host had quite a sharp wit, but alas he has moved on, or Polish Radio decided to drop the program.

Back at the **BBC, Radio 4** (available online) presents **Americana** each Sunday night at 715pm UK time (and available for 7 days via the BBC iPlayer). Matt Frei, the host, is no Alastair Cooke, but then who is (Matt will never have a Sesame Street character named after him). The program is billed as an insider's guide to the people and stories shaping America today, and it lives up to it's billing. Matt Frei wanders around the United States talking to people about life, their views and the issues of the day.

In any given episode, one might hear an interview with Newt Gingrich, a visit to a minor league baseball game, or a discussion of the delights of Soul Food. Frei, and other occasional hosts, manage to combine really interesting interviews and slices of American life into each episode. His outsider's perspective gives the program a unique viewpoint.

❖ European Business Week – Deutsche Welle

Germany is the major player in the Euro Zone, and is a major backer of recent efforts to prop up the Greek economy (along with the economy of the rest of Europe). As Germany goes so too seems to go Europe. This program provides deeper insight into the economic issues of the day. As the tagline says, "Making Europe's business your business". Typical topics include big stories like the currency crisis in Europe, gold as a safe haven, an investigation of the popularity of "Exchange Traded Funds" (ETFs) and the Moldovan wine industry. The program gives the back-story on a lot of the issues that occasionally merit a line or two in press reports in North America. For those of us struggling to understand what's going on in economic matters, it's a great resource. One can hear the program on shortwave at 2000 UTC on 11795 and 11865 kHz respectively. Or listen (like the BBC for 7 days at **www.dw-world.de/dw/0,,12582,00.html**

Euro Bus Week (illustration for the European Business Week program)

❖ And in other news...

Genealogy, or the tracing of one's family tree, is one of the most popular hobbies today. The BBC is a remarkably helpful place to start, or to look for help in building on such a project. The place to start is at the Family History page (**www.bbc.co.uk/familyhistory/**) where you will find all sorts of links to resources to help you in your journey through the past. Among the links, on the right hand side of the page is one to the most recent series of the Tracing Your Roots program hosted by Sally Magnusson. Usually, after 7 days, these programs disappear from the BBC online website but this is one of an increasing number of programs whose content is available beyond the seven day limit (including Americana). As this is written, the series, which was aired starting in August 2009, is still available. In each program, Sally shares listener's stories, and discusses topics of interest to the amateur genealogist. Presumably a new series is imminent so that may be available by the time you read this. Stay tuned.

Another link on the BBC Family History site leads to resources for tracing Welsh genealogy. Clicking on that eventually leads to the BBC Wales production Look Up Your Genes (click "Other Resources"). Sadly these programs aren't also archived, so you have to watch out for new programs by checking the BBC Wales website. The BBC player used to list all the available programs from each service with links to each one.

Great Grandmother Thanks to some luck and some tips via the BBC Family History site, I discovered information about my Great Grandmother.

It's a lot prettier now, but less informative. As a result I missed the most recent series of Look Up Your Genes, which ended in late April. Still one must be grateful that we still have access to these programs outside the UK.

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

Convert your time to UTC.

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

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

Find the station you want to hear.

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

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

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

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

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

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

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

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

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

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

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

Alokesh Gupta, New Delhi, India; Arnulf Piontek, Germany; Elena Osipova, VO Russia; Ivo Ivanov; Bulgaria; Sean Gilbert, UK; Bob Fraser, Belfast, ME; Leo van der Woude/R Netherlands; Noel Green, UK; Rachel Baughn/MT; Ron Howard, CA; Rich D' Angelo/NASWA-*Flash Sheet*, NASWA-*Journal*; Tom Taylor, UK; 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	0004		Canada, Radio Canada International			6100na
0000	0015	mtwhf	Moldova, (Transnistria) Radio PMR			9665na
0000	0027		Czech Republic, Radio Prague			9790na
0000	0030		Egypt, Radio Cairo	11590na		
0000	0030	vl	Guyana, Voice of Guyana	3290va		
0000	0030		Thailand, Radio Thailand World Service			15275na
0000	0030		USA, Voice of America	7555as		
0000	0045		India, All India Radio	6055as		7305as
			9705as	11645as	13605as	
0000	0056		Romania, Radio Romania International			7385na
			9580na			
0000	0057		Canada, Radio Canada International			11700as
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	15230pa	15415as	17750as
			17715pa	17795pa		
0000	0100		Bahrain, Radio Bahrain	6010me		
0000	0100		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St John's NF	6160na		
0000	0100		Canada, CKZU Vancouver BC	6160na		
0000	0100		China, China Radio International			6020eu
			6075as	6180as	7350eu	7415as
			9570eu	11790as	11885as	13750as
0000	0100		Germany, Deutsche Welle	9885as		15595as
			17525as			
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100		New Zealand, Radio NZ International			15730pa
0000	0100	DRM	New Zealand, Radio NZ International			15720pa
0000	0100		Russia, Voice of Russia	9665na		9890na
0000	0100		Spain, Radio Exterior de Espana			6055na
0000	0100		Sri Lanka, SLBC	6005as	9770as	15745as
0000	0100		UK, BBC World Service	5970as		6195as
			7395as	9740as	12095as	13725as
0000	0100		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0000	0100		USA, EWTN/WEWN Vandiver AL			11520af
0000	0100		USA, WBCQ Monticello ME	5110usb		9330am
			7415usb			
0000	0100		USA, WHRI Cypress Creek SC			5875na
			5920am	7315na		
0000	0100	vl	USA, WINB Red Lion PA	9265ca		
0000	0100		USA, WRMI Miami FL	9955ca		
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WTWW Lebanon TN	9480na		
0000	0100		USA, WWCR Nashville TN	4840na		7465na
			9980na			
0000	0100		USA, WWRB Manchester TN	3185na		3215na
			5050na			
0000	0100		USA, WYFR/Family Radio Worldwide			5950na
			6985na	7360sa	7520sa	9505na
			15440na			
0000	0100		Zambia, 1 Africa Radio/CVC	4965af		
0005	0100	twhfa	Canada, Radio Canada International			6100na
0030	0045	twhfas	Albania, Radio Tirana	9860na		
0030	0100		China, China Radio International			11730as
0030	0100		Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			
0030	0100	mtwhfa	Serbia, International Radio of Serbia			9675na
0030	0100		Thailand, Radio Thailand World Service			15275na
0030	0100	Sun	UK, Bible Voice Broadcasting	7405as		
0030	0100		USA, Voice of America/Special English			7430as
			9715as	9780va	11725va	15205va
			15290va	15560va	17820va	
0040	0100	mtwhf	Moldova, (Transnistria) Radio PMR			9665eu

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

0100	0104	twhfa	Canada, Radio Canada International			6100na
0100	0127		Czech Republic, Radio Prague			7345na
0100	0130		China, China Radio International			11730as
0100	0130		Slovakia, Radio Slovakia International			5930na
			9440sa			
0100	0130		Vietnam, Voice of Vietnam	6175na		
0100	0157		North Korea, Voice of Korea	9345as		9730as
			11735sa	13760as	15180as	
0100	0159		Canada, Radio Canada International			9620as
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	15230pa	15415as	17750as
			17715pa	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 John's NF	6160na		
0100	0200		Canada, CKZU Vancouver BC	6160na		
0100	0200		China, China Radio International			6020eu
			6080na	6175eu	9410eu	9470eu
			9535as	9570eu	9580na	9790na
			11870as	15785as		
0100	0200		Cuba, Radio Havana Cuba	5970na		6000na
			6060na			
0100	0200	vl	Guyana, Voice of Guyana	3290va		
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200		New Zealand, Radio NZ International			13730pa
0100	0200	DRM	New Zealand, Radio NZ International			15720pa
0100	0200		Russia, Voice of Russia	9665na		9890na
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, Radio Taiwan International			11875as
0100	0200		UK, BBC World Service	5970as		6195as
			7395as	9410as	9740as	11750as
			12095as	13725as	15310as	15335as
			15360as	17615as		
0100	0200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0100	0200		USA, EWTN/WEWN Vandiver AL			11520af
0100	0200		USA, KJES Vado NM	7555na		
0100	0200		USA, KJES Vado, NM	7555na		
0100	0200		USA, Voice of America	7430va		9780va
			11705va			
0100	0200		USA, WBCQ Monticello ME	5110usb		9330am
			7415usb			
0100	0200		USA, WHRI Cypress Creek SC			5875na
			5920am	7315na		
0100	0200	vl	USA, WINB Red Lion PA	9265ca		
0100	0200		USA, WRMI Miami FL	9955ca		
0100	0200		USA, WRNO New Orleans LA	7505am		
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WTWW Lebanon TN	5080na		
0100	0200		USA, WWCR Nashville TN	3215na		4840na
			9980na			
0100	0200		USA, WWRB Manchester TN	3185na		5050na
			5745na			
0100	0200		USA, WYFR/Family Radio Worldwide			6985na
			9505na	15440na		
0100	0200		Zambia, 1 Africa Radio/CVC	4965af		
0130	0200		Iran, VOIRI/IRIB	7245na	9495na	
0130	0200		Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			
0130	0200		Sweden, Radio Sweden	6010na		
0130	0200	twhfa	USA, Voice of America/Special English			7465ca
			9820ca			
0140	0200		Vatican City State, Vatican Radio			7335va
			11850as			
0145	0200	twhfas	Albania, Radio Tirana	7425na		

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

0200	0215		Croatia, Croatian Radio	3985eu		9925am
0200	0227		Iran, VOIRI/IRIB	7245na	9495na	
0200	0230		Thailand, Radio Thailand World Service			15275na
0200	0230		USA, KJES Vado NM	7555na		
0200	0230		USA, KJES Vado, NM	7555na		
0200	0245		USA, WYFR/Family Radio Worldwide			11835na
0200	0257		North Korea, Voice of Korea	13650as		15100as
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300	twhfa	Argentina, Radio Nacional RAE			11710am
0200	0300		Australia, ABC NT Alice Springs			4835do
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek			4910do
0200	0300		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0200	0300		Bahrain, Radio Bahrain	6010me		
0200	0300		Bulgaria, Radio Bulgaria	9700na		11700na
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St John's NF	6160na		
0200	0300		Canada, CKZU Vancouver BC	6160na		
0200	0300		China, China Radio International			11770as
			13640as			
0200	0300		Cuba, Radio Havana Cuba	5970na		6000na
			6060na			

SHORTWAVE GUIDE

0200	0300		Egypt, Radio Cairo	6270na		
0200	0300	vl	Guyana, Voice of Guyana	3290va		
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		New Zealand, Radio NZ International			13730pa
0200	0300	DRM	New Zealand, Radio NZ International			15720pa
0200	0300		Palau, T8WH/WHRI/Sound of Hope Radio 15710as			
0200	0300		Philippines, PBS/ Radyo Pilipinas 15510me	15285me		11880me
0200	0300		Russia, Voice of Russia	9665sa		15425na
0200	0300		South Korea, KBS World Radio			9580sa
0200	0300		Taiwan, Radio Taiwan International 9680ca			5950na
0200	0300		Uganda, Radio Uganda	4975do		
0200	0300		UK, BBC World Service 9410as	6005af 12095as	6195as 15310as	
0200	0300		USA, American Forces Network 5446usb 12759usb	5765usb 13362usb	7812usb	4319usb 12133usb
0200	0300		USA, EWTN/WEWN Vandiver AL			11520af
0200	0300		USA, WBCQ Monticello ME 7415usb	5110usb		9330am
0200	0300		USA, WHRI Cypress Creek SC 5920am	7315na		5875na
0200	0300	vl	USA, WINB Red Lion PA	9265ca		
0200	0300		USA, WRMI Miami FL	9955ca		
0200	0300		USA, WRNO New Orleans LA	7505am		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WTWW Lebanon TN	9480na		
0200	0300		USA, WWCR Nashville TN 5890na	3215na		4840na
0200	0300		USA, WWRB Manchester TN 5745na	3185na		5050na
0200	0300		USA, WYFR/Family Radio Worldwide 6100sa	6985na	9385ca	5985ca 9505na
0200	0300		Zambia, 1 Africa Radio/CVC	4965af		
0215	0230		Nepal, Radio Nepal	5005as		
0230	0300	twhfas	Albania, Radio Tirana	7425na		
0230	0300		Sweden, Radio Sweden	6010na		9510va
0230	0300		Vietnam, Voice of Vietnam	6175na		
0245	0300		Australia, HCJB Global	15400as		
0245	0300		India, All India Radio	3945do		
0250	0300		Vatican City State, Vatican Radio 7305am	9610am		6040am

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

0300	0315	Sun	Swaziland, TWR Africa	3200af		
0300	0320		Vatican City State, Vatican Radio 7305am	9610am		6040am
0300	0327		Czech Republic, Radio Prague			7345na
0300	0330		Egypt, Radio Cairo	6270na		
0300	0330		Philippines, PBS/ Radyo Pilipinas 15510me	15285me		11880me
0300	0330		Sri Lanka, SLBC	6005as	9770as	15745as
0300	0330		Vatican City State, Vatican Radio 9660af	15460as		7360af
0300	0355		South Africa, Channel Africa	6135af		
0300	0356		Romania, Radio Romania International 9645na	11895as	15340as	7335na
0300	0357		North Korea, Voice of Korea 9730as	7200as		9345as
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 13690pa 17750as	9660pa 15230pa 21725pa	15415as	12080pa 15515pa
0300	0400		Bahrain, Radio Bahrain	6010me		
0300	0400	twhfas	Canada, CBC NQ SW Service	9625na		
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St John's NF	6160na		
0300	0400		Canada, CKZU Vancouver BC	6160na		
0300	0400		China, China Radio International 9790na 15785as	11770as	15110as	9690na 15120eu
0300	0400		Cuba, Radio Havana Cuba 6060na	5970na		6000na
0300	0400		Germany, Deutsche Welle	12005as		15595as
0300	0400	vl	Guyana, Voice of Guyana	3290va		
0300	0400		Malaysia, RTM/Traxx FM	7295do		
0300	0400		New Zealand, Radio NZ International			13730pa
0300	0400	DRM	New Zealand, Radio NZ International			15720pa
0300	0400		Oman, Radio Oman	15355af		
0300	0400		Palau, T8WH/WHRI/Sound of Hope Radio 15700as			
0300	0400		Russia, Voice of Russia 15585as	9665sa		15425na
0300	0400	DRM	Russia, Voice of Russia	15735as		
0300	0400		South Africa, Channel Africa	3345af		
0300	0400		Taiwan, Radio Taiwan International 15320as			5950na
0300	0400		Turkey, Voice of Turkey	5975va		6165va
0300	0400		Uganda, Radio Uganda	4975do		
0300	0400		UK, BBC World Service 6145af 9750af 15310as	6190af 11945af 17790as	6195va 12035as	7255af 12095as
0300	0400		USA, American Forces Network 5446usb 12759usb	5765usb 13362usb	7812usb	4319usb 12133usb
0300	0400		USA, EWTN/WEWN Vandiver AL			9455af
0300	0400		USA, Voice of America 9855af	15580af		4930af 6080af
0300	0400		USA, WBCQ Monticello ME 7415usb	5110usb		9330am
0300	0400		USA, WHRI Cypress Creek SC 5920am	7315na		5875na
0300	0400	vl	USA, WINB Red Lion PA	9265ca		
0300	0400		USA, WRMI Miami FL	9955ca		
0300	0400		USA, WRNO New Orleans LA	7505am		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WTWW Lebanon TN	9480na		
0300	0400		USA, WWCR Nashville TN 5890na	3215na		4840na
0300	0400		USA, WWRB Manchester TN 5745na	3185na		5050na
0300	0400		USA, WYFR/Family Radio Worldwide 9505na	11740sa	15255sa	6985na
0300	0400		Zambia, 1 Africa Radio/CVC	4965af		
0330	0357		Czech Republic, Radio Prague			9445me
0330	0400	twhfas	Albania, Radio Tirana	7425na		
0330	0400	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0330	0400		UK, BBC World Service	11945af		
0330	0400		Vietnam, Voice of Vietnam	6175na		
0345	0400	vl/Sat/Sun	Uganda, Radio Uganda	4975do		

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

0400	0430	mtwhf	France, Radio France Internationale 11995af			9805af
0400	0430	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0400	0430		USA, Voice of America 9855af	12080af	15580af	4930af 6080af
0400	0445		USA, WYFR/Family Radio Worldwide 9505na			6985na
0400	0458		New Zealand, Radio NZ International			13730pa
0400	0458	DRM	New Zealand, Radio NZ International			15720pa
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 13690pa 17750as	9660pa 15230pa 21725pa	15415as	12080pa 15515pa
0400	0500		Bahrain, Radio Bahrain	6010me		
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na		
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St John's NF	6160na		
0400	0500		Canada, CKZU Vancouver BC	6160na		
0400	0500		China, China Radio International 6080na 17730af	13750as 17855af	15120eu	6020na 15785as
0400	0500		Cuba, Radio Havana Cuba 6060na	5970na		6000na
0400	0500		Germany, Deutsche Welle 12045af	15400af		6180af 7240af
0400	0500	vl	Guyana, Voice of Guyana	3290va		
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Russia, Voice of Russia	13775na		15585as
0400	0500	DRM	Russia, Voice of Russia	15735as		
0400	0500		South Africa, Channel Africa	3345af		
0400	0500		Sri Lanka, SLBC	6005as	9770as	15745as
0400	0500		Uganda, Radio Uganda	4975do		
0400	0500		UK, BBC World Service 6190af 12035af 15360as	7255af 12095as 17790as	7310af 13675eu	6055af 9410eu 15310as
0400	0500		USA, American Forces Network 5446usb 12759usb	5765usb 13362usb	7812usb	4319usb 12133usb

0400	0500		USA, EWTN/WEWN Vandiver AL			9455af
0400	0500		USA, WBCQ Monticello ME	5110usb		7415usb
0400	0500		USA, WHRI Cypress Creek SC			5920am
			7315na			
0400	0500	mtwhfs	USA, WHRI Cypress Creek SC			7365eu
0400	0500	Sat	USA, WHRI Cypress Creek SC			9825me
0400	0500		USA, WRMI Miami FL	9955ca		
0400	0500		USA, WRNO New Orleans LA	7505am		
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WTWW Lebanon TN	9480na		
0400	0500		USA, WWCR Nashville TN	3215na		4840na
			5890na			
0400	0500		USA, WWRB Manchester TN	3185na		
0400	0500		USA, WYFR/Family Radio Worldwide			9680na
0400	0500		Zambia, 1 Africa Radio/CVC	4965af		9430af
			5925al			
0430	0500	Sat/Sun	Greece, Voice of Greece	11645eu		
0430	0500		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0430	0500	mtwhf	Swaziland, TWR Africa	3200af		4775af
0430	0500		USA, Voice of America	4930af		4960af
			6080af	12080af	15580af	
0455	0500		Nigeria, Voice of Nigeria/External Service			
			15120eu			
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 NQ SW Service	9625na		
0500	0530		China, CNR-11/Holy Tibet	9530do		11685do
			15570do			
0500	0530		Czech Republic, Radio Prague			9955ca
0500	0530	mtwhf	France, Radio France Internationale			11995af
			13680af			
0500	0530		Germany, Deutsche Welle	6180af		7430af
			9700af	9825af		
0500	0530		Japan, NHK World/ Radio Japan			5975va
			6110na	11970as	15205as	17810as
0500	0530	Sun	UK, BBC World Service	15420af		
0500	0530		Vatican City State, Vatican Radio			4005eu
			5965eu	7250eu	9660af	11625af
			13765af			
0500	0555		Sri Lanka, SLBC	6005as	9770as	15745as
0500	0600		Anguilla, Worldwide Univ Network			6090am
0500	0600		Australia, ABC NT Alice Springs			4835do
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek			4910do
0500	0600		Australia, Radio Australia	9660pa		12080pa
			13630as	15160pa	15230pa	15415as
			17750as			
0500	0600		Bahrain, Radio Bahrain	6010me		
0500	0600		Bhutan, Bhutan Broadcasting Service			6035as
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St John's NF	6160na		
0500	0600		Canada, CKZU Vancouver BC	6160na		
0500	0600		China, China Radio International			6020na
			6190na	11710me	11895as	15350as
			15465as	17505af	17540as	17730af
			17855af			
0500	0600		Cuba, Radio Havana Cuba	5970na		6010na
			6010na	6060na		
0500	0600	DRM	Germany, Deutsche Welle	17525as		
0500	0600	mtwhf	Greece, Voice of Greece	11645eu		
0500	0600	vl	Guyana, Voice of Guyana	3290va		
0500	0600		Kuwait, Radio Kuwait	15110as		
0500	0600		Malaysia, RTM/Traxx FM	7295do		
0500	0600		New Zealand, Radio NZ International			11725pa
0500	0600	DRM	New Zealand, Radio NZ International			11675pa
0500	0600		Nigeria, Voice of Nigeria/External Service			
			15120eu			
0500	0600		Russia, Voice of Russia	13775na		
0500	0600	mtwh	Slovakia, IRRS/Euro Gospel Radio			5990va
0500	0600		South Africa, Channel Africa	7230af		
0500	0600		Swaziland, TWR Africa	3200af		6120af
			9500af			
0500	0600		Taiwan, Radio Taiwan International			5950na
0500	0600		Uganda, Radio Uganda	4975do		
0500	0600		UK, BBC World Service	3995eu		7255af
			7310af	9410eu	11945af	12095va
			15310as	15360as	15560eu	17640af
			17790as			
0500	0600	mtwhf	UK, BBC World Service	15420af		
0500	0600		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0500	0600		USA, EWTN/WEWN Vandiver AL			6890va
0500	0600		USA, Voice of America	4930af		6080af
			12080af	15580af		
0500	0600		USA, WBCQ Monticello ME	5110usb		7415usb
0500	0600		USA, WHRI Cypress Creek SC			5920am
			7365va	11565pa		
0500	0600		USA, WRMI Miami FL	9955ca		
0500	0600		USA, WTJC Newport NC	9370na		
0500	0600		USA, WTWW Lebanon TN	9480na		
0500	0600		USA, WWCR Nashville TN	3215na		4840na
0500	0600		USA, WWRB Manchester TN	3185na		
0500	0600		USA, WYFR/Family Radio Worldwide			9680na
0500	0600		Zambia, 1 Africa Radio/CVC	4965af		
0515	0530		Rwanda, Radio Rwanda	6055do		
0530	0556		Romania, Radio Romania International			9655eu
			21500pa	17760pa		
0530	0556	DRM	Romania, Radio Romania International			7305eu
0530	0600		Clandestine, Sudan Radio Service/ SRS			13720af
0530	0600		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0530	0600		Thailand, Radio Thailand World Service			17655eu

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

0600	0630	Sat/Sun	Australia, Radio Australia	15290as		
0600	0630		China, Xizang PBS/Holy Tibet	4905do		4920do
			5240do	6110do	6130do	6200do
			9490do	9580do		
0600	0630	mtwhf	France, Radio France Internationale			9765af
			11615af	15160af	17800af	
0600	0630		Germany, Deutsche Welle	7325af		15275af
0600	0630	Sat/Sun	Greece, Voice of Greece/Radio Filia			11645eu
0600	0630		Laos, Lao National Radio	7145as		
0600	0645	mtwhf	South Africa, TWR	11640af		
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	9660pa		12080pa
			13630as	13690pa	15160pa	15230pa
			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 John's NF	6160na		
0600	0700		Canada, CKZU Vancouver BC	6160na		
0600	0700		China, China Radio International			11710me
			11870af	11895as	13660as	15140af
			15350as	15465as	17505af	17540as
0600	0700		Cuba, Radio Havana Cuba	5970na		6000na
			6010na	6060na		
0600	0700	DRM	Germany, Deutsche Welle	3995eu		6130eu
0600	0700	vl	Guyana, Voice of Guyana	3290va		
0600	0700		Kuwait, Radio Kuwait	15110as		
0600	0700		Malaysia, RTM/Traxx FM	7295do		
0600	0700		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0600	0700		Nigeria, Voice of Nigeria/External Service			
			15120eu			
0600	0700		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0600	0700		Russia, Voice of Russia	15405pa		
0600	0700		South Africa, Channel Africa	7230af		
0600	0700		Swaziland, TWR Africa	4775af		6120af
			9500af			
0600	0700		Uganda, Radio Uganda	7195do		
0600	0700		UK, BBC World Service	3995eu		6005af
			6190af	7310af	9410af	9860af
			12015af	12095as	15310as	17640af
			17790as			
0600	0700	Sat/Sun	UK, BBC World Service	15420af		
0600	0700	DRM	UK, BBC World Service	3995eu		
0600	0700		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0600	0700		USA, EWTN/WEWN Vandiver AL			6890va
0600	0700		USA, Voice of America	6080af		12080af
			15580af			
0600	0700		USA, WBCQ Monticello ME	5110usb		7415usb
0600	0700		USA, WHRI Cypress Creek SC			5920am
			7365va	11565pa		
0600	0700		USA, WRMI Miami FL	9955ca		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WTWW Lebanon TN	9480na		

0600	0700		USA, WWCR Nashville TN	3215na	4840na	
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR/Family Radio Worldwide			5850ca
			7520va	9680na	11530af	11580va
0600	0700		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0600	615	Sat/Sun	South Africa, TWR	11640af		
0630	0645		Vatican City State, Vatican Radio			4005eu
			5965eu	7250eu	9645af	11740eu
			15595eu			
0630	0700		Bulgaria, Radio Bulgaria	9600eu	11600eu	
0630	0700		Vatican City State, Vatican Radio			11625af
			13765af	15570af		
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			7440pa

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

0700	0727		Czech Republic, Radio Prague			9880eu
0700	0730	mtwhf	France, Radio France Internationale			13675af
0700	0730		Slovakia, Radio Slovakia International			9440va
			11650va			
0700	0730	Sun	UK, Bible Voice Broadcasting	5945eu		
0700	0745	Sat	UK, Bible Voice Broadcasting	5945eu		
0700	0745		USA, WYFR/Family Radio Worldwide			7520va
0700	0750	Sun	Germany, TWR Europe	6105eu		
0700	0750	mtwhf	Germany, TWR Europe	6105eu		
0700	0750	mtwhf	Monaco, TWR Europe	9800eu		
0700	0800		Anguilla, Worldwide Univ Network			6090am
0700	0800		Australia, ABC NT Alice Springs			4835do
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek			4910do
0700	0800		Australia, Radio Australia	9475as	9660pa	
			9710as	11945pa	12080pa	
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 John's NF	6160na		
0700	0800		Canada, CKZU Vancouver BC	6160na		
0700	0800		China, China Radio International			11895as
			13660as	13710eu	15125me	15350as
			17710as			
0700	0800	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0700	0800	DRM	Germany, Deutsche Welle	5790eu	9545eu	
0700	0800	vl	Guyana, Voice of Guyana	3290va		
0700	0800		Kuwait, Radio Kuwait	15110as		
0700	0800		Malaysia, RTM/Traxx FM	7295do		
0700	0800		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0700	0800		Myanmar, Myanma Radio	9730do		
0700	0800		New Zealand, Radio NZ International			6170pa
0700	0800	DRM	New Zealand, Radio NZ International			7440pa
0700	0800		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as	15725as		
0700	0800		Russia, Voice of Russia	15405pa	17495va	
0700	0800		South Africa, Channel Africa	7230af		
0700	0800		Swaziland, TWR Africa	4775af	6120af	
			9500af			
0700	0800		Uganda, Radio Uganda	7195do		
0700	0800		UK, BBC World Service	5790eu	6190af	
			9860af	11760me	11765af	13830af
			15400af	15575as	17790as	17830af
0700	0800	Sat/Sun	UK, BBC World Service	15420af		
0700	0800		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0700	0800		USA, EWTN/WEWN Vandiver AL			6890va
0700	0800		USA, WBCQ Monticello ME	5110usb	7415usb	
0700	0800		USA, WHRI Cypress Creek SC			5920am
			7365va	11565pa		
0700	0800		USA, WRMI Miami FL	9955ca		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WTWW Lebanon TN	9480na		
0700	0800		USA, WWCR Nashville TN	3215na	4840na	
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		USA, WYFR/Family Radio Worldwide			5950na
			5985na	6875na	9385af	9505ca
0700	0800		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0715	0750	Sat	Germany, TWR Europe	6105eu		
0715	0750	Sat	Monaco, TWR Europe	9800eu		
0730	0800		Australia, HCJB Global	11750as		
0730	0800		Clandestine, Cotton Tree News			15220af

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

0800	0830		Australia, ABC NT Alice Springs			4835do
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek			4910do
0800	0830		Myanmar, Myanma Radio	9730do		
0800	0845		USA, WYFR/Family Radio Worldwide			5950na
			5985na	9385af		
0800	0900		Anguilla, Worldwide Univ Network			6090am
0800	0900		Australia, HCJB Global	11750pa		
0800	0900		Australia, Radio Australia	5995pa	9475as	
			9580pa	9590pa	9710pa	11945pa
			12080pa	13630as		
0800	0900		Bahrain, Radio Bahrain	6010me		
0800	0900	t/DRM	Belgium, TDP Radio	6015eu		
0800	0900		Bhutan, Bhutan Broadcasting Service			6035as
0800	0900		Canada, CFRX Toronto ON	6070na		
0800	0900		Canada, CFVP Calgary AB	6030na		
0800	0900		Canada, CKZN St John's NF	6160na		
0800	0900		Canada, CKZU Vancouver BC	6160na		
0800	0900		China, China Radio International			11620as
			11895as	13710eu	15350as	15465as
			15625me	17540as		
0800	0900	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0800	0900	DRM	Germany, Deutsche Welle	12095as		
0800	0900	vl	Guyana, Voice of Guyana	3290va		
0800	0900		Malaysia, RTM/Traxx FM	7295do		
0800	0900		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0800	0900		New Zealand, Radio NZ International			6170pa
0800	0900	DRM	New Zealand, Radio NZ International			7440pa
0800	0900		Nigeria, Voice of Nigeria/External Service			
			9690af			
0800	0900		Palau, T8WH/WHRI/Sound of Hope Radio			
			15725as			
0800	0900	mtwhfs	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0800	0900		Russia, Voice of Russia	15405pa	17495va	
0800	0900	DRM	Russia, Voice of Russia	12060eu		
0800	0900		South Africa, Channel Africa	9625af		
0800	0900	Sun	South Africa, Radio League	7205af	17570af	
0800	0900		South Korea, KBS World Radio			9570as
0800	0900		Swaziland, TWR Africa	4775af	6120af	
			9500af			
0800	0900		Uganda, Radio Uganda	7195do		
0800	0900		UK, BBC World Service	6190af	9860af	
			11760me	15310as	15400af	15575as
			17640af	17790as	17830af	21470af
0800	0900		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0800	0900		USA, EWTN/WEWN Vandiver AL			6890va
0800	0900		USA, KNLS Anchor Point AK	11765as		
0800	0900		USA, WBCQ Monticello ME	5110usb	7415usb	
0800	0900		USA, WHRI Cypress Creek SC			5920am
			11565pa			
0800	0900		USA, WRMI Miami FL	9955ca		
0800	0900		USA, WTJC Newport NC	9370na		
0800	0900		USA, WTWW Lebanon TN	9480na		
0800	0900		USA, WWCR Nashville TN	3215na	4840na	
0800	0900		USA, WWRB Manchester TN	3185na		
0800	0900		USA, WYFR/Family Radio Worldwide			5985na
			6875na			
0800	0900		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0815	0825		Nepal, Radio Nepal	5005as		
0820	0900	smtwhf	Guam, KTWR/TWR	15170as		
0830	0900		Australia, ABC NT Alice Springs			2310do
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek			2325do
0830	0900	mtwhfa	Guam, KTWR/TWR	11840pa		

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

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa		
0900	0929		Czech Republic, Radio Prague			17650af
0900	0930		Australia, HCJB Global	11750pa		
0900	0930	DRM	Bulgaria, Radio Bulgaria	11900eu		
0900	0930	mtwhfa	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0900	0959		Germany, Deutsche Welle	15640as	17820as	
0900	1000		Anguilla, Worldwide Univ Network			6090am
0900	1000		Australia, ABC NT Alice Springs			2310do
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, Radio Australia	9475as	9580pa	
			9590pa	11945pa		

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 John's NF	6160na		
0900	1000		Canada, CKZU Vancouver BC	6160na		
0900	1000		China, China Radio International			11620as
			13790pa	15210as	15270eu	15350as
			17490eu	17570eu	17750as	
0900	1000	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0900	1000	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0900	1000	2nd Sun	Germany, Blue Star Radio	6140eu		
0900	1000	4th Sun	Germany, Radio Gloria International			6140eu
0900	1000		Malaysia, RTM/Traxx FM	7295do		
0900	1000		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0900	1000		New Zealand, Radio NZ International			6170pa
0900	1000	DRM	New Zealand, Radio NZ International			7440pa
0900	1000		Nigeria, Voice of Nigeria/External Service			
			9690af			
0900	1000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0900	1000		Russia, Voice of Russia	15170as		17495va
0900	1000	DRM	Russia, Voice of Russia	12060eu		
0900	1000	3rd Sat	Slovakia, IRRS/Radio City	9510va		
0900	1000	1st Sat	Slovakia, IRRS/Radio Joystick	9510va		
0900	1000		Tajikistan, Voice of Tajik/External Svc			7245va
0900	1000		Uganda, Radio Uganda	7195do		
0900	1000	DRM	UK, BBC World Service	9610eu		13810eu
0900	1000		UK, BBC World Service	6190af		6195as
			9740as	9860af	11760me	15310as
			15400af	15575as	17640af	17760as
			17830af	21470af	21660as	
0900	1000		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0900	1000		USA, EWTN/WEWN Vandiver AL			11520va
0900	1000		USA, WBCQ Monticello ME	5110usb		
0900	1000		USA, WHRI Cypress Creek SC			5920am
			7365na	11565pa		
0900	1000		USA, WRMI Miami FL	9955ca		
0900	1000		USA, WTJC Newport NC	9370na		
0900	1000		USA, WTWW Lebanon TN	9480na		
0900	1000		USA, WWCR Nashville TN	4840na		9985na
0900	1000		USA, WWRB Manchester TN	3185na		
0900	1000		USA, WYFR/Family Radio Worldwide			5985na
			6875na	9465as	9755na	
0900	1000		Zambia, 1 Africa Radio/CVC	6065af		13590af
0930	1000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0930	1000		Saudi Arabia, BSKSA/Saudi Radio			15250af
0930	1000	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va

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

1000	1030		Czech Republic, Radio Prague			9955na
1000	1030		Japan, NHK World/ Radio Japan			9605as
			9625pa	9825pa	11780as	
1000	1030	fa	Philippines, FEBC	15325as		
1000	1030		Vietnam, Voice of Vietnam	9840as		12020as
1000	1057		Netherlands, R Netherlands Worldwide			11895as
			12065as	15110as		
1000	1057		North Korea, Voice of Korea	11710sa		11735sa
			13650as	15180sa		
1000	1058		New Zealand, Radio NZ International			6170pa
1000	1100		Anguilla, Worldwide Univ Network			11775am
1000	1100		Australia, ABC NT Alice Springs			2310do
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek			2325do
1000	1100		Australia, Radio Australia	9475as		9580pa
			9590pa	11945pa		
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 John's NF	6160na		
1000	1100		Canada, CKZU Vancouver BC	6160na		
1000	1100		China, China Radio International			6040na
			11610as	11635eu	13590as	13620as
			13720as	13790pa	15190as	15350as
			17490eu			
1000	1100	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
1000	1100	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1000	1100	DRM	Germany, Deutsche Welle	9545eu		13810eu
1000	1100	3rd Sun	Germany, European Music Radio			6140eu
1000	1100		India, All India Radio	7270as		13695pa
			15020as	15260as	15410as	17510pa
			17895pa			
1000	1100		Indonesia, Voice of Indonesia	9526va		11785al
1000	1100		Malaysia, RTM/Traxx FM	7295do		
1000	1100	DRM	New Zealand, Radio NZ International			7440pa
1000	1100		Nigeria, Voice of Nigeria/External Service			
			9690af			
1000	1100		Palau, T8WH/WHRI/Sound of Hope Radio			
			15725as			
1000	1100		Russia, Voice of Russia	15170as		
1000	1100		Saudi Arabia, BSKSA/Saudi Radio			15250af
			15470af			
1000	1100	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va
1000	1100		Uganda, Radio Uganda	7195do		
1000	1100	DRM	UK, BBC World Service	9545eu		13810eu
1000	1100	Sat/Sun	UK, BBC World Service	15400af		17830af
1000	1100		UK, BBC World Service	6190af		6195as
			9545eu	9740as	9860af	11760me
			15310as	15575as	17640af	17790as
			21470af	21660as		
1000	1100		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1000	1100		USA, EWTN/WEWN Vandiver AL			11520va
1000	1100		USA, KNLS Anchor Point AK	11765as		
1000	1100		USA, WHRI Cypress Creek SC			5920am
			11565pa			
1000	1100	vl	USA, WINB Red Lion PA	9265ca		
1000	1100		USA, WRMI Miami FL	9955ca		
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WTWW Lebanon TN	9480na		
1000	1100		USA, WWCR Nashville TN	4840na		9985na
1000	1100		USA, WWRB Manchester TN	3185na		
1000	1100		USA, WYFR/Family Radio Worldwide			5950na
			5985na	6875na	9450as	9465as
			9755na			
1000	1100		Zambia, 1 Africa Radio/CVC	6065af		13590af
1030	1057		Czech Republic, Radio Prague			9880eu
1030	1100		Iran, VOIRI/IRIB	15600as	17660as	
1030	1100		Mongolia, Voice of Mongolia	12085as		
1059	1100		New Zealand, Radio NZ International			9655pa

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

1100	1127		Iran, VOIRI/IRIB	15600as	17660as	
1100	1130	f/DRM	Japan, NHK World/ Radio Japan			9760eu
1100	1130		Pakistan, PBC/ Radio Pakistan	15100as		17720as
1100	1130	Sat/DRM	South Korea, KBS World Radio			9760eu
1100	1130	mtwhf	UK, BBC World Service	15400af		
1100	1130		Vietnam, Voice of Vietnam	7285as		
1100	1145		USA, WYFR/Family Radio Worldwide			6875na
			9550sa	9755na		
1100	1156		Romania, Radio Romania International			15210eu
			15430eu	17510af	17670af	
1100	1158	DRM	New Zealand, Radio NZ International			7440pa
1100	1200		Anguilla, Worldwide Univ Network			11775am
1100	1200		Australia, ABC NT Alice Springs			2310do
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek			2325do
1100	1200		Australia, Radio Australia	5995pa		6020pa
			9475as	9580pa	9590pa	9965as
			11945pa			
1100	1200	DRM	Australia, Radio Australia	12080pa		
1100	1200		Bahrain, Radio Bahrain	6010me		
1100	1200	f/DRM	Belgium, TDP Radio	6015eu		
1100	1200	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1100	1200		Canada, CFRX Toronto ON	6070na		
1100	1200		Canada, CFVP Calgary AB	6030na		
1100	1200		Canada, CKZN St John's NF	6160na		
1100	1200		Canada, CKZU Vancouver BC	6160na		
1100	1200		China, China Radio International			5955as
			6040na	11650as	11660as	11750na
			11795as	13590as	13645as	13650eu
			13720as	17490eu		
1100	1200	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
1100	1200	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1100	1200		Malaysia, RTM/Traxx FM	7295do		
1100	1200		New Zealand, Radio NZ International			9655pa
1100	1200		Nigeria, Voice of Nigeria/External Service			
			9690af			
1100	1200		Russia, Voice of Russia	12065as		
1100	1200		Saudi Arabia, BSKSA/Saudi Radio			15250af
			15470af			
1100	1200	Sun	Slovakia, IRRS/Euro Gospel Radio			9515va
1100	1200		Taiwan, Radio Taiwan International			7445as
			11715as			
1100	1200		Uganda, Radio Uganda	7195do		

1100	1200		UK, BBC World Service	6190af	6195as	
			9545eu	9740as	9860af	11760me
			15280as	15310as	15575as	17640af
			17790as	17830af	21470af	
1100	1200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1100	1200		USA, EWTN/WEWN Vandiver AL			11520va
1100	1200		USA, WHRI Cypress Creek SC			5920am
1100	1200	vl	USA, WINB Red Lion PA	9265ca		
1100	1200		USA, WRMI Miami FL	9955ca		
1100	1200		USA, WTJC Newport NC	9370na		
1100	1200		USA, WTWW Lebanon TN	5080na		
1100	1200		USA, WWCR Nashville TN	4840na	5890na	
			15825na			
1100	1200		USA, WWRB Manchester TN	3185na		
1100	1200		USA, WYFR/Family Radio Worldwide			5950na
			5985na	7730sa	9625sa	15560as
1100	1200		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1130	1200	Sat/Sun	Australia, HCJB Global	15400as		
1130	1200	f	Vatican City State, Vatican Radio/Mass			15595me
			17765me			
1130	1200		Vietnam, Voice of Vietnam	9840as	12020as	
1145	1200	Sat/Sun	UK, Bible Voice Broadcasting	5945as		

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

1200	1215		Nepal, Radio Nepal	5005as		
1200	1215	Sat/Sun	UK, Bible Voice Broadcasting	5945as		
1200	1215	mtwhfa	Vatican City State, Vatican Radio			9830am
1200	1230	mtwhf	France, Radio France Internationale			17800af
			21620af			
1200	1230		Germany, AWR Europe	15435as		
1200	1230		Japan, NHK World/ Radio Japan			6120na
			9625pa	9695as	9790eu	
1200	1230		Saudi Arabia, BSKSA/Saudi Radio			15250af
1200	1245		USA, WYFR/Family Radio Worldwide			5950na
			5985na			
1200	1258		New Zealand, Radio NZ International			9655pa
1200	1259		Poland, Polskie Radio Warsaw			11675eu
			11980eu			
1200	1300		Anguilla, Worldwide Univ Network			11775am
1200	1300		Australia, ABC NT Alice Springs			2310do
1200	1300		Australia, ABC NT Katherine	2485do		
1200	1300		Australia, ABC NT Tennant Creek			2325do
1200	1300	Sat/Sun	Australia, HCJB Global	15400as		
1200	1300		Australia, Radio Australia	6020pa	9475as	
			9580pa	9965as	11945pa	
1200	1300	DRM	Australia, Radio Australia	5995pa		
1200	1300		Bahrain, Radio Bahrain	6010me		
1200	1300	a/DRM	Belgium, TDP Radio	6015eu		
1200	1300	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1200	1300		Canada, CFRX Toronto ON	6070na		
1200	1300		Canada, CFVP Calgary AB	6030na		
1200	1300		Canada, CKZN St John's NF	6160na		
1200	1300		Canada, CKZU Vancouver BC	6160na		
1200	1300		China, China Radio International			5955as
			9460as	9660as	9730as	9760pa
			11650as	11660as	11690me	11760pa
			11980as	13645as	13650eu	13790eu
			17490eu			
1200	1300	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1200	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service			5990do
			7110do	9704do		
1200	1300	DRM	Germany, Deutsche Welle	9545eu	13810eu	
1200	1300		Malaysia, RTM/Traxx FM	7295do		
1200	1300		Nigeria, Voice of Nigeria/External Service			
			9690af			
1200	1300	mwfs	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1200	1300		Russia, Voice of Russia	11500as	11755as	
1200	1300		Saudi Arabia, BSKSA/Saudi Radio			15470af
1200	1300		South Korea, KBS World Radio			9650na
1200	1300		Uganda, Radio Uganda	7195do		
1200	1300		UK, BBC World Service	5875as	6190af	
			6195as	9545eu	9740as	9860af
			11750as	11760me	15310as	15575as
			17640af	17790as	17830af	
1200	1300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1200	1300		USA, EWTN/WEWN Vandiver AL			11520va
1200	1300		USA, KNLS Anchor Point AK	7355as	9680as	
1200	1300		USA, Voice of America	7575va	9510va	
			9760va	12075va		
1200	1300		USA, WBCQ Monticello ME	9330am		
1200	1300		USA, WHRI Cypress Creek SC			7315am
1200	1300	Sat/Sun	USA, WHRI Cypress Creek SC			9410na
1200	1300	vl	USA, WINB Red Lion PA	9265ca		
1200	1300		USA, WRMI Miami FL	9955ca		
1200	1300		USA, WTJC Newport NC	9370na		
1200	1300		USA, WTWW Lebanon TN	9479na		
1200	1300		USA, WWCR Nashville TN	7490af	9980na	
			13845na	15825na		
1200	1300		USA, WWRB Manchester TN	3185na		
1200	1300		USA, WYFR/Family Radio Worldwide			17555sa
			17795na			
1200	1300		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1215	1300		Egypt, Radio Cairo	17870as		
1215	1300	mtwhyf	UK, BBC World Service	9410ca	11860ca	
1230	1300	mtwhf	Australia, FEBA Radio	15400as		
1230	1300	mtwhf	Australia, HCJB Global	15400as		
1230	1300		Bangladesh, Bangladesh Betar			7250as
1230	1300	Sat	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1230	1300		Thailand, Radio Thailand World Service			9890va
1230	1300		Vietnam, Voice of Vietnam	9840as	12020as	
1230	13000		Turkey, Voice of Turkey	15450eu	15520as	

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

1300	1329		Czech Republic, Radio Prague			11600eu
1300	1330		Australia, HCJB Global	15400as		
1300	1330		Egypt, Radio Cairo	17870as		
1300	1330		Japan, NHK World/ Radio Japan			11985as
1300	1330		Turkey, Voice of Turkey	15450as	15520eu	
1300	1330	Sun	USA, WHRI Cypress Creek SC			11785na
1300	1357		North Korea, Voice of Korea	9335eu	11710na	
			13760as	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	9580pa	
			9590pa			
1300	1400	DRM	Australia, Radio Australia	5995pa		
1300	1400		Bahrain, Radio Bahrain	6010me		
1300	1400	s/DRM	Belgium, TDP Radio	6015na		
1300	1400	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1300	1400		Canada, CFRX Toronto ON	6070na		
1300	1400		Canada, CFVP Calgary AB	6030na		
1300	1400		Canada, CKZN St John's NF	6160na		
1300	1400		Canada, CKZU Vancouver BC	6160na		
1300	1400		China, China Radio International			5995as
			9570na	9650na	9730as	9765as
			9870as	11660as	11760me	11980as
			13610eu	13755as	15260na	
1300	1400	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1300	1400		Indonesia, Voice of Indonesia	9526va	11785al	
1300	1400		Malaysia, RTM/Traxx FM	7295do		
1300	1400		New Zealand, Radio NZ International			6170pa
1300	1400		Nigeria, Voice of Nigeria/External Service			
			9690af			
1300	1400		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1300	1400		Russia, Voice of Russia	12065as		
1300	1400		South Korea, KBS World Radio			9770as
1300	1400		Tajikistan, Voice of Tajik/External Svc			7245va
1300	1400		Uganda, Radio Uganda	4975do		
1300	1400		UK, BBC World Service	5875as	6190af	
			6195as	9545eu	9740as	9860af
			11760me	15310as	15420af	15575as
			17640af	17790as	17830af	21470af
1300	1400		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1300	1400		USA, EWTN/WEWN Vandiver AL			13835eu
1300	1400		USA, KJES Vado NM	11715na		
1300	1400		USA, KJES Vado, NM	11715na		
1300	1400	Sat/Sun	USA, Voice of America	7575va	9510va	
			9760va			
1300	1400		USA, WBCQ Monticello ME	9330am		
1300	1400	Sat/Sun	USA, WHRI Cypress Creek SC			9495am
			9840na			
1300	1400	vl	USA, WINB Red Lion PA	9265ca		
1300	1400		USA, WRMI Miami FL	9955ca		
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WTWW Lebanon TN	9479na		
1300	1400		USA, WWCR Nashville TN	7490af	9980na	
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	9385na		
1300	1400		USA, WYFR/Family Radio Worldwide			11520as
			11560as	11830na	11910na	12155as
			13820as	17795na		

1300	1400		Zambia, 1 Africa Radio/CVC	6065af	13590af
1305	1400	Sun	Greece, Voice of Greece	9420va	15630va
1330	1400	mta	Guam, KSDA/ AWR	11860as	
1330	1400		India, All India Radio	9690as	11620as
			13710as		
1330	1400		Laos, Lao National Radio	7145as	
1330	1400		Sweden, Radio Sweden	15735va	
1330	1400	Sat/Sun	USA, WHRI Cypress Creek SC		11785na
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as

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

1400	1425	mh	Guam, KTWR/TWR	9975as	
1400	1430		China, CNR-11/Holy Tibet	6010do	7350do
			9480do		
1400	1430	Sun	Germany, Pan American Broadcasting		15205as
1400	1430	`	Japan, NHK World/ Radio Japan		11705as
			11985as	21560va	
1400	1430		Thailand, Radio Thailand World Service		9575va
1400	1430	Sun	United Arab Emirates, FEBA Radio		12025as
1400	1435	twfas	Guam, KTWR/TWR	9975as	
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	6080pa	7240pa
			9590pa		
1400	1500		Bahrain, Radio Bahrain	6010me	
1400	1500	DRM	Belgium, TDP Radio/Disco Palace		6015eu
1400	1500		Bhutan, Bhutan Broadcasting Service		6035as
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1400	1500		Canada, CFRX Toronto ON	6070na	
1400	1500		Canada, CFVP Calgary AB	6030na	
1400	1500		Canada, CKZN St John's NF	6160na	
1400	1500		Canada, CKZU Vancouver BC	6160na	
1400	1500		China, China Radio International		5955as
			9765as	9870as	11665as	11675as
			11765eu	13710as	13740na	13790eu
			17630as			
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af
1400	1500		India, All India Radio	9690as	11620as
			13710as		
1400	1500		Libya, LJB/Voice of Africa	17725af	21695af
1400	1500		Malaysia, RTM/Traxx FM	7295do	
1400	1500		Netherlands, R Netherlands Worldwide		11835as
			15745as		
1400	1500		New Zealand, Radio NZ International		6170pa
1400	1500		Nigeria, Voice of Nigeria/External Service		
			9690af		
1400	1500		Oman, Radio Oman	15140va	
1400	1500		Palau, T8WH/WHRI/Sound of Hope Radio		
			9930as		
1400	1500		Russia, Voice of Russia	4975va	6000as
			9455as	11500as		
1400	1500	DRM	Russia, Voice of Russia	9750eu	
1400	1500		South Africa, Channel Africa	9625af	
1400	1500		Uganda, Radio Uganda	4975do	
1400	1500		UK, BBC World Service	5790eu	5875as
			6190af	6195as	7230af	9740as
			11920as	12095as	15310as	17640af
			17830af	21470af		
1400	1500	DRM	UK, BBC World Service	9545eu	13590eu
1400	1500	Sat	UK, Bible Voice Broadcasting	15265as	
1400	1500		United States, Overcomer Ministries		6110eu
			13810va		
1400	1500		USA, American Forces Network		4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1400	1500		USA, EWTN/WEWN Vandiver AL		13835as
1400	1500		USA, KJES Vado NM	11715am	
1400	1500		USA, KNLS Anchor Point AK	11765as	
1400	1500		USA, Voice of America	6080af	12080af
			15530va	15580af	17740va	17585af
1400	1500	mtwhf	USA, Voice of America	7540va	7575va
			9760va		
1400	1500		USA, WBCQ Monticello ME	9330am	
1400	1500	Sat/Sun	USA, WHRI Cypress Creek SC		9840na
			11785na	17510am		
1400	1500	vl	USA, WINB Red Lion PA	9265ca	
1400	1500		USA, WJHR International Milton FL		15550usb
1400	1500		USA, WRMI Miami FL	9955ca	
1400	1500		USA, WTJC Newport NC	9370na	
1400	1500		USA, WTWW Lebanon TN	9479na	
1400	1500		USA, WWCR Nashville TN	7490af	9980na
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385na	
1400	1500		USA, WYFR/Family Radio Worldwide		9365as
			9615as	9865as	11560as	11725as
			11830na	11910na	13695na	17795na
1400	1500		Zambia, 1 Africa Radio/CVC	6065af	13590af
1415	1430	mtwhfa	Germany, Pan American Broadcasting		15205as
1415	1430		Nepal, Radio Nepal	5005as	
1415	1500	Sun	UK, Bible Voice Broadcasting	15265as	
1425	1455	mtwhf	Swaziland, TWR Africa	6065af	
1430	1445	Sun	Germany, Pan American Broadcasting		15205as
1430	1459		China, CNR-2/Business Radio	6055do	6155do
			7245as	7315as	7335as	7375as
			9820as			
1430	1500	mtwhfa	Albania, Radio Tirana	13625na	
1430	1500		Australia, Radio Australia	9475as	11660as
1430	1500		China, China Radio International		7325as
			11695as	12110as		
1430	1500		Sweden, Radio Sweden	13820va	
1445	1500	mtwhf	Australia, FEBA Radio	15340as	
1445	1500	Sat/Sun	Australia, HCJB Global	15340as	

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi		5015eu
1500	1515	Sun	UK, Bible Voice Broadcasting	13740as	
1500	1530		Australia, HCJB Global	15340as	
1500	1530	Sun	China, Voice of the Strait	4940do	9505do
1500	1530		Guam, KSDA/ AWR	11720as	
1500	1530		UK, BBC World Service	7405af	11860af
			15420af		
1500	1530		Vietnam, Voice of Vietnam	7285as	9840as
			12020as		
1500	1545		USA, WYFR/Family Radio Worldwide		15770sa
1500	1550		New Zealand, Radio NZ International		6170pa
1500	1557		Canada, Radio Canada International		15125as
			11975as		
1500	1557		Libya, LJB/Voice of Africa	17725af	21695af
1500	1557		Netherlands, R Netherlands Worldwide		11835as
			15745as		
1500	1557		North Korea, Voice of Korea	9335eu	11710na
			13760na	15245eu		
1500	1600		Anguilla, Worldwide Univ Network		11775am
1500	1600		Australia, ABC NT Alice Springs		2310do
1500	1600		Australia, ABC NT Katherine	2485do	
1500	1600		Australia, Radio Australia	5995pa	6080pa
			7240pa	9475as	9590pa	11660as
1500	1600		Bahrain, Radio Bahrain	6010me	
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1500	1600		Canada, CFRX Toronto ON	6070na	
1500	1600		Canada, CFVP Calgary AB	6030na	
1500	1600		Canada, CKZN St John's NF	6160na	
1500	1600		Canada, CKZU Vancouver BC	6160na	
1500	1600		China, China Radio International		5955as
			6095me	7325as	7410as	9720me
			9870as	9800as	11965eu	13640eu
			13740na	17630as		
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa		15190af
1500	1600		Malaysia, RTM/Traxx FM	7295do	
1500	1600		Myanmar, Myanma Radio	5985as	
1500	1600		Nigeria, Voice of Nigeria/External Service		
			15120af		
1500	1600		Russia, Voice of Russia	4975va	6000as
			9455as	9660as	9735me	11985af
			12040eu	13855va		
1500	1600		South Africa, Channel Africa	9625af	
1500	1600		Uganda, Dunamis Shortwave	4750af	
1500	1600		Uganda, Radio Uganda	4975do	
1500	1600		UK, BBC World Service	5790eu	5875as
			6575as	6190af	6195as	7230af
			9740as	11920as	12095eu	15310as
			15400af	17640af	17830af	21470af
1500	1600	DRM	UK, BBC World Service	5790eu	13590eu
1500	1600		United States, Overcomer Ministries		6110eu
			13810va	17485eu		
1500	1600		USA, American Forces Network		4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1500	1600		USA, EWTN/WEWN Vandiver AL		13835as
1500	1600		USA, Voice of America	4930af	7540va
			7575va	12080af	12150va	13750va
			15530va	15580af	17895af	
1500	1600		USA, Voice of America/Special English		6140va
			7520va	9485va	9760va	
1500	1600		USA, WBCQ Monticello ME	9330am	
1500	1600	Sat	USA, WHRI Cypress Creek SC		15195va
1500	1600	Sat/Sun	USA, WHRI Cypress Creek SC		9840na
			11785na		

SHORTWAVE GUIDE

1500	1600	Sun	USA, WHRI Cypress Creek SC			17510va
1500	1600	vl	USA, WINB Red Lion PA	13570ca		
1500	1600		USA, WJHR International Milton FL			15550usb
1500	1600		USA, WRMI Miami FL	9955na		
1500	1600		USA, WTJC Newport NC	9370na		
1500	1600		USA, WTWW Lebanon TN	9479na		
1500	1600		USA, WWCR Nashville TN	7490af	9980na	
			13845na	15825na		
1500	1600		USA, WWRB Manchester TN	9385na		
1500	1600		USA, WYFR/Family Radio Worldwide			6280as
			11605as	11830na	11910na	15520na
			17795na			
1500	1600		Zambia, 1 Africa Radio/CVC	6065af		13590af
1505	1600	DRM	Canada, Radio Canada International			9800na
1505	1600		Canada, Radio Canada International			9515as
1515	1545	Sat	UK, Bible Voice Broadcasting	13740as		
1525	1600	Sat/Sun	Swaziland, TWR Africa	6025af		
1530	1550		Vatican City State, Vatican Radio			13765as
			15235as			
1530	1600		China, Xizang PBS/Holy Tibet	4905do		4920do
			5240do	6110do	6130do	6200do
			7255do	7385do		
1530	1600		Germany, AWR Europe	15255as		
1530	1600		Iran, VOIRI/IRIB	7305as	9600as	
1530	1600		Mongolia, Voice of Mongolia	9665as		12085as
1530	1600		Sweden, Radio Sweden	13870va		13600al
1530	1600	h	UK, Bible Voice Broadcasting	13740as		
1530	1600	Sun	UK, Bible Voice Broadcasting	13590me		
1530	1600		Vatican City State, Vatican Radio			11850as
1545	1600	m	UK, Bible Voice Broadcasting	13590me		
1545	1600	twhfa	UK, Bible Voice Broadcasting	13590me		
1551	1600		New Zealand, Radio NZ International			7440pa
1551	1600	DRM	New Zealand, Radio NZ International			6170pa

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

1600	1605	Sun	Croatia, Croatian Radio	6165eu		
1600	1615	mtwhfa	Croatia, Croatian Radio	6165eu		
1600	1615		Pakistan, PBC/ Radio Pakistan	7530me		11565af
			11585af			
1600	1615	f	UK, Bible Voice Broadcasting	13590me		
1600	1625	Sat/Sun	Swaziland, TWR Africa	6025af		
1600	1627		Czech Republic, Radio Prague			9740eu
1600	1627		Iran, VOIRI/IRIB	7305as	9600as	
1600	1630	Sun	Germany, Pan American Broadcasting			13830me
1600	1630		Guam, KSDA/ AWR	11720as		11805as
1600	1630		Myanmar, Myanma Radio	9730do		
1600	1630		Vietnam, Voice of Vietnam	7220me		7280eu
			9550me	9730va		
1600	1645	h	UK, Bible Voice Broadcasting	13590me		
1600	1645		USA, WYFR/Family Radio Worldwide			11830na
			11865na			
1600	1657		North Korea, Voice of Korea	9990na		11545va
1600	1700		Anguilla, Worldwide Univ Network			11775am
1600	1700		Australia, ABC NT Alice Springs			2310do
1600	1700		Australia, ABC NT Katherine	2485do		
1600	1700		Australia, Radio Australia	5995pa		6080pa
			7240pa	9465as	9710pa	11660as
1600	1700		Bahrain, Radio Bahrain	6010me		
1600	1700	Sat	Canada, CBC NQ SW Service	9625na		
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St John's NF	6160na		
1600	1700		Canada, CKZU Vancouver BC	6160na		
1600	1700		Canada, Radio Canada International			9515as
1600	1700	DRM	Canada, Radio Canada International			9800na
1600	1700		China, China Radio International			6060as
			7235as	7420af	9570af	11900af
			11940eu	11965eu	13760eu	
1600	1700		Egypt, Radio Cairo	12170af		
1600	1700		Ethiopia, Radio Ethiopia/External Service			7165va
			9560af			
1600	1700	mtwhf	France, Radio France Internationale			15605af
			17605af			
1600	1700		Germany, Deutsche Welle	6170as		9485as
			9540as	15410as		
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		New Zealand, Radio NZ International			7440pa
1600	1700	DRM	New Zealand, Radio NZ International			6170pa
1600	1700		Russia, Voice of Russia	4975va		11985va
			12040eu	13855va		
1600	1700		South Korea, KBS World Radio			9515eu
1600	1700		Taiwan, Radio Taiwan International			11550as
			13840as			
1600	1700		Uganda, Dunamis Shortwave	4750af		
1600	1700		Uganda, Radio Uganda	4975do		
1600	1700		UK, BBC World Service	3255af		5790eu
			5850as	5975as	6190af	9695as
			12095eu	15400af	17640af	17795af
			17830af	21470af		
1600	1700	DRM	UK, BBC World Service	3995eu		5790eu
1600	1700	Sat/Sun	UK, Bible Voice Broadcasting	13590me		
1600	1700		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1600	1700		USA, EWTN/WEWN Vandiver AL			15610va
1600	1700		USA, Voice of America	4930af		6080af
			15580af			
1600	1700		USA, Voice of America/Special English			11890va
			12080va	13570va		
1600	1700		USA, WBCQ Monticello ME	9330am		
1600	1700		USA, WHRI Cypress Creek SC			9840na
			11785na	17520af		
1600	1700	vl	USA, WINB Red Lion PA	13570ca		
1600	1700		USA, WJHR International Milton FL			15550usb
1600	1700		USA, WRMI Miami FL	9955na		
1600	1700		USA, WTJC Newport NC	9370na		
1600	1700		USA, WTWW Lebanon TN	9479na		
1600	1700		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385na		
1600	1700		USA, WYFR/Family Radio Worldwide			6085ca
			11850as	13695na	17545af	17795na
			18980va	21455va	21525af	
1600	1700		Zambia, 1 Africa Radio/CVC	6065af		13590af
1615	1630	mtwhf	Swaziland, TWR Africa	6130af		
1615	1630		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	9645eu	15595va
1615	1700	Sun	UK, BBC World Service	7405af		11860af
			15420af			
1630	1700		Guam, KSDA/ AWR	11740as		
1630	1700		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1630	1700		Slovakia, Radio Slovakia International			5920eu
			6055eu			
1630	1700	Sat/Sun	Swaziland, TWR Africa	6130af		
1630	1700	Sat	UK, BBC World Service	11860af		
1630	1700	mtwhf	UK, BBC World Service	15420af		
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi			4930eu

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

1700	1705		Canada, Radio Canada International			9515as
1700	1705	DRM	Canada, Radio Canada International			9800na
1700	1715	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
1700	1715		UK, Bible Voice Broadcasting	13590me		
1700	1727		Czech Republic, Radio Prague			9740eu
1700	1730	DRM	Romania, Radio Romania International			7350eu
1700	1730		Sweden, Radio Sweden	13600va		13870va
1700	1730		USA, Voice of America	6080af		12015af
			15580af	17895af		
1700	1746		UK, BBC World Service	6005af		9410af
1700	1755		South Africa, Channel Africa	9675af		
1700	1756	DRM	Romania, Radio Romania International			9535eu
1700	1756		Romania, Radio Romania International			11735eu
1700	1757		Netherlands, R Netherlands Worldwide			7395af
1700	1759		Canada, Radio Canada International			5850na
1700	1759		Poland, Polskie Radio Warsaw			7265eu
			9770eu			
1700	1800		Anguilla, Worldwide Univ Network			11775am
1700	1800		Australia, ABC NT Alice Springs			2310do
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, Radio Australia	5995pa		6080pa
			9475as	9510pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me		
1700	1800	Sat	Canada, CBC NQ SW Service	9625na		
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St John's NF	6160na		
1700	1800		Canada, CKZU Vancouver BC	6160na		
1700	1800		China, China Radio International			6090as
			6140as	6145eu	6165me	7235as
			7265af	7410as	7420as	9570af
			9695eu	11900af	13760eu	
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio Africa			7190af
			15190af			
1700	1800	DRM	Germany, Deutsche Welle	5790eu		
1700	1800		Kuwait, Radio Kuwait	11990va		
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		New Zealand, Radio NZ International			7440pa
1700	1800	DRM	New Zealand, Radio NZ International			6170pa

1700	1800		Nigeria, Voice of Nigeria/External Service 15120af			
1700	1800		Palau, T8WH/WHRI/Sound of Hope Radio 9930va			
1700	1800		Russia, Voice of Russia 12040eu	4975va 13855af	11985va	
1700	1800		Swaziland, TWR Africa	3200af	9500af	
1700	1800		Taiwan, Radio Taiwan International		15690af	
1700	1800		Tajikistan, Voice of Tajik/External Svc		7245va	
1700	1800		Uganda, Dunamis Shortwave	4750af		
1700	1800		Uganda, Radio Uganda	4975do		
1700	1800		UK, BBC World Service 5850as	3255af 5875eu	5790eu 5975as	6190af
			7405af	9810as	12095af	13675eu
			15400af	17795af	17830af	
1700	1800	DRM	UK, BBC World Service	3995eu		
1700	1800	Sat	UK, Bible Voice Broadcasting	9645me		
1700	1800	Sat/Sun	UK, Bible Voice Broadcasting	13590me		
1700	1800		USA, American Forces Network 5446usb	5765usb	7812usb	4319usb 12133usb
			12759usb	13362usb		
1700	1800		USA, EWTN/WEWN Vandiver AL		15610va	
1700	1800		USA, WBCQ Monticello ME	9330am	15420usb	
1700	1800	mtwhfs	USA, WHRI Cypress Creek SC		9840na	
1700	1800		USA, WHRI Cypress Creek SC 17520af		11785na	
1700	1800	vl	USA, WINB Red Lion PA	13570ca		
1700	1800		USA, WJHR International Milton FL		15550usb	
1700	1800		USA, WRMI Miami FL	9955ca		
1700	1800		USA, WTJC Newport NC	9370na		
1700	1800		USA, WTWW Lebanon TN	9479na		
1700	1800		USA, WWCR Nashville TN 13845na	9980na 15825na	12160af	
1700	1800		USA, WWRB Manchester TN	9385na		
1700	1800		USA, WYFR/Family Radio Worldwide 13690na	17545af	7395af 17795na	18980va
			21455va			
1700	1800		Zambia, 1 Africa Radio/CVC	4965af	13590af	
1730	1740	fas	USA, Voice of America 15775af	4930af	11605af	
1730	1800		Bulgaria, Radio Bulgaria	5900eu	7400eu	
1730	1800	DRM	Bulgaria, Radio Bulgaria	9400eu		
1730	1800		Clandestine, Sudan Radio Service/ SRS		9590af	
1730	1800		UK, Bible Voice Broadcasting	13590me		
1730	1800	Sun	UK, Bible Voice Broadcasting	9645me		
1730	1800		USA, Voice of America 17895af	12015af	15580af	
1730	1800		Vatican City State, Vatican Radio 13765af	15570af	11625af	
1745	1800		Bangladesh, Bangladesh Betar		7250as	
1745	1800	DRM	India, All India Radio	9950eu		
1745	1800		India, All India Radio 7400af	7410af	6120af 7550eu	6280eu 9415af
			9445af	11935af		
1745	1800	mtwhf	Moldova, (Transnistria) Radio PMR		6240na	
1755	1800		Clandestine, Radio Dialogue	4895af		

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

1800	1810	Sun	UK, Bible Voice Broadcasting	13590me		
1800	1815		Clandestine, Radio Dialogue	4895af		
1800	1830	w	Austria, AWR Europe	9755af		
1800	1830		South Africa, AWR 3215af	3345af	9610af	
1800	1830		UK, BBC World Service	5850as	5975as	
1800	1830	Sun	UK, Bible Voice Broadcasting	9430me		
1800	1830		USA, Voice of America 12015af	6080af 15580af	9850af	
1800	1830	fa	USA, Voice of America 15775af	4930af	11605af	
1800	1830		Vietnam, Voice of Vietnam	5955eu		
1800	1835		New Zealand, Radio NZ International		7440pa	
1800	1835	DRM	New Zealand, Radio NZ International		6170pa	
1800	1857		Netherlands, R Netherlands Worldwide		6020af	
1800	1857		North Korea, Voice of Korea	13760af	15245eu	
1800	1859		Canada, Radio Canada International 11765af	17735af	9530af 17810af	
1800	1900		Anguilla, Worldwide Univ Network		11775am	
1800	1900	mtwhf	Argentina, Radio Nacional RAE 15345eu		9690eu	
1800	1900		Australia, ABC NT Alice Springs		2310do	
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia 9475as	9510pa	6080pa 9710pa	7240pa 11880pa
1800	1900		Bahrain, Radio Bahrain	6010me		
1800	1900		Bangladesh, Bangladesh Betar		7250eu	
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St John's NF	6160na		
1800	1900		Canada, CKZU Vancouver BC	6160na		
1800	1900		China, China Radio International 13760eu		9600eu	
1800	1900		Equatorial Guinea, Radio Africa 15190af		7190af	
1800	1900	DRM	Germany, Deutsche Welle	5790eu		
1800	1900	DRM	India, All India Radio	9950eu		
1800	1900		India, All India Radio 7400af	7410af	6120af 7550eu	6280eu 9415af
			9445af	11935af		
1800	1900		Kuwait, Radio Kuwait	15540va		
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Netherlands, R Netherlands Worldwide 15535af		12045af	
1800	1900		Nigeria, Voice of Nigeria/External Service 15120af	7255al		
1800	1900		Palau, T8WH/WHRI/Sound of Hope Radio 9930va	9955as		
1800	1900	DRM	Poland, Polskie Radio Warsaw		6130eu	
1800	1900		Russia, Voice of Russia	4975me	12040eu	
1800	1900		South Korea, KBS World Radio		7275eu	
1800	1900		Swaziland, TWR Africa	3200af	9500af	
1800	1900		Taiwan, Radio Taiwan International		6155eu	
1800	1900		Uganda, Dunamis Shortwave	4750af		
1800	1900		Uganda, Radio Uganda	4975do		
1800	1900		UK, BBC World Service 5875eu	5950as	6190af	7405af
			9485as	11810af	12095af	13675eu
			15400af	17795af		
1800	1900	Sat	UK, Bible Voice Broadcasting	9430me		
1800	1900	Sun	UK, Bible Voice Broadcasting	6130eu		
1800	1900		USA, American Forces Network 5446usb	5765usb	7812usb	4319usb 12133usb
			12759usb	13362usb		
1800	1900		USA, EWTN/WEWN Vandiver AL		15610va	
1800	1900		USA, KJES Vado NM	15385pa		
1800	1900		USA, KJES Vado, NM	15385pa		
1800	1900		USA, WBCQ Monticello ME 15420usb	7415usb	9330am	
1800	1900		USA, WHRI Cypress Creek SC 11785na	17520af	9840na	
1800	1900	vl	USA, WINB Red Lion PA	13570ca		
1800	1900		USA, WJHR International Milton FL		15550usb	
1800	1900		USA, WRMI Miami FL	9955ca		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WTWW Lebanon TN	9479na		
1800	1900		USA, WWCR Nashville TN 13845na	9980na 15825na	12160af	
1800	1900		USA, WWRB Manchester TN	9385na		
1800	1900		USA, WYFR/Family Radio Worldwide 7395af	9770af	6180af 13615na	13690na
			13750af	17795na	17845af	18980va
1800	1900		Zambia, 1 Africa Radio/CVC	4965af	13590af	
1805	1810	Sat	Croatia, Croatian Radio	6165eu		
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu		
1830	1845		Rwanda, Radio Rwanda	6055do		
1830	1845	Sat	UK, Bible Voice Broadcasting	6130eu		
1830	1900		Serbia, International Radio of Serbia		6100eu	
1830	1900		Slovakia, Radio Slovakia International 6055eu		5920eu	
1830	1900		Turkey, Voice of Turkey	9785eu		
1830	1900		UK, BBC World Service	6005af	9410af	
1830	1900	f	UK, Bible Voice Broadcasting	9430me		
1830	1900		USA, Voice of America 9850af	12015af	4930af 15580af	6080af
1836	1900		New Zealand, Radio NZ International		9615pa	
1836	1900	DRM	New Zealand, Radio NZ International		9890pa	
1845	1900	mtwhas	Albania, Radio Tirana	7520eu	13640na	
1845	1900	Sun	UK, Bible Voice Broadcasting	11830af		
1859	1900		Netherlands, R Netherlands Worldwide 11610af	11970af	7425af	

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

1900	1915	Sun	UK, Bible Voice Broadcasting	11830af		
1900	1930		Germany, Deutsche Welle 17865af	6150af	11795af	
1900	1930		Turkey, Voice of Turkey	9785eu		
1900	1930		USA, Voice of America 6080af	4930af 9850af	4940af 15580af	17895af
1900	1930		Vietnam, Voice of Vietnam	7280eu	9730eu	
1900	1935	DRM	New Zealand, Radio NZ International		9890pa	
1900	1945	DRM	India, All India Radio	9950eu		

1900	1945		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1900	1945		USA, WYFR/Family Radio Worldwide		6085ca	
1900	1950		New Zealand, Radio NZ International		9615pa	
1900	1957		Netherlands, R Netherlands Worldwide		7425af	
			12045af	15535af		
1900	1957		North Korea, Voice of Korea	7100eu	9975af	
			11535va	11910af		
1900	2000		Anguilla, Worldwide Univ Network		11775am	
1900	2000		Australia, ABC NT Alice Springs		2310do	
1900	2000		Australia, ABC NT Katherine	2485do		
1900	2000		Australia, Radio Australia	6080pa	7240pa	
			9500as	9510pa	9710pa	11880pa
1900	2000		Bahrain, Radio Bahrain	6010me		
1900	2000	DRM	Belgium, TDP Radio	15755na		
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St John's NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000		China, China Radio International		7295af	
			9435af			
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000		Equatorial Guinea, Radio Africa		7190af	
			15190af			
1900	2000	DRM	Germany, Deutsche Welle	3995eu	5875eu	
1900	2000		Kuwait, Radio Kuwait	15540va		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Netherlands, R Netherlands Worldwide		11610af	
			11970af			
1900	2000		Nigeria, Voice of Nigeria/External Service			
			9690af			
1900	2000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1900	2000		Russia, Voice of Russia	12040eu		
1900	2000	mtwhf	Spain, Radio Exterior de Espana		9665af	
			11620eu			
1900	2000		Swaziland, TWR Africa	3200af		
1900	2000		Thailand, Radio Thailand World Service		7570eu	
1900	2000		Uganda, Radio Uganda	4975do		
1900	2000		UK, BBC World Service	3255af	3995eu	
			5875eu	5950as	6005af	6155as
			6190af	9410af	11810af	12095af
			15400af	17795af		
1900	2000		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1900	2000		USA, EWTN/WEWN Vandiver AL		15610va	
1900	2000		USA, Voice of America/Special English		7485va	
			9630va			
1900	2000		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
1900	2000		USA, WHRI Cypress Creek SC		9840na	
			11785na	15665af		
1900	2000	vl	USA, WINB Red Lion PA	13570ca		
1900	2000		USA, WJHR International Milton FL		15550usb	
1900	2000		USA, WRMI Miami FL	9955ca		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WTWW Lebanon TN	9479na		
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	
			6020af	7395af	9610af	9775af
			13615na	13690na	17795na	17845af
			18930eu	18980va		
1900	2000		Zambia, 1 Africa Radio/CVC	4965af	5940af	
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1905	2000	m	South Africa, Radio League	3215af		
1930	2000	Sat/Sun	Germany, Pan American Broadcasting		6175af	
1930	2000		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
1930	2000		South Africa, RTE Radio One	6225af		
1930	2000		USA, Voice of America	4930af	4940af	
			6080af	9850af	15580af	
1936	2000	DRM	New Zealand, Radio NZ International		11675pa	
1945	2000	DRM	Vatican City State, Vatican Radio		9800am	
1950	2000		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu	9645eu	
1951	2000		New Zealand, Radio NZ International		11725pa	

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

2000	2005	m	South Africa, Radio League	3215af		
2000	2015	Sun	Germany, Pan American Broadcasting		6175af	
2000	2020		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu	9645eu	
2000	2027		Czech Republic, Radio Prague		5930eu	
2000	2027		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu	13640na	
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030	Sat	Germany, Pan American Broadcasting		6175af	
2000	2030		South Africa, RTE Radio One	6225af		
2000	2030		Swaziland, TWR Africa	3200af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	15580af		
2000	2030	DRM	Vatican City State, Vatican Radio		9800am	
2000	2030		Vatican City State, Vatican Radio		7365af	
			9755af	11625af		
2000	2045	h	Rwanda, Radio Rwanda	6055do		
2000	2045		USA, WYFR/Family Radio Worldwide		17750eu	
2000	2050	DRM	New Zealand, Radio NZ International		11675pa	
2000	2056		Romania, Radio Romania International		9690na	
			11880eu	11940na		
2000	2057		Germany, Deutsche Welle	6150af	11795af	
			11865af			
2000	2057		Netherlands, R Netherlands Worldwide		7425af	
			11610af	11970af		
2000	2059		Canada, Radio Canada International		15235af	
			17735af			
2000	2100		Anguilla, Worldwide Univ Network		11775am	
2000	2100		Australia, ABC NT Alice Springs		2310do	
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek		2325do	
2000	2100		Australia, Radio Australia	6080pa	11650pa	
			11660pa	11880pa		
2000	2100	Sat/Sun	Australia, Radio Australia	6080pa	7240pa	
			12080pa			
2000	2100		Bahrain, Radio Bahrain	6010me		
2000	2100		Belarus, Radio Belarus	7255eu	7360eu	
			7390eu			
2000	2100	DRM	Belgium, TDP Radio/Disco Palace		15755na	
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St John's NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		China, China Radio International		5960eu	
			5985af	7285eu	7295af	7415eu
			9440af	9600eu		
2000	2100		Equatorial Guinea, Radio Africa		7190af	
			15190af			
2000	2100		Indonesia, Voice of Indonesia	9526va	11785al	
2000	2100		Kuwait, Radio Kuwait	15540va		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		New Zealand, Radio NZ International		11725pa	
2000	2100		Nigeria, Voice of Nigeria/External Service			
			15120af			
2000	2100		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2000	2100		Russia, Voice of Russia	12040eu		
2000	2100		Uganda, Radio Uganda	4975do		
2000	2100		UK, BBC World Service	3255af	5875eu	
			6005af	6190af	9410af	11810af
			12095af	13820af	15400af	
2000	2100		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2000	2100		USA, EWTN/WEWN Vandiver AL		15610va	
2000	2100		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
2000	2100		USA, WHRI Cypress Creek SC		11785na	
			13660eu	15665af		
2000	2100	vl	USA, WINB Red Lion PA	13570ca		
2000	2100		USA, WJHR International Milton FL		15550usb	
2000	2100		USA, WRMI Miami FL	9955ca		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WTWW Lebanon TN	9479na		
2000	2100		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family Radio Worldwide		6020af	
			7430eu	9610af	13615na	15195af
			17725sa	17795na	17845af	18980va
2000	2100		Zambia, 1 Africa Radio/CVC	4965af	5940af	
2000	2105		Uganda, Radio Uganda	4975do		
2030	2045		Thailand, Radio Thailand World Service		9680eu	
2030	2056	DRM	Romania, Radio Romania International		9765eu	
2030	2100		Cuba, Radio Havana Cuba	11760ca		
2030	2100		Sweden, Radio Sweden	9495va		
2030	2100		Turkey, Voice of Turkey	7205va		
2030	2100		USA, Voice of America	4930af	6080af	
			7355af	15580af		
2030	2100	fa	USA, Voice of America	4940af		

2030	2100		Vietnam, Voice of Vietnam	7220me	7280eu	
			9550me	9730eu		
2045	2100		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2045	2100	DRM	India, All India Radio	9950eu		

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

2100	2130		Australia, ABC NT Alice Springs	2310do		
2100	2130		Australia, ABC NT Alice Springs	2310do		
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek	2325do		
2100	2130		Austria, AWR Europe	11955af		
2100	2130	Sat	Canada, CBC NQ SW Service	9625na		
2100	2130		Cuba, Radio Havana Cuba	11760ca		
2100	2130		Serbia, International Radio of Serbia	6100eu		
2100	2130		South Korea, KBS World Radio	3955eu		
2100	2130		Turkey, Voice of Turkey	7205va		
2100	2145		USA, WYFR/Family Radio Worldwide	13615na		
			13690na	17795na	18980va	
2100	2150		New Zealand, Radio NZ International	11725pa		
2100	2150	DRM	New Zealand, Radio NZ International	11675pa		
2100	2157		Germany, Deutsche Welle	9735as	11865af	
			15640af			
2100	2157		North Korea, Voice of Korea	13760va	15245eu	
2100	2200		Angola, Radio Nacional de Angola	7217do		
2100	2200		Anguilla, Worldwide Univ Network	11775am		
2100	2200		Australia, Radio Australia	9500as	9660pa	
			11650pa	11660pa	11695as	12080pa
			13630pa	15515pa		
2100	2200		Bahrain, Radio Bahrain	6010me		
2100	2200		Belarus, Radio Belarus	7255eu	7360as	
			7390eu			
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 John's NF	6160na		
2100	2200		Canada, CKZU Vancouver BC	6160na		
2100	2200	DRM	Canada, Radio Canada International	9800na		
2100	2200		China, China Radio International	5960eu		
			7205af	7285eu	7325af	7415eu
			9600eu			
2100	2200		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2100	2200		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2100	2200	DRM	India, All India Radio	9950eu		
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana	9650eu		
2100	2200		Syria, Radio Damascus	9330eu	12085as	
2100	2200	DRM	UK, BBC World Service	3995eu		
2100	2200		UK, BBC World Service	3255af	3915as	
			5790eu	5875as	5905as	6005af
			6190af	6195as	7405af	9915af
			12095af			
2100	2200		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2100	2200		USA, EWTN/WEWN Vandiver AL	15610va		
2100	2200		USA, Voice of America	6080af	15580af	
2100	2200		USA, WBCQ Monticello ME	7415usb	9330am	
			15420usb			
2100	2200		USA, WHRI Cypress Creek SC	9690eu		
			11785na	13660eu		
2100	2200	vl	USA, WINB Red Lion PA	13570ca		
2100	2200		USA, WJHR International Milton FL	15550usb		
2100	2200		USA, WRMI Miami FL	9955ca		
2100	2200		USA, WTJC Newport NC	9370na		
2100	2200		USA, WTWW Lebanon TN	9479na		
2100	2200		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2100	2200		USA, WWRB Manchester TN	3215na	9385na	
2100	2200		USA, WYFR/Family Radio Worldwide	7425af		
			12055af	17845af		
2100	2200		Zambia, 1 Africa Radio/CVC	4965af	5940af	
2115	2145		Egypt, Radio Cairo	6270eu		
2130	2157		Czech Republic, Radio Prague	9410af		
2130	2200		Australia, ABC NT Alice Springs	4835do		
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na		
2130	2200		China, China Radio International	7365eu		
2130	2200		Guam, KSDA/ AWR	11850as		
2130	2200		Netherlands, R Netherlands Worldwide	7460af		
2130	2200		Sweden, Radio Sweden	7460va		

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

2200	2230		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2200	2230	DRM	India, All India Radio	9950eu		
2200	2245		Egypt, Radio Cairo	6270eu		
2200	2245		USA, WYFR/Family Radio Worldwide	15770af		
2200	2256		Romania, Radio Romania International	5960as		
			7435va	9790eu	11940as	
2200	2300		Anguilla, Worldwide Univ Network	6090am		
2200	2300		Australia, ABC NT Alice Springs	4835do		
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, Radio Australia	9660pa	11695as	
			11875as	12080pa	13630pa	15230pa
			15240as	15415as	15515pa	15560pa
2200	2300		Bahrain, Radio Bahrain	6010me		
2200	2300	smtwhf	Canada, CBC NQ SW Service	9625na		
2200	2300		Canada, CFRX Toronto ON	6070na		
2200	2300		Canada, CFVP Calgary AB	6030na		
2200	2300		Canada, CKZN St John's NF	6160na		
2200	2300		Canada, CKZU Vancouver BC	6160na		
2200	2300		China, China Radio International	9590as		
2200	2300		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300		New Zealand, Radio NZ International	13730pa		
2200	2300	DRM	New Zealand, Radio NZ International	15720pa		
2200	2300		Russia, Voice of Russia	9890na		
2200	2300		Turkey, Voice of Turkey	9830va		
2200	2300		Uganda, Radio Uganda	4975do		
2200	2300		UK, BBC World Service	3915as	5905as	
			5935af	6195as	7490as	9440as
			9740as	9915af	12095af	
2200	2300	DRM	UK, BBC World Service	3995eu		
2200	2300		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2200	2300		USA, EWTN/WEWN Vandiver AL	11520va		
2200	2300	mtwhf	USA, Voice of America	5895va	7460va	
			7575va	11955va		
2200	2300		USA, WBCQ Monticello ME	5110usb	7415usb	
			9330am			
2200	2300		USA, WHRI Cypress Creek SC	9785af		
			11785na			
2200	2300	vl	USA, WINB Red Lion PA	9265ca		
2200	2300		USA, WJHR International Milton FL	15550usb		
2200	2300		USA, WRMI Miami FL	9955ca		
2200	2300		USA, WTJC Newport NC	9370na		
2200	2300		USA, WTWW Lebanon TN	9479na		
2200	2300		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2200	2300		USA, WWRB Manchester TN	3215na	9385va	
2200	2300		USA, WYFR/Family Radio Worldwide	5950na		
			11740na	15440na		
2200	2300		Zambia, 1 Africa Radio/CVC	4965af		
2215	2230		Croatia, Croatian Radio	3985eu	9925ca	
2230	2257		Czech Republic, Radio Prague	9440na		
2230	2300		China, Xizang PBS/Holy Tibet	4905do	4920do	
			5240do	6110do	6130do	6200do
			7255do	7385do		
2230	2300		Guam, KSDA/ AWR	15320as		
2230	2300		USA, Voice of America/Special English	9570va		
			11705va	15145va		
2245	2300		India, All India Radio	6055as	7305as	
			9705as	9705as	9950as	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	11875as	
			12080pa	13690pa	15560pa	17750as
2300	0000		Bahrain, Radio Bahrain	6010me		
2300	0000		Bulgaria, Radio Bulgaria	9700na	11700na	
2300	0000	smtwhf	Canada, CBC NQ SW Service	9625na		
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		
2300	0000		Canada, CKZN St John's NF	6160na		
2300	0000		Canada, CKZU Vancouver BC	6160na		
2300	0000		China, China Radio International	5915as		
			5990ca	6145na	7350eu	7410as
			9610as	11690pa	11790as	11840na
2300	0000		Cuba, Radio Havana Cuba	5040na		
2300	0000		Egypt, Radio Cairo	11590na		

SHORTWAVE GUIDE

2300	0000	vl	Guyana, Voice of Guyana	3290va		
2300	0000		India, All India Radio	6055as	7305as	
			9705as	9705as	9950as	11645as
			13605as			
2300	0000		Malaysia, RTM/Traxx FM	7295do		
2300	0000		New Zealand, Radio NZ International			13730pa
2300	0000	DRM	New Zealand, Radio NZ International			15720pa
2300	0000		Russia, Voice of Russia	9665na	9890na	
2300	0000		UK, BBC World Service	3915as	6195as	
			7490as	9740as	9890as	11850as
			12010as			
2300	0000		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2300	0000		USA, EWTN/WEWN Vandiver AL			11520va
2300	0000		USA, Voice of America	5895va	7575va	
			11955va			
2300	0000		USA, WBCQ Monticello ME	5110usb	7415usb	
			9330am			
2300	0000		USA, WHRI Cypress Creek SC			7315na
2300	0000	Sat	USA, WHRI Cypress Creek SC			9690am
2300	0000	mtwhfs	USA, WHRI Cypress Creek SC			5920am
2300	0000	vl	USA, WINB Red Lion PA	9265ca		
2300	0000		USA, WJHR International Milton FL			15550usb
2300	0000		USA, WRMI Miami FL	9955ca		
2300	0000		USA, WTJC Newport NC	9370na		
2300	0000		USA, WTWW Lebanon TN	9479na		
2300	0000		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN	9385na	6890va	
2300	0000		USA, WYFR/Family Radio Worldwide			5950na
			11580sa	15655sa	15440na	
2300	0000		Zambia, 1 Africa Radio/CVC	4965af		
2300	2330		Australia, Radio Australia	11695as	15240as	
			17795pa			
2300	2330		USA, Voice of America/Special English			9570as
			13755va	15145va		
2300	2330	DRM	Vatican City State, Vatican Radio			9755am
2300	2345		USA, WYFR/Family Radio Worldwide			11740na
2330	0000		UK, BBC World Service	9580as		
2330	0000		USA, Voice of America/Special English			7460as
			9570va	13755va	15145va	15340va
2330	0000		Vietnam, Voice of Vietnam	9840as	12020as	

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana ..... **http://rtsh.sil.at/**
Angola, Radio Nacional de Angola..... **www.rna.ao/**
Anguilla, Worldwide Univ Network ..... **www.worldwideuniversitynetwork.com/**
Argentina, Radio Nacional RAE..... **www.radionacional.com.ar/**
Australia, ABC NT Alice Springs..... **www.abc.net.au/radio/**
Australia, ABC NT Katherine..... **www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek ..... **www.abc.net.au/radio/**
Australia, FEBA Radio..... **www.feba.org**
Australia, HCJB Global ..... **www.hcjb.org/**
Australia, Radio Australia ..... **www.abc.net.au/ra/**
Austria, AWR Europe **www.awr2.org/**
Bahrain, Radio Bahrain ..... **www.radiobahrain.fm/**
Bangladesh, Bangladesh Betar ..... **www.betar.org.bd/**
Belarus, Radio Belarus ..... **www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio ..... **www.airtime.be/schedule.html**
Belgium, TDP Radio/Disco Palace ..... **www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service ..... **www.bbs.com.bt/**
Bulgaria, Radio Bulgaria ..... **www.bnr.bg/**
Canada, CBC NQ SW Service..... **www.cbc.ca/north/**
Canada, CFRX Toronto ON..... **www.cfrb.com**
Canada, CFVP Calgary AB..... **www.classiccountryam1060.com**
Canada, CKZN St John's NF ..... **www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC..... **www.cbc.ca/bc**
Canada, Radio Canada International ..... **www.rcinet.ca/**
China, China Radio International ..... **www.cri.cn/**
China, Voice of the Strait..... **www.vos.com.cn**
Clandestine, Cotton Tree News..... **www.cottontreenews.org/**
Clandestine, Sudan Radio Service/ SRS ..... **www.sudanradio.org/**
Croatia, Croatian Radio ..... **www.hrt.hr/**
Cuba, Radio Havana Cuba ..... **www.radiohc.cu/**
Czech Republic, Radio Prague ..... **www.radio.cz/**
Egypt, Radio Cairo..... **www.sis.gov.eg/**
Ethiopia, Radio Ethiopia/External Service.... **www.erta.gov.et**
France, Radio France Internationale..... **http://rfienglish.com**
Germany, AWR Europe..... **www.awr2.org/**
Germany, Blue Star Radio ..... **www.mvbalticradio.de**
Germany, Deutsche Welle ..... **www.dw-world.de/**
Germany, European Music Radio..... **www.emr.org.uk/**
Germany, Pan American Broadcasting ..... **www.radiopanam.com/**
Germany, Radio Gloria International ..... **www.radiopanam.com/**
Germany, TWR Europe..... **www.twr.org**
Greece, Voice of Greece/Radio Filia..... **www.voiceofgreece.gr/**
Greece, Voice of Greece ..... **www.voiceofgreece.gr/**
Guam, KSDA/ AWR **www.awr2.org/**
Guam, KTWR/TWR..... **www.twr.org/**
Guyana, Voice of Guyana ..... **www.voiceofguyana.com/**
India, All India Radio ..... **www.allindiaradio.org/**
Indonesia, Voice of Indonesia ..... **www.voi.co.id**
Iran, VOIRI/IRIB ..... **www.irib.ir/English/**
Japan, NHK World/ Radio Japan..... **www.nhk.or.jp/english/**
Kuwait, Radio Kuwait..... **www.media.gov.kw/**
Laos, Lao National Radio ..... **www.lnr.org.la**
Libya, LJB/Voice of Africa ..... **www.voiceofafrica.com.ly**
Malaysia, RTM/Traxx FM..... **www.traxxfm.net/index.php**
Malaysia, RTM/Voice of Malaysia..... **www.rtm.gov.my**
Mali, ORTM Du Mali ..... **www.ortm.ml**
Monaco, TWR Europe ..... **www.twr.org/**
Mongolia, Voice of Mongolia..... **www.mnb.mn**
Nepal, Radio Nepal ..... **www.radionepal.org/**
Netherlands, R Netherlands Worldwide ..... **www.radionetherlands.nl/**
New Zealand, Radio NZ International ..... **www.rnzi.com**
Nigeria, Voice of Nigeria/External Service .. **www.voiceofnigeria.org**
Oman, Radio Oman..... **www.oman-tv.gov.om**
Pakistan, PBC/ Radio Pakistan..... **www.radio.gov.pk**
Palau, T8WH/WHRI/Sound of Hope Radio . **www.whr.org/**
Philippines, PBS/ Radyo Pilipinas..... **www.pbs.gov.ph/**
Philippines, FEBC..... **www.febc.ph**
Poland, Polskie Radio Warsaw ..... **www.polskieradio.pl**
Romania, Radio Romania International ..... **www.rri.ro/**
Russia, Voice of Russia ..... **www.ruvr.ru/**
Rwanda, Radio Rwanda ..... **www.orinfor.gov.rw/radiorwanda.eng.html**
Saudi Arabia, BSKSA/Saudi Radio..... **www.saudiradio.net/**
Serbia, International Radio of Serbia..... **www.glassrbije.org**
Slovakia, IRRS/Euro Gospel Radio..... **www.nexus.org**
Slovakia, IRRS/Radio City ..... **www.nexus.org**
Slovakia, IRRS/Radio Joystick ..... **www.nexus.org**
Slovakia, Radio Slovakia International..... **www.rsi.sk**
South Africa, AWR..... **www.awr2.org/**
South Africa, Channel Africa..... **www.channelafrica.org**
South Africa, Radio League..... **www.sarl.org.za**
South Africa, RTE Radio One **www.rte.ie/radio1/**
South Africa, TWR ..... **www.twr.org/**
South Korea, KBS World Radio ..... **http://rki.kbs.co.kr/english/**
Spain, Radio Exterior de Espana ..... **www.ree.rne.es/**
Sri Lanka, SLBC ..... **www.slbc.lk**
Swaziland, TWR Africa ..... **www.twr.org.za**
Sweden, Radio Sweden ..... **www.sr.se/rs/english/**
Syria, Radio Damascus..... **www.rtv.gov.sy/**
Taiwan, Radio Taiwan International ..... **http://english.rti.org.tw/**
Thailand, Radio Thailand World Service **www.hsk9.com/**
Turkey, Voice of Turkey..... **www.trt.net.tr**
Uganda, Dunamis Shortwave ..... **www.biblevoice.org/stations/east-africa**
Uganda, Radio Uganda ..... **www.ubconline.co.ug**
UK, BBC World Service..... **www.bbc.co.uk/worldservice/**
UK, Bible Voice Broadcasting..... **www.biblevoice.org/**
United Arab Emirates, FEBA Radio ..... **www.febaradio.info**
United States, Overcomer Ministries..... **www.overcomerministry.org/**
USA, American Forces Network ..... **http://myafn.dodmedia.osd.mil/**
USA, EWTN/WEWN Vandiver AL ..... **www.ewtn.com**
USA, KNLS Anchor Point AK..... **www.knls.org/**
USA, Voice of America ..... **www.voanews.com/**
USA, Voice of America/Special English..... **www.voanews.com/**
USA, WBCQ Monticello ME..... **www.wbcq.com/**
USA, WHRI Cypress Creek SC ..... **www.whr.org/**
USA, WINB Red Lion PA ..... **www.winb.com/**
USA, WRMI Miami FL..... **www.wrmi.net/**
USA, WRNO New Orleans LA ..... **www.wrnoworldwide.org/**
USA, WTJC Newport NC..... **www.fbnradio.com/**
USA, 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**
Vatican City State, Vatican Radio/Mass..... **www.vaticanradio.org**
Vietnam, Voice of Vietnam..... **www.vov.org.vn**
Zambia, 1 Africa Radio/CVC..... **www.1africa.tv**

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

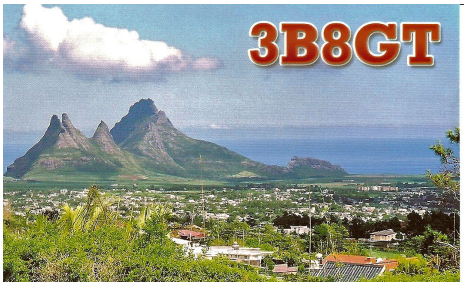
Firecracker Special

It's July again. Time for fireworks, cookouts and celebrating our nation's independence on the 4th. Enjoy your holiday, find some time for radio listening and try for this month's special QSLs from across the globe.

AMATEUR RADIO

Germany-DL0PFO, 147.3 MHz. Two full data cards for special transmission of 100th Anniversary of Guglemo Marconi and Karl Braun. Received in 28 days for report to: Jurgen Gerpott, D-22880 Wedel, Rebhunhweg 21, Germany (Mauro Giroletti, Italy/UDXF). Website **www.mmqtc-award.org**

Mauritius-3B8GT, 19 MHz/PSK31. IOTA: AF-049. Full data Mauritius scenery card signed by operator. Received in 45 days for $2.00US to: Alexey Averkin, P.O. Box 10, Floreal, Mauritius. Email: *3b8gt@mail.ru* (Larry Van Horn, NC)



AUSTRIA

Radio Netherlands Worldwide via Moosbrunn, Austria relay, 6015 kHz. Six full data cards signed by Jaime Báguena, confirming RNW relay sites from: Rampisham, UK (6040), Bonaire, Netherlands Antilles (6165), Greenville, NC USA (9895), Kigali, Rwanda (9895) and Trincomalee, Sri Lanka (9895). Received in five weeks for email report to *cartas@rnw.nl* (Artur Fernández Llorella, Catalonia, Spain/HCDX).

CLANDESTINE

Radio Republica via Rampisham, UK 9810 kHz. Email confirmation from Maria A. Lima, Special Assistant to Program Coordinator. Received in 24 hours for report sent to *info@directorio*Website: **www.directorio.org/en**. Veri signer's email *marialima@directorio.org* (Duane Hadley, Bristol, TN)

CZECH REPUBLIC

Radio Prague 7355 kHz. Full data Karel apek card unsigned, plus schedule. Card is part of the *Year of Czech Writer* series. Received in 12 days for email report to *cr@radio.cz* Station address: Vinohradská 12, 120 99 Prague 2, Czech Republic (Frank Hillton, Charleston, SC). Website: **www.radio.cz/en** Via Ascension relay 7420 kHz verified in 10 days for email report (Hadley).

EQUATORIAL GUINEA

Radio Bata, 5005 kHz. Verification letter and folder card signed by Julián Esono Ela. Received in 110 days for a Spanish report. Station address: Apartado 749, Bata, Rio Muni, Equatorial Guinea. (Giroletti).

INDIA

All India Radio (Bangalore) 9445 kHz. Full data Buddha scenery card, with illegible signature. Received in 72 days for an English report and two IRCs. Station address: Directorate of Spectrum Management and Synergy, Room 204, Akashvani Bhavan, New Delhi, India 110 001 India (Bill Wilkins, Springfield, MO)

MALAYSIA

Voice of Malaysia, 9750 kHz. Full data card unsigned, plus station stickers. Received in 42 days for an English report and $2.00US. Station address: Suara Malaysia, Wisma Radio Angkasapuri, P.O. Box 11272, 50740 Kuala Lumpur, Malaysia (Ben Clement, Portland, OR). Email: *vom@rtm.net.my* ^ Streaming audio: **www.rtm.net.my/**

MEDIUM WAVE

KXTK, *ESPN Radio*, 1280 AM kHz. Homemade design QSL and business card from Bill Bordeaux-Chief Engineer, plus bumper sticker. Received in 20 days for CD report. Station address: P.O. Box 14910, San Luis Obispo, CA 93406 (Patrick Martin, Seaside, CA). ^ Streaming audio at **www.espnradio1280.com/**

WCCO, 830 AM kHz. Full data station logo card signed by Joe Joncos-Engineer. Received in five weeks for an AM report. Station address: 625 2nd Ave. South, Minneapolis, MN 55402 USA (Mauricio Salamanca, Spain/playdx). ^ Streaming audio: **www.wcco.cbslocal.com/**

WSB, 750 AM kHz. Full data station logo card unsigned, plus WSB magnet. Received in 25 days for an AM report and two US mint stamps. Station address: 1601 Peachtree Street, Atlanta, GA 30309 (James R. Davis, Ft. Worth, TX). ^ Streaming audio: **www.wsbradio.com.**

NORTHERN MARIANA ISLANDS

Radio Free Asia, 5810 kHz. Full data panda card unsigned, plus sticker. Received in 71 days for an English report. Station address: 2025 M. St. N.W., Ste 300, Washington, DC 20036 (Wilkins). RFA 7210 via Irkutsk, Russia. *Olympics 2010* card in 16 days for report to *qsl@rfa.org* (Edward Kusalik, Albert, Canada).

PHILIPPINES

Radyo Pilipinas, 15285 kHz. Full data verification letter signed by Ric G. Lorenzo-Audience Relations, plus two station stickers. Received in 45 days for an English report. Station address: Philippine Broadcasting Service, 4th Floor, PIA Building, Visayas Avenue, Quezon City 1100, Metro Manila Philippines (Tom Banks, Dallas, TX). Email: *radio_pilipinas_oversewas@yahoo.com*

PIRATE (US)

Voice of Next Thursday, 6950, 6955 kHz. Full data cards of *AC/DC Nursing Home* and *Google Wet Drive*, signed by Gabriel Syme. Also received same versions via email to: *voiceofnextthursday@gmx.de* (Andrew Yoder, PA/Cumbre DX)

ROMANIA

Radio Romania International 6030 kHz. Full data card of the *Fortress of Viscri* confirming DRM service. Received in 30 days for online report at station website (Ken Reitz, VA). Full data *Fortress* card unsigned for 9645 kHz. Received in 15 days for email report at **www.rri.ro** (Sam Wright, Biloxi, MS).

UKRAINE

WRN 5800 kHz. Full data email confirmation from Michiel Wood to confirm the *Premier League Program*. Transmitter site only as "Ukraine." Received in three weeks for email report to *freqdept@wrn.org* (Llorella).

UNITED KINGDOM

IBRA Radio via Rampisham, UK 11875 kHz. Two full data pdf QSL sheets confirmed by Maria Levander, with site/power notation. Received in 24 hours for report to *info@ibra.se* (Kusalik).

UTILITY

Taiwan-XSX Keelung Radio, 4209.5 kHz. *QSL Certificate*. Received in eight days. Email response from Janet Kuo-Director of Keelung Radio at: *zz224910@cht.com.tw* prior to the postal response. Station address: 9, Yi 3rd Road, Keelung, Taiwan, Republic of China (Foltz).

Thailand-Bangkok Meterological Radio, 8743 kHz. Full data paper card and letter from Ms. Jantima Niyomchok. Received in 30 days for a CD report and $1.00 US. Station address: Meterological Department, 4353 Sukhumvit, Thailand. (Martin Foltz, CA/UDXF)

USA-NMG, 4316 kHz. Full data NMG card and letter signed by OSI J. Singleton. Received in 11 days for a utility report, $ 1.00US (returned) and address label (used for reply). Station address: USCG CAMSLANT, 4720 Douglas A. Munro Red., Chesapeake, VA 233222-4399. (Wilkins).

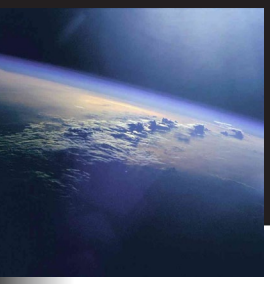
USA

WJHR, 15550 kHz. Partial data paper QSL unsigned, plus religious brochure and letter from G.S. Mock. Received in eight days for an English report and $1.00US. Station address: 5920 Oak Manor Dr., Milton, FL 32570. (Wilkins).

VATICAN RADIO

Vatican Radio, 11740 kHz. Full data station scenery card unsigned and souvenir postcard of the Vatican. Received in 25 days for English report and $2.00US. Station address: Piazza Pia 3, 1-00120 Vatican City, Vatican State. (Tom R. Becker, Jasper, GA) ^ Streaming and on-demand audio, podcast at **www.radiovaticana.org**

Radio Veritas Asia via Santa Maria di Galeria transmitter 11715 kHz. Full data card signed by Arlene A. Donarber-Audience Relations Department, with site notation as Vatican relay (Kusalik).



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.

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

1500	1600		Bolivia, Radio Causachun Coca			6075do
1500	1600		Bolivia, Radio Cultural Juan XXIII			6055do
1500	1600		Bolivia, Radio Eco 4409do			
1500	1600		Bolivia, Radio Estambul	4498do		
1500	1600		Bolivia, Radio Fides	6155do		9624do
1500	1600		Bolivia, Radio Illimani/Radio Patria Nueva 6025do			
1500	1600		Bolivia, Radio Logos	4865do		6165al
1500	1600		Bolivia, Radio Nacional de Huanuni			5967do
1500	1600		Bolivia, Radio San Gabriel	6080do		
1500	1600		Bolivia, Radio San Jose	5580do		
1500	1600		Bolivia, Radio San Miguel	4699do		
1500	1600		Bolivia, Radio Santa Ana	4451do		
1500	1600		Bolivia, Radio Santa Cruz	6134do		
1500	1600		Bolivia, Radio Tacana	4781do		
1500	1600		Chile, La Voz Crista	9635sa		17680sa
1500	1600		Colombia, La Voz de tu Conciencia 5910al			6010do
1500	1600		Colombia, La Voz del Guaviare			6035do
1500	1600		Colombia, Radio Marfil Estereo 6010al			5910do
1500	1600		Cuba, Radio Havana Cuba	6110am		6150am
			11730ca	11760am	15120sa	15380sa
1500	1600	Sun	Cuba, Radio Nacional de Venezuela			11690am
			12010am	13680am	13750am	17750am
1500	1600		Cuba, Radio Nacional de Venezuela			11680am
1500	1600		Cuba, Radio Rebelde	5025na		
1500	1600		Dominican Rep. R Amanecer Internacional 6025va			
1500	1600		Ecuador, Radio El Buen Pastor	4814do		
1500	1600		Ecuador, Radio Quito	4919do		
1500	1600		Equatorial Guinea, Radio Bata			5005do
1500	1600		Equatorial Guinea, Radio Malabo			6250do
1500	1545		Guatemala, Radio Buenas Nuevas			4799do
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, XEQM/RASA Onda Corta			6104do
1500	1600		Mexico, XERTA/Radio Transcontinental			4800do
1500	1600		Mexico, XEXQ/Radio Universidad			6045do
1500	1600		Peru, Radio Altura 5010do			
1500	1600		Peru, Radio Bethel 5949do			
1500	1600		Peru, Radio Cusco 6195do			
1500	1600		Peru, Radio del Pacifico	4974do		
1500	1600		Peru, Radio La Hora	4857do		
1500	1600		Peru, Radio La Reyna de la Selva			5485do
1500	1600	Sun	Peru, Radio La Voz de la Selva	4824do		
1500	1600		Peru, Radio La Voz de las Huarinjas			5059do
1500	1600		Peru, Radio Madre de Dios	4950do		
1500	1600		Peru, Radio Manantial	4991do		
1500	1600		Peru, Radio Maranon	4835do		
1500	1600		Peru, Radio Melodia	5940do		
1500	1600		Peru, Radio Ondas del Huallaga			3329do
1500	1600		Peru, Radio Ondas del Suroiente			5120do
1500	1600		Peru, Radio Quillabamba	5025do		
1500	1600		Peru, Radio Santa Rosa	6047do		
1500	1600		Peru, Radio Sicuani	4826do		
1500	1600		Peru, Radio Tawantinsuyo	6175do		
1500	1600		Peru, Radio Union 6114do			
1500	1600		Peru, Radio Victoria	6020do		9720do
1500	1600		Peru, Radio Vision 4790do			
1500	1600		Spain, Radio Exterior de Espana			15585eu
			21570sa	21610as		
1500	1600	mtwhf	Spain, Radio Exterior de Espana 17595sa			15385af
1500	1600	Sat/Sun	Spain, Radio Exterior de Espana 17755af			17595sa
1500	1600	Sun	Spain, Radio Exterior de Espana			9765ca
			11815sa	17850na		
1500	1600		Uruguay, Radio Sarandi	6045do		
1500	1600		USA, EWTN/WEWN Vandiver AL 12070ca			11550ca
1500	1600		USA, KJES Vado NM	11715na		
1500	1600		USA, KVOH Rancho Simi CA	17775ca		
1500	1600		USA, Radio Marti	11930ca	13820ca	15330ca
1500	1600		USA, WYFR/Family Radio Worldwide			6085ca
			11725am	11740sa	13615sa	15130am
			17555sa			
1500	1600		Venezuela, Radio Amazonas	4940do		

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

1600	1700		Bolivia, Radio Causachun Coca			6075do
1600	1700		Bolivia, Radio Cultural Juan XXIII			6055do
1600	1700		Bolivia, Radio Eco 4409do			
1600	1700		Bolivia, Radio Estambul	4498do		
1600	1700		Bolivia, Radio Fides	6155do		9624do
1600	1700		Bolivia, Radio Illimani/Radio Patria Nueva 6025do			
1600	1700		Bolivia, Radio Logos	4865do		6165al
1600	1700		Bolivia, Radio Nacional de Huanuni			5967do
1600	1700		Bolivia, Radio San Jose	5580do		
1600	1700		Bolivia, Radio San Miguel	4699do		
1600	1700		Bolivia, Radio Santa Ana	4451do		
1600	1700		Bolivia, Radio Tacana	4781do		
1600	1700		Chile, La Voz Crista	9635sa		17680sa
1600	1700		Colombia, La Voz de tu Conciencia 5910al			6010do
1600	1700		Colombia, La Voz del Guaviare			6035do
1600	1700		Colombia, Radio Marfil Estereo 6010al			5910do
1600	1700		Cuba, Radio Havana Cuba	6110am		6150am
			11730ca	11760am	15120sa	15380sa
1600	1700	Sun	Cuba, Radio Nacional de Venezuela			11690am
			12010am	13680am	13750am	17750am
1600	1700		Cuba, Radio Rebelde	5025na		
1600	1700		Dominican Rep. R Amanecer Internacional 6025va			
1600	1700		Ecuador, Radio Quito	4919do		
1600	1700		Equatorial Guinea, Radio Bata			5005do
1600	1700		Equatorial Guinea, Radio Malabo			6250do
1600	1700		Honduras, HRMI/ Radio Misiones Intl			3340do
1600	1700		Mexico, XEOI/Radio Mil	6010do		
1600	1700		Mexico, XEQM/RASA Onda Corta			6104do
1600	1700		Mexico, XERTA/Radio Transcontinental			4800do
1600	1700		Mexico, XEXQ/Radio Universidad			6045do
1600	1700		Peru, Radio Altura 5010do			
1600	1700		Peru, Radio Bethel 5949do			
1600	1700		Peru, Radio Cusco 6195do			
1600	1700		Peru, Radio del Pacifico	4974do		
1600	1700		Peru, Radio La Hora	4857do		
1600	1700		Peru, Radio La Reyna de la Selva			5485do
1600	1700	Sun	Peru, Radio La Voz de la Selva	4824do		
1600	1700		Peru, Radio La Voz de las Huarinjas			5059do
1600	1700		Peru, Radio Madre de Dios	4950do		
1600	1700		Peru, Radio Manantial	4991do		
1600	1700		Peru, Radio Maranon	4835do		
1600	1700		Peru, Radio Melodia	5940do		
1600	1700		Peru, Radio Ondas del Huallaga			3329do
1600	1700		Peru, Radio Ondas del Suroiente			5120do
1600	1700		Peru, Radio Quillabamba	5025do		
1600	1700		Peru, Radio Santa Rosa	6047do		
1600	1700		Peru, Radio Sicuani	4826do		
1600	1700		Peru, Radio Tawantinsuyo	6175do		
1600	1700		Peru, Radio Union 6114do			
1600	1700		Peru, Radio Victoria	6020do		9720do
1600	1700		Peru, Radio Vision 4790do			
1600	1700		Spain, Radio Exterior de Espana			15585eu
			21570sa	21610as		
1600	1700	mtwhf	Spain, Radio Exterior de Espana 17595sa			15385af

1600	1700	Sun	Spain, Radio Exterior de Espana 17850na	9765ca
1600	1700	Sat/Sun	Spain, Radio Exterior de Espana 17595sa 17755af 17850na	11815sa
1600	1700		Uruguay, Radio Sarandi	6045do
1600	1700		USA, EWTN/WEWN Vandiver AL 12070ca	11550ca
1600	1700		USA, KVOH Rancho Simi CA	17775ca
1600	1700		USA, Radio Marti 11830ca 13820ca	15330ca
1600	1700		USA, WYFR/Family Radio Worldwide 18930eu	15130am
1600	1700		Venezuela, Radio Amazonas	4940do
1630	1700		Bulgaria, Radio Bulgaria	11800eu 13800eu
1630	1700		Turkey, Voice of Turkey	11930eu

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

1700	1800		Bolivia, Radio Causachun Coca	6075do
1700	1800		Bolivia, Radio Cultural Juan XXIII	6055do
1700	1800		Bolivia, Radio Estambul	4498do
1700	1800		Bolivia, Radio Fides	6155do 9624do
1700	1800		Bolivia, Radio Illimani/Radio Patria Nueva 6025do	
1700	1800		Bolivia, Radio Logos	4865do 6165al
1700	1800		Bolivia, Radio San Miguel	4699do
1700	1800		Bolivia, Radio Tacana	4781do
1700	1800		Chile, La Voz Crista	9635sa 17680sa
1700	1800		Colombia, La Voz de tu Conciencia 5910al	6010do
1700	1800		Colombia, La Voz del Guaviare	6035do
1700	1800		Colombia, Radio Marfil Estereo 6010al	5910do
1700	1800		Cuba, Radio Havana Cuba 11730ca 11760am 12030ca 15380sa	6110am 6150am 15120sa
1700	1800	Sun	Cuba, Radio Nacional de Venezuela 12010am 13680am 13750am	11690am 17750am
1700	1800		Cuba, Radio Rebelde	5025na
1700	1800		Dominican Rep. R Amanecer Internacional 6025va	
1700	1800		Ecuador, Radio Quito	4919do
1700	1800		Equatorial Guinea, Radio Bata	5005do
1700	1800		Equatorial Guinea, Radio Malabo	6250do
1700	1800		Honduras, HRMI/ Radio Misiones Intl	3340do
1700	1800		Indonesia, Voice of Indonesia	9525va 11785al
1700	1800		Mexico, XEOI/Radio Mil	6010do
1700	1800		Mexico, XEQM/RASA Onda Corta	6104do
1700	1800		Mexico, XERTA/Radio Transcontinental	4800do
1700	1800		Mexico, XEXQ/Radio Universidad	6045do
1700	1800		Peru, Radio Altura 5010do	
1700	1800		Peru, Radio Bethel 5949do	
1700	1800		Peru, Radio Cusco 6195do	
1700	1800		Peru, Radio del Pacifico	4974do
1700	1800	mtwhfa	Peru, Radio La Hora	4857do
1700	1800		Peru, Radio La Reyna de la Selva	5485do
1700	1800	Sun	Peru, Radio La Voz de la Selva	4824do
1700	1800		Peru, Radio La Voz de las Huarinjas	5059do
1700	1800		Peru, Radio Madre de Dios	4950do
1700	1800		Peru, Radio Manantial	4991do
1700	1800		Peru, Radio Maranon	4835do
1700	1800		Peru, Radio Melodia	5940do
1700	1800		Peru, Radio Ondas del Huallaga	3329do
1700	1800		Peru, Radio Ondas del Suroiente	5120do
1700	1800		Peru, Radio Quillabamba	5025do
1700	1800		Peru, Radio Santa Rosa	6047do
1700	1800		Peru, Radio Sicuani	4826do
1700	1800		Peru, Radio Tawantinsuyo	6175do
1700	1800		Peru, Radio Union 6114do	
1700	1800		Peru, Radio Victoria	6020do 9720do
1700	1800		Peru, Radio Vision 4790do	
1700	1800		Spain, Radio Exterior de Espana 17715sa	7275eu
1700	1800	mtwhf	Spain, Radio Exterior de Espana 17755af	17595sa
1700	1800	Sun	Spain, Radio Exterior de Espana 17850na	9765ca
1700	1800	Sat/Sun	Spain, Radio Exterior de Espana 11815sa 17595sa 17755af	9665eu 17850na
1700	1730		Turkey, Voice of Turkey	11930eu
1700	1800		Uruguay, Radio Sarandi	6045do
1700	1800		USA, EWTN/WEWN Vandiver AL 13830ca	11550ca
1700	1800		USA, KVOH Rancho Simi CA	17775ca
1700	1800		USA, Radio Marti 11930ca 13820ca	15330ca
1700	1800		USA, WYFR/Family Radio Worldwide 15130am 17535am	6085ca
1700	1800		Venezuela, Radio Amazonas	4940do

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

1800	1900	Sun	Argentina, Radio Nacional RAE 11710am	6060am
1800	1900		Bolivia, Radio Causachun Coca	6075do
1800	1900		Bolivia, Radio Cultural Juan XXIII	6055do
1800	1900		Bolivia, Radio Estambul	4498do
1800	1900		Bolivia, Radio Illimani/Radio Patria Nueva 6025do	
1800	1900		Bolivia, Radio Logos	4865do 6165al
1800	1900		Bolivia, Radio San Miguel	4699do
1800	1900		Bolivia, Radio Tacana	4781do
1800	1900		Chile, La Voz Crista	9635sa 17680sa
1800	1900		Colombia, La Voz de tu Conciencia 5910al	6010do
1800	1900		Colombia, La Voz del Guaviare	6035do
1800	1900		Colombia, Radio Marfil Estereo 6010al	5910do
1800	1900		Cuba, Radio Havana Cuba 11730ca 11760am 12030ca 15380sa	6110am 6150am 15120sa
1800	1900		Cuba, Radio Rebelde	5025na
1800	1827		Czech Republic, Radio Prague	5930eu
1800	1900		Dominican Rep. R Amanecer Internacional 6025va	
1800	1900		Ecuador, Radio Quito	4919do
1800	1900		Equatorial Guinea, Radio Bata	5005do
1800	1900		Equatorial Guinea, Radio Malabo	6250do
1800	1900		Honduras, HRMI/ Radio Misiones Intl	3340do
1800	1900		Mexico, XEOI/Radio Mil	6010do
1800	1900		Mexico, XEQM/RASA Onda Corta	6104do
1800	1900		Mexico, XERTA/Radio Transcontinental	4800do
1800	1900		Mexico, XEXQ/Radio Universidad	6045do
1800	1900		Peru, Radio Altura 5010do	
1800	1900		Peru, Radio Bethel 5949do	
1800	1900		Peru, Radio Cusco 6195do	
1800	1900		Peru, Radio del Pacifico	4974do
1800	1900	mtwhfa	Peru, Radio La Hora	4857do
1800	1900		Peru, Radio La Reyna de la Selva	5485do
1800	1900	Sun	Peru, Radio La Voz de la Selva	4824do
1800	1900		Peru, Radio La Voz de las Huarinjas	5059do
1800	1900		Peru, Radio Madre de Dios	4950do
1800	1900		Peru, Radio Manantial	4991do
1800	1900		Peru, Radio Melodia	5940do
1800	1900		Peru, Radio Ondas del Huallaga	3329do
1800	1900		Peru, Radio Ondas del Suroiente	5120do
1800	1900		Peru, Radio Quillabamba	5025do
1800	1900		Peru, Radio Santa Rosa	6047do
1800	1900		Peru, Radio Sicuani	4826do
1800	1900		Peru, Radio Tawantinsuyo	6175do
1800	1900		Peru, Radio Union 6114do	
1800	1900		Peru, Radio Victoria	6020do 9720do
1800	1900		Peru, Radio Vision 4790do	
1800	1900		Spain, Radio Exterior de Espana 17715sa	7275eu
1800	1900	mtwhf	Spain, Radio Exterior de Espana 11815sa 17755af	9765ca 17850na
1800	1900	Sat/Sun	Spain, Radio Exterior de Espana 11815sa 17595ca	9665eu 17850na
1800	1830	Sun	UK, Bible Voice Broadcasting	9435eu
1800	1900		Uruguay, Radio Sarandi	6045do
1800	1900		USA, EWTN/WEWN Vandiver AL 13830ca	12050ca
1800	1900		USA, KVOH Rancho Simi CA	17775ca
1800	1900		USA, Radio Marti 11930ca 13820ca	15330ca
1800	1900		USA, WYFR/Family Radio Worldwide 15130am 18930eu	6120eu
1800	1900		Venezuela, Radio Amazonas	4940do
1800	1830		Vietnam, Voice of Vietnam/Overseas Service 7280eu 9730eu	

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

1900	2000	Sun	Argentina, Radio Nacional RAE 11710am	6060am
1900	2000		Bolivia, Radio Causachun Coca	6075do
1900	2000		Bolivia, Radio Cultural Juan XXIII	6055do
1900	2000		Bolivia, Radio Estambul	4498do
1900	2000		Bolivia, Radio Illimani/Radio Patria Nueva 6025do	
1900	2000		Bolivia, Radio Logos	4865do 6165al
1900	2000		Bolivia, Radio San Miguel	4699do
1900	2000		Bolivia, Radio Tacana	4781do
1900	2000		Chile, La Voz Crista	9635sa 17680sa

1900	2000		Colombia, La Voz de tu Conciencia 5910al			6010do
1900	2000		Colombia, La Voz del Guaviare			6035do
1900	2000		Colombia, Radio Marfil Estereo 6010al			5910do
1900	2000		Cuba, Radio Havana Cuba 11730ca	6110am 11760am	12030ca	6150am 15120sa 15380sa
1900	2000		Cuba, Radio Nacional de Venezuela			15290am
1900	2000		Cuba, Radio Rebelde	5025na		
1900	1927		Czech Republic, Radio Prague			5930eu
1900	2000		Dominican Rep. R Amanecer Internacional 6025va			
1900	2000		Ecuador, HCJB Global	6050sa		
1900	2000		Ecuador, Radio Quito	4919do		
1900	2000		Equatorial Guinea, Radio Bata			5005do
1900	2000		Equatorial Guinea, Radio Malabo			6250do
1900	2000		Honduras, HRMI/ Radio Misiones Intl			3340do
1900	2000		Mexico, XEOI/Radio Mil	6010do		
1900	2000		Mexico, XEQM/RASA Onda Corta			6104do
1900	2000		Mexico, XERTA/Radio Transcontinental			4800do
1900	2000		Mexico, XEXQ/Radio Universidad			6045do
1900	1957		North Korea, Voice of Korea	13760eu		15245eu
1900	2000		Peru, Radio Altura 5010do			
1900	2000		Peru, Radio Bethel 5949do			
1900	2000		Peru, Radio Cusco 6195do			
1900	2000		Peru, Radio del Pacifico	4974do		
1900	2000	mtwhfa	Peru, Radio La Hora	4857do		
1900	2000		Peru, Radio La Reyna de la Selva			5485do
1900	2000	Sun	Peru, Radio La Voz de la Selva	4824do		
1900	2000		Peru, Radio La Voz de las Huarinjas			5059do
1900	2000		Peru, Radio Madre de Dios	4950do		
1900	2000		Peru, Radio Manantial	4991do		
1900	2000		Peru, Radio Melodia	5940do		
1900	2000		Peru, Radio Ondas del Huallaga			3329do
1900	2000		Peru, Radio Ondas del Suroiente			5120do
1900	2000		Peru, Radio Quillabamba	5025do		
1900	2000		Peru, Radio Santa Rosa	6047do		
1900	2000		Peru, Radio Sicuani	4826do		
1900	2000		Peru, Radio Tawantinsuyo	6175do		
1900	2000		Peru, Radio Union 6114do			
1900	2000		Peru, Radio Victoria	6020do		9720do
1900	2000		Peru, Radio Vision 4790do			
1900	1956		Romania, Radio Romania International 11715ca			9700ca
1900	1930		Serbia, International Radio of Serbia			6100eu
1900	2000	mtwhf	Spain, Radio Exterior de Espana 11815sa	17850na		9765ca
1900	2000	Sat/Sun	Spain, Radio Exterior de Espana 11815sa	17595sa	17850na	9665eu 17755af
1900	2000		Spain, Radio Exterior de Espana			15110na
1900	2000		Uruguay, Radio Sarandi	6045do		
1900	2000		USA, EWTN/WEWN Vandiver AL 13820ca			12050ca
1900	2000		USA, KVOH Rancho Simi CA	17775ca		
1900	2000		USA, Radio Marti 11930ca		13820ca	15330ca
1900	1930	Sat	Vatican City State, Vatican Radio 11625af			9755af
1900	2000		Venezuela, Radio Amazonas	4940do		
1930	2000		Bolivia, Radio Santa Ana	4451do		
1930	2000		Guatemala, Radio Buenas Nuevas			4799do

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

2000	2100	Sat/Sun	Argentina, Radio Nacional RAE 11710am			6060am
2000	2100		Bolivia, Radio Causachun Coca			6075do
2000	2100		Bolivia, Radio Cultural Juan XXIII			6055do
2000	2100		Bolivia, Radio Estambul	4498do		
2000	2100		Bolivia, Radio Illimani/Radio Patria Nueva 6025do			
2000	2100		Bolivia, Radio Logos	4865do		6165al
2000	2100		Bolivia, Radio Nacional de Huanuni			5967do
2000	2100		Bolivia, Radio San Miguel	4699do		
2000	2100		Bolivia, Radio Santa Ana	4451do		
2000	2100		Bolivia, Radio Tacana	4781do		
2000	2100		Chile, La Voz Crista	9635sa		17680sa
2000	2100		Colombia, La Voz de tu Conciencia 5910al			6010do
2000	2100		Colombia, La Voz del Guaviare			6035do
2000	2100		Colombia, Radio Marfil Estereo 6010al			5910do
2000	2100		Cuba, Radio Havana Cuba 15120sa	11730ca 15380sa		12030ca
2000	2100		Cuba, Radio Nacional de Venezuela			17705am
2000	2100		Cuba, Radio Rebelde	5025na		
2000	2100		Dominican Rep. R Amanecer Internacional 6025va			
2000	2100		Ecuador, HCJB Global	6050sa		
2000	2100		Ecuador, Radio Quito	4919do		
2000	2100		Equatorial Guinea, Radio Bata			5005do
2000	2100		Equatorial Guinea, Radio Malabo			6250do
2000	2100		Guatemala, Radio Buenas Nuevas			4799do
2000	2100		Honduras, HRMI/ Radio Misiones Intl			3340do
2000	2100		Mexico, XEOI/Radio Mil	6010do		
2000	2100		Mexico, XEQM/RASA Onda Corta			6104do
2000	2100		Mexico, XERTA/Radio Transcontinental			4800do
2000	2100		Mexico, XEXQ/Radio Universidad			6045do
2000	2100		Peru, Radio Altura 5010do			
2000	2100		Peru, Radio Bethel 5949do			
2000	2100		Peru, Radio Cusco 6195do			
2000	2100		Peru, Radio del Pacifico	4974do		
2000	2100	mtwhfa	Peru, Radio La Hora	4857do		
2000	2100		Peru, Radio La Reyna de la Selva			5485do
2000	2100	Sun	Peru, Radio La Voz de la Selva	4824do		
2000	2100		Peru, Radio La Voz de las Huarinjas			5059do
2000	2100		Peru, Radio Madre de Dios	4950do		
2000	2100		Peru, Radio Manantial	4991do		
2000	2100		Peru, Radio Melodia	5940do		
2000	2100		Peru, Radio Ondas del Huallaga			3329do
2000	2100		Peru, Radio Ondas del Suroiente			5120do
2000	2100		Peru, Radio Quillabamba	5025do		
2000	2100		Peru, Radio Santa Rosa	6047do		
2000	2100		Peru, Radio Sicuani	4826do		
2000	2100		Peru, Radio Tarma	4775do		
2000	2100		Peru, Radio Tawantinsuyo	6175do		
2000	2100		Peru, Radio Union 6114do			
2000	2100		Peru, Radio Victoria	6020do		9720do
2000	2100		Peru, Radio Vision 4790do			
2000	2100		Russia, Voice of Russia	5920eu		7440eu
2000	2030		Slovakia, Radio Slovakia International 11650sa			9695eu
2000	2100		Spain, Radio Exterior de Espana 15110na			7275eu
2000	2100	Sat/Sun	Spain, Radio Exterior de Espana 11815sa	17595sa	17755af	9665eu 17850na
2000	2100		Taiwan, Radio Taiwan International			3965eu
2000	2100		Uruguay, Radio Sarandi	6045do		
2000	2100		USA, EWTN/WEWN Vandiver AL 13820ca			12050ca
2000	2100		USA, KVOH Rancho Simi CA	17775ca		
2000	2100		USA, Radio Marti 9565as	11930ca		13820ca
2000	2100		USA, WYFR/Family Radio Worldwide 11855am	15130am		5985ca
2000	2100		Venezuela, Radio Amazonas	4940do		
2030	2100		Cuba, Radio Havana Cuba	6120ca		9660ca
2030	2057		Czech Republic, Radio Prague			5930va
2030	2100		Iran, VOIRI/ IRIB	6055eu	7300eu	9780eu

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

2100	2200	Sat/Sun	Argentina, Radio Nacional RAE 11710am			6060am
2100	2200		Bolivia, Radio Causachun Coca			6075do
2100	2200		Bolivia, Radio Cultural Juan XXIII			6055do
2100	2200		Bolivia, Radio Estambul	4498do		
2100	2200		Bolivia, Radio Fides	6155do		9624do
2100	2200		Bolivia, Radio Illimani/Radio Patria Nueva 6025do			
2100	2200		Bolivia, Radio Logos	4865do		6165al
2100	2200		Bolivia, Radio Loyola	5996do		
2100	2200		Bolivia, Radio Nacional de Huanuni			5967do
2100	2200		Bolivia, Radio Pio XII	5952do		
2100	2200		Bolivia, Radio San Gabriel	6080do		
2100	2200		Bolivia, Radio San Jose	5580do		
2100	2200		Bolivia, Radio San Miguel	4699do		
2100	2200		Bolivia, Radio Santa Ana	4451do		
2100	2200		Bolivia, Radio Santa Cruz	6134do		
2100	2200		Bolivia, Radio Tacana	4781do		
2100	2200		Bolivia, Radio Virgen de Remedios			4834do
2100	2200		Chile, La Voz Crista	9635sa		17680sa
2100	2200		China, China Radio International 9640eu			6020eu
2100	2200		Colombia, La Voz de tu Conciencia 5910al			6010do
2100	2200		Colombia, La Voz del Guaviare			6035do
2100	2200		Colombia, Radio Marfil Estereo 6010al			5910do

2100	2200		Cuba, Radio Havana Cuba	5040va	6120ca	
			9660ca	11730ca	12030ca	15120sa
			15370eu	15380sa		
2100	2200		Cuba, Radio Rebelde	5025na		
2100	2200		Dominican Rep. R Amanecer Internacional			
			6025va			
2100	2200		Ecuador, HCJB Global	6050sa		
2100	2200		Ecuador, Radio El Buen Pastor	4814do		
2100	2200		Ecuador, Radio Quito	4919do		
2100	2200		Equatorial Guinea, Radio Bata		5005do	
2100	2200		Equatorial Guinea, Radio Malabo		6250do	
2100	2130		Guatemala, Radio Buenas Nuevas		4799do	
2100	2200		Honduras, HRMI/ Radio Misiones Intl		3340do	
2100	2127		Iran, VOIRI/ IRIB	6055eu	7300eu	9780eu
2100	2200		Mexico, XEOI/Radio Mil	6010do		
2100	2200		Mexico, XEQM/RASA Onda Corta		6104do	
2100	2200		Mexico, XERTA/Radio Transcontinental		4800do	
2100	2200		Mexico, XEXQ/Radio Universidad		6045do	
2100	2200		Peru, Radio Altura 5010do			
2100	2200		Peru, Radio Bethel 5949do			
2100	2200		Peru, Radio Cultural Amauta	4955do		
2100	2200		Peru, Radio Cusco 6195do			
2100	2200	mtwhfa	Peru, Radio La Hora	4857do		
2100	2200		Peru, Radio La Reyna de la Selva		5485do	
2100	2200	Sun	Peru, Radio La Voz de la Selva	4824do		
2100	2200		Peru, Radio La Voz de las Huarinjas		5059do	
2100	2200		Peru, Radio Madre de Dios	4950do		
2100	2200		Peru, Radio Manantial	4991do		
2100	2200		Peru, Radio Melodia	5940do		
2100	2200		Peru, Radio Ondas del Huallaga		3329do	
2100	2200		Peru, Radio Ondas del Suroiente		5120do	
2100	2200		Peru, Radio Quillabamba	5025do		
2100	2200		Peru, Radio Santa Rosa	6047do		
2100	2200		Peru, Radio Sicuani	4826do		
2100	2200		Peru, Radio Tarma 4775do			
2100	2200		Peru, Radio Tawantinsuyo	6175do		
2100	2200		Peru, Radio Union 6114do			
2100	2200		Peru, Radio Victoria	6020do	9720do	
2100	2156		Romania, Radio Romania International		9755ca	
			11965ca			
2100	2200		Spain, Radio Exterior de Espana		7275eu	
			15110na			
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana		9765eu	
			11815sa	17595sa	17755af	17850na
2100	2200		Uruguay, Radio Sarandi	6045do		
2100	2200		USA, EWTN/WEWN Vandiver AL		12050ca	
			13820ca			
2100	2200		USA, KVOH Rancho Simi CA	17775ca		
2100	2200		USA, Radio Marti	9565ca	11930ca	13820ca
2100	2200		USA, WYFR/Family Radio Worldwide		5985ca	
			9355eu	11700sa	11855am	15130am
2100	2200		Venezuela, Radio Amazonas	4940do		
2120	2140		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu		
2130	2200		Bulgaria, Radio Bulgaria	6200eu	9800eu	

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

2200	2300		Argentina, Radio Nacional RAE		6060am	
			11710am			
2200	2300	mtwhf	Argentina, Radio Nacional RAE		11710am	
			15345eu			
2200	2300		Bolivia, Radio Causachun Coca		6075do	
2200	2300		Bolivia, Radio Cultural Juan XXIII		6055do	
2200	2300		Bolivia, Radio Estambul	4498do		
2200	2300		Bolivia, Radio Fides	6155do	9624do	
2200	2300		Bolivia, Radio Illimani/Radio Patria Nueva			
			6025do			
2200	2300		Bolivia, Radio Lipez	4796do		
2200	2300		Bolivia, Radio Logos	4865do	6165al	
2200	2300		Bolivia, Radio Loyola	5996do		
2200	2300		Bolivia, Radio Mosoj Chaski	3310do		
2200	2300		Bolivia, Radio Nacional de Huanuni		5967do	
2200	2300		Bolivia, Radio Pio XII	5952do		
2200	2300		Bolivia, Radio San Gabriel	6080do		
2200	2300		Bolivia, Radio San Jose	5580do		
2200	2300		Bolivia, Radio San Miguel	4699do		
2200	2300		Bolivia, Radio Santa Ana	4451do		
2200	2300		Bolivia, Radio Santa Cruz	6134do		
2200	2300		Bolivia, Radio Tacana	4781do		
2200	2300		Bolivia, Radio Virgen de Remedios		4834do	
2200	2230		Bulgaria, Radio Bulgaria	6200eu	9800eu	
2200	2259		Canada, Radio Canada International		11900sa	
			15455sa			
2200	2300		Chile, La Voz Crista	9635sa	17680sa	
2200	2300		China, China Radio International		6020eu	
			7210eu	7250eu	9640eu	9490sa
			13700sa			
2200	2300		Colombia, La Voz de tu Conciencia		6010do	
			5910al			
2200	2300		Colombia, La Voz del Guaviare		6035do	
2200	2300		Colombia, Radio Marfil Estereo		5910do	
			6010al			
2200	2300		Cuba, Radio Havana Cuba	5040va	6000na	
			6120ca	9640na	9660ca	11730ca
			12030ca	15120sa	15370eu	15380sa
2200	2300		Cuba, Radio Nacional de Venezuela		11670am	
2200	2300		Cuba, Radio Rebelde	5025na		
2200	2300		Dominican Rep. R Amanecer Internacional			
			6025va			
2200	2300		Ecuador, HCJB Global	6050sa		
2200	2255		Ecuador, La Voz del Napo	3279do		
2200	2300		Ecuador, Radio El Buen Pastor	4814do		
2200	2300		Ecuador, Radio Quito	4919do		
2200	2300		Equatorial Guinea, Radio Bata		5005do	
2200	2300		Equatorial Guinea, Radio Malabo		6250do	
2200	2300		Guatemala, Radio Buenas Nuevas		4799do	
2200	2300		Honduras, HRMI/ Radio Misiones Intl		3340do	
2200	2300		Honduras, Radio Luz y Vida	3250do		
2200	2300		Mexico, XEOI/Radio Mil	6010do		
2200	2300		Mexico, XEQM/RASA Onda Corta		6104do	
2200	2300		Mexico, XERTA/Radio Transcontinental		4800do	
2200	2300		Mexico, XEXQ/Radio Universidad		6045do	
2200	2257		North Korea, Voice of Korea	13760eu	15245eu	
2200	2300		Peru, Radio Altura 5010do			
2200	2300		Peru, Radio Bethel 5949do			
2200	2300		Peru, Radio Bolivar	5460do		
2200	2300		Peru, Radio Cultural Amauta	4955do		
2200	2300		Peru, Radio Cusco 6195do			
2200	2300		Peru, Radio del Pacifico	4974do		
2200	2300		Peru, Radio Huanta 2000	4747do	4755al	
2200	2300	mtwhfa	Peru, Radio La Hora	4857do		
2200	2300		Peru, Radio La Reyna de la Selva		5485do	
2200	2300	Sun	Peru, Radio La Voz de la Selva	4824do		
2200	2300		Peru, Radio La Voz de las Huarinjas		5059do	
2200	2300		Peru, Radio Madre de Dios	4950do		
2200	2300		Peru, Radio Manantial	4991do		
2200	2300		Peru, Radio Melodia	5940do		
2200	2300		Peru, Radio Ondas del Suroiente		5120do	
2200	2300		Peru, Radio Quillabamba	5025do		
2200	2300		Peru, Radio Santa Rosa	6047do		
2200	2300		Peru, Radio Sicuani	4826do		
2200	2300		Peru, Radio Tarma 4775do			
2200	2300		Peru, Radio Tawantinsuyo	6175do		
2200	2300		Peru, Radio Union 6114do			
2200	2300		Peru, Radio Victoria	6020do	9720do	
2200	2300		Peru, Radio Vision 4790do			
2200	2300	Sat/Sun	Spain, Radio Exterior de Espana		9765ca	
			17850na			
2200	2300		Spain, Radio Exterior de Espana		7275eu	
			9570af	15110na		
2200	2300		Syria, Radio Damascus	9330va	12085va	
2200	2300		Uruguay, Radio Sarandi	6045do		
2200	2300		USA, EWTN/WEWN Vandiver AL		12050ca	
			13820ca			
2200	2300		USA, KVOH Rancho Simi CA	17775ca		
2200	2300		USA, Radio Marti	6030ca	7405ca	9565ca
2200	2300		USA, WYFR/Family Radio Worldwide		5985ca	
			9935ca	11580sa	11665sa	
2200	2300		Venezuela, Radio Amazonas	4940do		
2205	2300		Canada, Radio Canada International		6100sa	
2230	2300		Bolivia, Radio Eco 4409do			
2230	2300		Bolivia, Radio Yura	4716do		
2230	2300		Peru, Radio Rasuwilca	4805do		
2230	2300		Peru, Radio San Nicolas	5470do		
2230	2300		Peru, Radio Super Sensacion	6536do		

WANT MORE?

Access to the **MTXra Shortwave Broadcast Guide** is free to MTXpress subscribers. If you are a subscriber to the printed magazine, you may add a full year of **MTXpress/MTXtra** to your subscription for only $11.95. Call 1-800-438-8155 or visit ***www.monitoringtimes.com*** to learn how.

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Brian Wood, W0DZ
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Product Review: RFSpace SDR-IQ

Great strides are being made in the art of Software-Defined Radio (SDR). This month we'll review the popular SDR-IQ, made by RFSpace, Inc. But before we do, let's first dispel a few myths.

Myth #1: Any radio that can have new firmware downloaded into it is an SDR.

Many modern radios can have their firmware updated remotely and easily. But that does not make them SDRs. A true SDR samples the RF spectrum and then performs math operations on the data to produce a received signal, which is then converted back into an analog signal and output to speakers. The reverse is done for transmitter circuits up to the power amplifiers.

Myth #2: SDR's can't have real front panels.

An SDR is often implemented by using a high-speed analog-to-digital converter to sample the radio spectrum and then feeding the data over a high-speed bus such as FireWire or USB into a PC, so it is only natural to use the PC itself to run software that provides a simulated front panel. But there is really no reason manufacturers couldn't also make a "real" front panel.

Myth #3: Any radio with Digital Signal Processing (DSP) is an SDR.

DSP is a handy way to eliminate signals that are different enough from the expected signal to be easily detectable in software, such as noise, heterodynes (birdies and steady received carriers) and pulse noise. It is also possible to create variable width filters using DSP algorithms. But just because a radio has DSP does not make it an SDR.

Many people complain that DSP makes signals sound like they are inside a drum, or perhaps they sound "watery." There also tend to be many adjustments to the algorithm that are often located inside menus, making optimization something of a chore.

DSP algorithms are usually implemented at either audio or at an IF that is fairly low in frequency, so as to not put a huge strain on the processor's time. Since computer programs take time to execute, there is also often a noticeable delay between a live signal and a processed one which can be annoying as one tunes across a band. These objections will slowly fade away as processors run faster, algorithms get smarter, and more of the radio is implemented in software.

❖ RFSpace SDR-IQ

RFSpace manufactures several SDRs, but the SDR-IQ has a good combination of features and performance at a price of about $500 USD. Here's a list of features:

- Maximum display bandwidth of 196 KHz at as low as 0.75 Hz Resolution Bandwidth
- Records and plays back spectrum segments up to 196 KHz wide with full demodulation and tuning capabilities
- Frequency coverage of 500Hz (yes, Hz, not kHz!) to 30 MHz
- Fully documented interface and ActiveX control
- Drivers for Linux and Windows
- Network server application for Linux and Windows. Allows remote use of the radio across high speed internet
- SpectraVue software
- Included example source code for spectrum analysis application
- Directly interfaces with DZKit, Elecraft, Icom, Kenwood and Yaesu radios for use as a tracking panoramic adapter
- Built in serial RS-232 port. This port can be used to communicate with external radios
- Supports AM, FM, NFM, WFM, LSB, USB, CW, CWR, DSB, DRM and custom filters / offsets
- Outputs data in I/Q Wave Format, Excel and graphic formats with resolutions as wide as 262144 pixels
- No power supply needed. (USB port powered)

KEY SPECIFICATIONS:

- Clipping RF level (Max Gain): -4dBm (Typ)
- Maximum Frequency display BW: 190 KHz
- Sampling Rate: 66.666 MHz
- I/Q Image Rejection: 80 dB+ (Typ)
- MDS (500 Hz): -127 dBm @ 14 MHz
- Input IP3: 15dBm+ (Typ)
- Current Draw: 425 mA
- Dimensions: 3.75x3.75x1.25 Inches
- Max FFT Size: 262144 Point
- Max IQ Recording (All BWs): Unlimited to Hardrive.
- Screen Update Rate: 50 FFTs/sec, 190 KHz SPAN @ 100 Hz RBW
- Window Type: Rectangular, Hanning, Hamming, FlatTop, Blackman, Blackman-Harris
- Displayed Average Noise Level dBm/Hz:-133dBm/Hz Typ. 14.200 MHz
- Worst Case Spurious Carriers (Birdies): -80dBfs, -100dBfs (typ)

Figures 1 and 2 show what this tiny receiver looks like. As you can see, there's not a lot of "RF space" in there: just a simple front end with preamp and attenuator feeding a high speed 14-bit A-D and a fast microprocessor. Sampled data is fed to the PC via the USB port, which also provides 5V@425mA for the board.

The RS-232 connector allows the radio

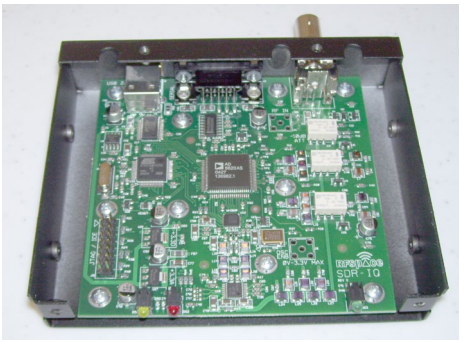

Figure 1. An inside look at the SDR-IQ

Figure 2. The back panel of the SDR-IQ

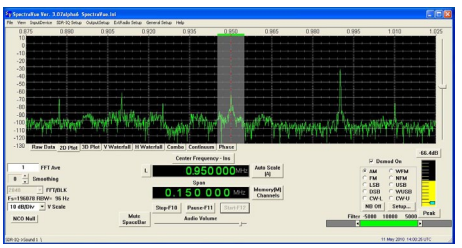

Figure 3. A traditional spectrum analyzer view. This is a 150 kHz slice of the AM broadcast band in Denver, CO, with the center signal showing a High-Def audio station at 950 kHz. The carrier, normal sidebands and digital subbands are clearly visible.

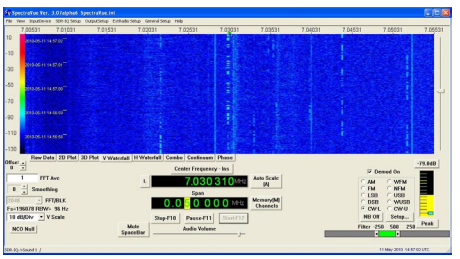

Figure 4. A "vertical waterfall" view. This is a 50 kHz slice of the 40M amateur CW band. Several CW stations can be seen, and the Morse characters are clearly visible. The yellow characters along the side are time stamps.

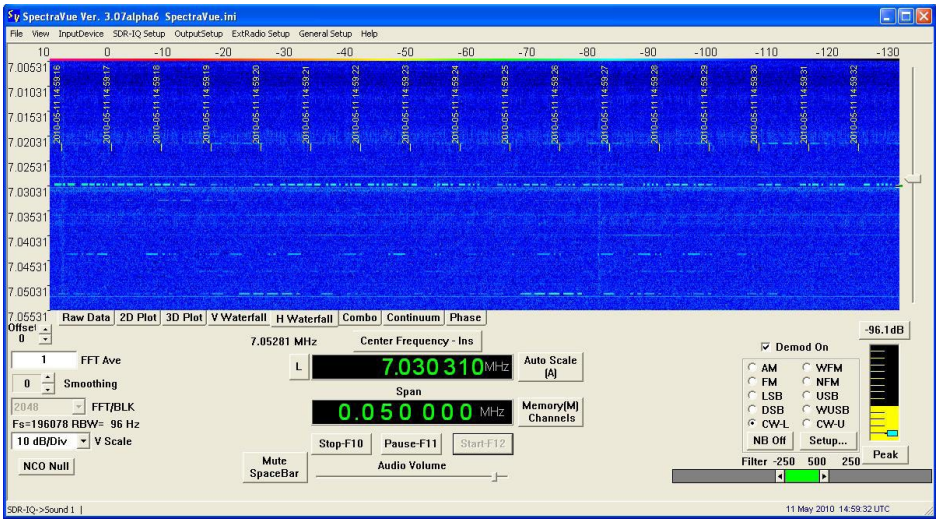

Figure 5. A "horizontal waterfall" view. This is the same slice of 40M as in Figure 4, but viewed horizontally.

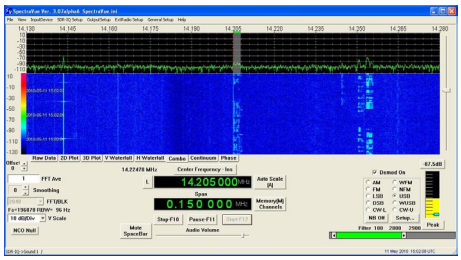

Figure 6. A combination spectrum analyzer and vertical waterfall view. This is a 50 kHz slice of the 20M amateur phone band. The spectral content of the voice is clearly visible. One can even tell whether the operator is using a microphone tailored for DX (more high frequency content) or ragchewing (more low frequency content).

to control other radios, although it can also do so directly from the PC via any available COM port, as we will shortly see.

The SpectraVue software provides several views of the spectrum:

Traditional spectrum analyzer. This mode is what most users are probably familiar with, since many ham rigs have panadapters that display information about the band in use in this fashion. (Fig. 3)

Vertical waterfall. This is a display mode most common in PSK31 and other digital modes. (Fig. 4)

Horizontal waterfall. If looking at CW sideways bothers you, try this view! (Fig. 5)

Combination spectrum analyzer/waterfall (Fig. 6)

There are several fairly complicated setup screens, but the defaults are usually sufficient until you need to use the more esoteric functions (recording spectrum for later playback, selecting palettes, etc.)

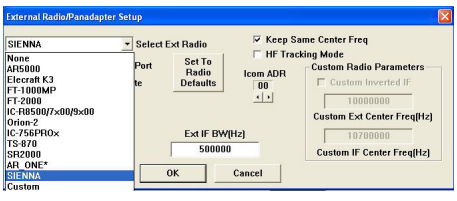

Figure 7. Several radios are supported by SpectraVue software.

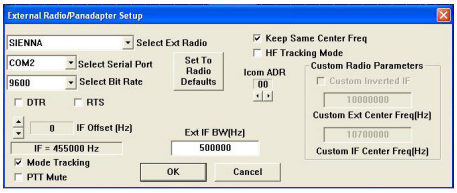

Figure 8. A complete view of the external radio setup screen, showing the COM port, baud rate, DTR/RTS selections, IF data, Mode tracking and PTT Mute functions.

❖ Tracking Panadapter

Although the SDR-IQ is a fully functional receiver all by itself, when coupled with a radio, it makes a nice panadapter. Supported radios are selected from a drop-down dialog box as shown in Figure 7. Once the desired radio is selected and a COM port and baud rate is chosen (Figure 8), this window can be closed and rig control functions are then handled automatically. The SDR-IQ can be connected to an external radio in one of two ways – from the RS-232 port on the back panel, or via a PC COM port. If the radio has a built-in PC, you can select the internal COM port that controls the radio and not even have to connect an external cable between the PC and the radio.

You can use the SDR-IQ with non-

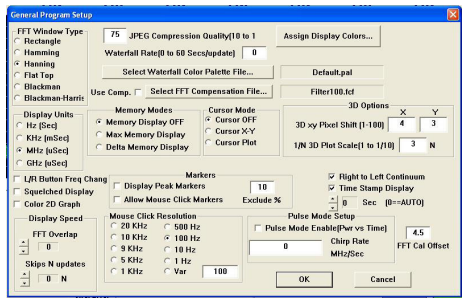

Figure 9. General setup. This is best left for experts.

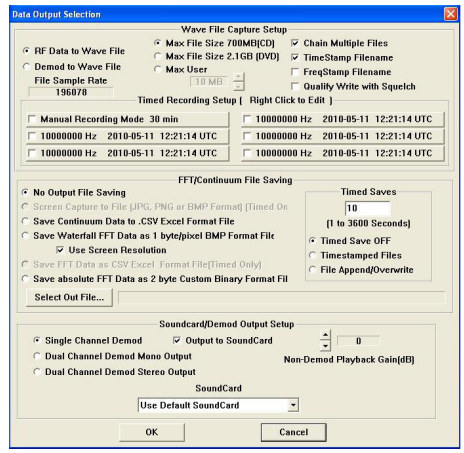

Figure 10. If you want to save data to disk for playback later, this screen gives you a lot of control over the formatting.

supported radios by selecting "Custom" and entering the IF frequency used by that radio, but the display has no way of knowing the actual tuned frequency in that case, so it displays the IF frequency. It also can't change the frequency of the rig.

❖ Setup Screens

Figure 9 shows the general setup screen. As you can see, there's a lot of information there, much of which is not needed in general use. The output setup screen (Figure 10) is useful if you want to save any captured information to disk for later playback. This can be very useful for those who may want to demo the radio at a time when the bands are dead or when there's no antenna available.

❖ Impressions

I found the SDR-IQ a fun receiver to use. I must admit, when I started, I was not a big fan of spectrum displays. I figured that I'd spend a lot of time getting mesmerized by the cool display and forget to actually operate the radio.

And I did do that, but it really does grow on you. I found myself watching SSB signals and trying to figure out what kind of microphone was being used based on whether I saw more high frequency response (such as you would want for DXing) or more mid-range response (such as you typically use for ragchewing).

I also watched some digital AM broadcasts, seeing both the normal AM signal and the digital sidebands.

Mostly, it was fun seeing a really big signal pop up, clicking on it, and having the radio it was connected to jump to that frequency. When a "blip" was heard, I could clearly see it traversing the entire band, as if someone was sweeping a VFO with the transmitter on. Band conditions were easily seen as a higher or lower noise floor.

All in all, I would give this radio a thumbs-up for ease of use, performance, flexibility and cost.

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MONITORING MILITARY COMMUNICATIONS

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Profile: US Navy Training Wings Five and Six

This month the Blue Angels will be performing at the Naval Air Station in Pensacola, Florida, their home base of operations. But there is more to NAS Pensacola than the Blues. Pensacola and its neighboring base, NAS Whiting Field, are home to two of the U.S. Navy Aviation Training Wings – TAW Five and Six.

If you are heading to Pensacola for the show and would like to monitor some of the other activity in the area, this month we have a profile of those two wings and their frequencies.

❖ Training Air Wing Five

Training Air Wing Five is located five miles north of Milton, Florida, on board Naval Air Station Whiting Field. The wing is comprised of three primary fixed-wing and three advanced helicopter squadrons, and it trains aviators from the Navy, Marine Corps, Coast Guard, Air Force, and allied nations. This wing is responsible for an estimated 43 percent of the Chief of Naval Air Training Command's total flight time and over 11 percent of Navy and Marine Corps' flight time world-wide. Over 1,200 personnel complete their essential flight training here annually.

TAW-5 Common Frequencies (Fixed Wing/Helicopter)

Whiting North Field Operations (NSE)

306.925/121.400	North Whiting Tower
251.150	North Whiting Ground
341.850	Formation Common
303.150 (1), 254.900 (2), 299.500 (3)	Area Common Frequencies
269.425	Barin Field Radio
257.975	Brewton Radio
380.800	Choctaw Radio/Tower
254.350	Evergreen Radio
264.200	Holley Radio
321.800	Saufley Radio
384.100	Summerdale Radio
345.200	Silverhill Radio
238.000	Wolf Field Radio
274.700	Night Common

Whiting South Field Operations (NDZ)

348.675/121.400	South Whiting Tower
346.800	South Whiting Ground
253.100	HITU
303.600	HT-8 FDO
255.100	HT-18 FDO
121.950	Instructor Common
237.900	Harold Crash
250.000	Pace Crash
361.100/361.900	Santa Rosa Crash
251.300	Site 8 Crash
358.800	Spencer Crash

Other TAW-5 commonly used frequencies:

122.800	Atmore (Airfield is Emergency use only) (0R1)
340.100	Contract Maintenance (NSE)
133.200/290.425	Duke Field Tower (EGI)
124.050/393.000	Eglin Approach (Crestview RI Advisory Area)
273.750	FITU/Spiral Base
123.000	Florala CTAF (0J4)
126.500/291.100	Hurlburt Field Tower (HRT)
346.400/120.200	Jax Center PNS Sector UHF (handles North MOA)
122.950	Mobile Downtown Air Center (BFM)
118.800/251.100	Mobile Downtown Tower (BFM)
123.000	Monroeville CTAF (MVC)
267.600	NAS Pensacola ATIS (NPA)
336.400	NAS Pensacola Ground (NPA)
120.700/340.200	NAS Pensacola Tower "Sherman Tower" (NPA)
233.700	NASWF ODO
122.950	Pensacola Aviation Center (PNS)
119.900/257.800	Pensacola Regional Tower (PNS)
371.900	Pensacola North MOA Common (monitored by Jax Center) (PNSN)
309.800	Pensacola South MOA Common "Gator Common" (PNSS)
307.375	RI Common (Crestview)
274.700	RI Common (Saufley, Monroeville, Whiting, Brooklyn, Gateswood) & Night Common
282.800	SAR Common
350.150	VT-2/Blackbird Base
342.800	VT-3/Red Knight Base
355.550	VT-6/Shooter Base
233.700	Whiting Base Operations/ODO
316.950	Whiting Metro
238.000	Wolf Radio

TAW-5 Fixed Wing Aircraft Frequencies Presets

Ch	*Frequency*	*Usage*
1	251.150	North Whiting Ground (NSE)
2	306.925/121.400	North Whiting Tower (NSE)
3	278.800/127.350	Pensacola Departure
4	269.375/119.000	Pensacola Approach (Southeast)
5	291.625/126.850	Pensacola Approach (North)
6	341.850	Formation Common
7	303.150	Area 1 Common
8	254.900	Area 2 Common
9	299.500	Area 3 Common
10	348.675/121.400	South Whiting Tower (NDZ)
11	257.775	North Whiting Clearance Delivery (NSE)
12	257.975/122.725	Brewton Radio (12J)
13	380.800	Choctaw Tower (NFJ)
14	264.200	Holley Radio (NKL)
15	254.350/122.700	Evergreen Radio (GZH)
16	321.800	Saufley Radio (NUN)
17	384.100	Summerdale Radio (NFD)
18	345.200	Silverhill Radio (NQB)
19	269.425	Barin Radio (NBJ)
20	290.325	North Whiting ATIS (NSE)

TAW-5 Helicopter Presets

Ch	*Frequency*	*Usage (UHF/VHF)*
1	273.575/121.950	South ATIS/Instructor Common
2	355.600/121.400	Clearance Delivery/South Tower
3	346.800/124.050	South Ground/Eglin Approach
4	348.675/135.150	South Tower/Pensacola Approach East Area Monitor
5	303.600/124.850	HT-8 (Eight Ball)/Pensacola Approach (NDZ)
6	255.100/119.000	HT-18 (Factory Hand)/Pensacola Approach (PNS)
7	250.000/118.600	NOLF Pace 1/Pensacola Approach West
8	358.800/119.900	NOLF Spencer/Pensacola Tower (PNS)
9	361.100/122.000	NOLF Santa Rosa/Flight Watch
10	237.900	NOLF Harold
11	251.300	NOLF Site 8
12	308.200	Western Area Common
13	384.300	Green/Red Route
14	262.700	Black/Orange Route
15	377.100	Purple Route
16	274.400	HLT-LX-514 (Bay Lander)
17	380.400	Primary Formation Common
18	328.200	Secondary Formation Common
19	385.400	Pensacola Approach (NDZ)
20	389.100	Eastern Op Area/Egin Monitor

❖ Training Air Wing Six

Training Air Wing Six trains and graduates approximately 450 United States Navy, Marine Corps, Air Force, and international students annually. Students from Germany, Italy, Saudi Arabia, and Singapore represent approximately ten percent of the total student population in this squadron.

Currently, they have 20 T-39 "Sabreliners", nine USAF T-1A "Jayhawks", 40 T-6A "Texan II", and eight T-45 "Goshawks" aircraft in their inventory.

TAW-6 T-6 Aircraft Presets

Ch	*Freq*	*Usage (UHF/VHF)*
1	267.600/123.475	NAS Pensacola ATIS (NPA)/Discrete
2	268.700/134.100	NAS Pensacola Clearance Delivery (NPA)
3	336.400/121.700	NAS Pensacola Ground (NPA)
4	340.200/120.700	NAS Pensacola Tower (NPA)
5	372.000/120.050	Pensacola Approach/Departure
6	270.800/120.650	Pensacola Approach/Departure
7	314.000/125.350	Pensacola Approach
8	239.050/121.250	Ground Controlled Approach (GCA)/Pensacola Regional ATIS (PNS)
9	305.200/119.900	GCA/Pensacola Regional Tower (PNS)
10	318.800/135.575	GCA/Mobile Downtown ATIS (BFM)
11	285.625/118.800	GCA/Mobile Downtown Tower (BFM)
12	348.725/123.000	GCA/Monroe County CTAF (MVC)
13	383.800/128.250	GCA/NAS Pensacola GCA (NPA)
14	288.325/124.750	GCA/Mobile Regional ATIS (MOB)
15	303.150/118.900	Area 1 Common/Mobile Regional Tower (MOB)
16	309.800/121.900	Gator Common – South MOA/Mobile Regional Ground Control (MOB)
17	380.800/121.400	Choctaw Tower
18	333.300/125.000	VNAV Tactical/Acadiana Regional Tower (ARA)
19	355.400/121.700	VT-10 Base/Acadiana Regional Ground (ARA)
20	360.400/122.800	VT-4 Base/Fairhope CTAF

Manual Dial Ups

269.425	Barin Radio
257.975/122.725	Brewton Radio
254.350/122.700	Evergreen Radio
345.200	Silverhill Radio
384.100	Summerdale Radio
274.700	Night Common
254.900	Area 2 Common
299.500	Area 3 Common
362.800	Form - Mobile Bay
254.250/124.600	Gulfport Approach
371.900	North MOA Common
346.400/120.200	North MOA Requests (Jax Center)
123.050	Foley CTAF
122.800	Bay Minette CTAF
122.700	Jack Edwards CTAF
122.800	Trent Lott CTAF

❖ Major Frequency Changes in Houston

Recently I received via email noting some official frequency changes for the Houston Air Route Traffic Control Center (ARTCC) in Texas. Houston center (FAA identifier ZHU) is located at George Bush Intercontinental Airport at 16600 JFK Boulevard. Houston ARTCC is one out of 22 Air Route Traffic Control Centers in the United States. The center controls airspace

in southern Texas, Louisiana, southern Mississippi, southwestern Alabama, and areas in the Gulf of Mexico.

Houston Center has 175,000 square miles of domestic airspace, and 110,000 square miles of oceanic airspace in the Gulf of Mexico. Houston Center also controls some 40,000 square miles of offshore airspace for IFR helicopter operations. The Center has 18 major military installations in its airspace. Some of these provide pilot training requiring many complex military operating areas (MOAs).

Some of the major frequency changes made recently involve offshore communication sites in the Gulf. When aircraft are 150 nautical miles or more away from shore, they lose radio contact with the air traffic control systems in the U.S. and other nations surrounding the Gulf. That leaves a large portion of the central Gulf without voice communication.

To provide for a complete VHF coverage of the Gulf of Mexico at the altitudes of 18,000 feet and above, the FAA entered into an agreement with National Data Buoy Center for a Buoy Communications System (BCS) manufactured by Harris Corporation. This system uses 12-meter diameter buoys located in the Gulf of Mexico.

The buoy-mounted communications system communicates with aircraft via standard FAA VHF/AM transceivers operating on air traffic control frequencies and with the ARTCC in Houston via a satellite link, providing direct, real-time communications between aircraft and controllers. These buoys are powered by solar panels and include a backup generator. You will see those sites marked in our frequency list in table one with the abbreviation "OG."

Table One is the best information we have to date for the various Houston center remote center air/ground (RCAG) frequencies, and updates would be appreciated.

And that will do it for this month's Milcom column. Until next month, 73 and good hunting.

TABLE ONE: HOUSTON ARTCC (ZHU)

126.625	Flight Watch – High Altitude
321.300	High Altitude: Special Use TSU (Designator is Amber-06)

Mobile Alabama

125.775/322.400	High Altitude
127.650/288.150	Low Altitude Discrete
132.600/387.050	Low Altitude
277.400	Low Altitude For T38 Military Aircraft Use

Alexandria Louisiana

120.975/299.600	Low Altitude Discrete
132.700/348.750	High Altitude
288.100	Low/High Altitude

Grand Isle Louisiana

132.175	Low/High Altitude
132.650/251.050	Low/High Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)
134.900/290.450	Low Altitude Discrete
135.775/353.550	Low/High Altitude Oceanic (Offshore Gulf)
370.900	High Altitude

Houma Louisiana

132.650	Low/High Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)

Intracoastal City Louisiana

120.350	Low Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)

Lacombe Louisiana

121.025/317.775	Low Altitude Discrete
126.550	Low Altitude Discrete
126.350/338.250	Low Altitude Discrete
126.875/327.050	High Altitude Discrete

Lafayette Louisiana

126.350/338.250	Low Altitude Discrete
133.650/263.100	High Altitude
134.425/335.525	Ultra-High Altitude Discrete

Lake Charles Louisiana

124.700/317.400	Low Altitude Discrete
132.950/360.650	High Altitude Discrete

Vermilion Louisiana

120.350	Low Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)

Hattiesburg Mississippi

119.725/285.600	High Altitude Discrete
126.800/327.800	Low Altitude Discrete (W-453/Eagle G)

McComb Mississippi

126.800/327.800	Low Altitude Discrete (W-453/Eagle G)
343.950	Low Altitude Discrete

Natchez Mississippi

120.975/299.600	Low Altitude Discrete

Atlantis OG

120.350	Low Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)
132.650	Low/High Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)
134.900	Low Altitude: Oceanic (Offshore Gulf)
135.775	Low/High Altitude Oceanic (Offshore Gulf)

Boxer OG

120.350	Low Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)
132.650	Low/High Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)

East Breaks OG

133.400	Low Altitude: Oceanic (Offshore Gulf)

East Cameron OG

120.350	Low Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)

Eugene Island OG

120.350	Low Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)
132.650/269.550	Low/High Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)

High Island OG

132.650	Low/High Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)

Independence OG

134.900	Low Altitude: Oceanic (Offshore Gulf)
135.775	Low/High Altitude Oceanic (Offshore Gulf)

Sarita OG

133.400	Low Altitude: Oceanic (Offshore Gulf)

South Timbalier OG

134.900/290.450	Low Altitude: Oceanic (Offshore Gulf)
135.775/251.050	Low/High Altitude Oceanic (Offshore Gulf)

Tick OG

120.350	Low Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf
133.400	Low Altitude: Oceanic (Offshore Gulf)

Virgo OG

134.900	Low Altitude: Oceanic (Offshore Gulf)

Austin Texas

125.650/273.550	Low Altitude Discrete
126.425/371.850	High Altitude Discrete
132.150/279.600	Low Altitude Discrete

Beaumont Texas

123.825/279.625	High Altitude Discrete
126.950	Low Altitude Discrete
133.800	Low Altitude Discrete
351.800	Low Altitude Discrete
363.050	Low Altitude Discrete

Cameron County Texas

132.650	Low/High Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)
133.400	Low Altitude: Oceanic (Offshore Gulf)

College Station Texas

120.400/371.900	Low Altitude Discrete
123.725/319.150	High Altitude Discrete
125.150	Low Altitude Discrete
128.075	Low Altitude Discrete
134.800	Low Altitude Discrete
269.600	Low Altitude Discrete
307.800	Low Altitude Discrete
322.550	High Altitude Discrete

Fredericksburg Texas

128.650/363.250	High Altitude Discrete
134.200/307.300	Low Altitude Discrete

Galveston Texas

132.650/269.550	Low/High Altitude: Oceanic Control in Gulf of Mexico (Offshore Gulf)
133.800/351.800	Low Altitude Discrete

Galveston A Texas

133.400/306.300	Low Altitude: Oceanic (Offshore Gulf)

Houston Texas

126.350	Low Altitude
134.350/269.000	High Altitude
269.500	High Altitude
281.500	High Altitude
307.200	High Altitude

Kerrville Texas

134.950/269.400	Low Altitude Discrete

Kingsville Texas

128.150/350.300	Low Altitude Discrete
133.750/354.000	High Altitude Discrete
269.300	High Altitude

Laredo Texas

126.100/319.100	Low Altitude Discrete
127.800/307.200	Low Altitude Discrete
133.750/354.000	High Altitude Discrete
375.825	High Altitude

Lometa Texas

132.350/317.500	Low Altitude Discrete
372.000	Low Altitude

Lufkin Texas

125.175/285.575	Low Altitude Discrete
126.950/363.050	Low Altitude Discrete
132.775/335.650	High Altitude Discrete
134.800/269.600	Low Altitude Discrete

Newton Texas

128.175/353.850	High Altitude Discrete
133.575	High Altitude Discrete
134.800/269.600	Low Altitude

Palacios Texas

128.600/279.600	Low Altitude Discrete

Rock Springs Texas

125.750/346.400	Low Altitude Discrete
132.400/299.200	High Altitude Discrete
267.900 322.700 324.300	High Altitude (For T-38 Use)

Rockport Texas

128.150/350.300	Low Altitude Discrete
322.150	Low Altitude

San Antonio Texas

125.250/354.000	High Altitude Discrete
132.800/343.700	Low Altitude Discrete
251.075	Low Altitude
306.900	Low Altitude: For T38 Military Aircraft Use (Randolph AFB)

San Antonio A Texas

239.375	High Altitude: Special Use User Preferred Trajectories (UPT)
254.375	High Altitude
301.400	High Altitude: For T38 Military Aircraft Use

Sealy Texas

126.425/371.850	High Altitude Discrete
128.600/360.800	Low Altitude Discrete
132.150/279.600	Low Altitude Discrete

Three Rivers Texas

134.600/322.500	Low Altitude Discrete

Uvalde Texas

126.100/319.100	Low Altitude Discrete
134.950/269.400	Low Altitude Discrete

Victoria Texas

124.725/291.750	High Altitude Discrete
135.050/353.600	Low Altitude Discrete

AR-108 (East/West) Aerial Refueling Track

132.650	ARCP/KC-10
133.400/306.300	ARCP/Exit
133.850/269.500	Exit/ARCP

AR-167 (North/South) Aerial Refueling Track

323.100	Exit/ARCP
380.200	ARCP/Exit

AR-302 (East) Aerial Refueling Track

288.150 322.400	Exit

AR-302 (East/West) Aerial Refueling Track

285.600 327.800	ARCP

AR-302 (West)

299.600 348.750	Exit

AR-313A (North/South) Aerial Refueling Track

288.100	ARCP/Exit

AR-614 Aerial Refueling Anchor

385.550	ARCP/Exit (I believe this frequency has changed, but have not locked down the new one)

FED FILES

GOVERNMENT COMMUNICATIONS

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Delivering the Frequencies - The U.S. Postal Service

In our world of electronic communications with messages being delivered at the speed of light, the traditional role of the United States Postal Service is starting to change. The agency has been in the news headlines lately due to increasing costs and possible cutbacks in delivery service. Some have wondered if the iconic image of the mailman delivering your letters and packages may be starting to fade into history.

Even with all of these changes, the Postal Service remains a federal agency firmly rooted in history. The Postal Service is one of the few federal government agencies explicitly mentioned in the U.S. Constitution. The Postal Reorganization Act of 1970 reorganized the Post Office from a cabinet level federal office to a corporate-like, independent federal agency. It does not receive tax dollars for its operations, so it is supposed to be self-sustaining, which means it should be able to pay for its own operations. But it still does answer to Congress when it requires postal rate changes and additional funding.

Postal operations often use federal radio frequencies for communications, particularly at the various postal facilities and truck terminal operations. Frequencies can vary throughout the country and can be simplex or a repeater. And, in some cases, the Postal Service may even be using a commercial radio service such as cell phone, Nextel or SMR radios for its on site communications.

You probably won't hear your local postal route delivery trucks using radios – at least I've never heard of any. But any of the large sorting, shipping, or Postal Bulk Main Facilities (BMF) used by the USPS will have some sort of radios. Many larger cities have radio equipped service vehicles such as tow trucks and mobile repair trucks to support the delivery vehicles in the Post Office fleet.

Airports are also a possible location where the Postal Service might be using radios. For example, I have found **166.3750 MHz** active at Chicago's O'Hare airport with postal vehicles moving around the airside ramps picking up and dropping off mail to the airlines.

Some scanner listeners have compared Postal Service communications to watching paint dry, but they do have quite a few potential frequencies that they can use. Much of the routine traffic can be pretty dull, I will admit, but some of the USPS radio channels are used for criminal investigations and security operations. I will focus more on those later in this column.

So let's get down to the frequencies. Here is a list of confirmed frequency allocations available to the US Postal Service:

162.2250	170.5750	409.3750
162.2500	170.6000	409.4500
162.5875	170.7750	409.5250
162.6125	170.9000	409.5500
163.0000	171.0000	409.6375
163.0250	171.1500	409.6500
163.0500	171.2625	409.7750
163.0750	171.3875	409.8250
163.1250	171.5000	409.9000
163.1750	171.6250	409.9375
163.3750	171.9750	410.0000
164.1000	172.3000	410.0250
164.1750	172.5000	410.2000
164.2000	173.0000	410.3250-Nationwide
164.3250	173.6125	410.3500
164.3500	173.6375	411.2750
164.4250	173.6875	411.3500
164.6000	173.7375	411.4000
164.6250	173.7875	411.4500
164.7000	173.8375	411.5000
164.8250	173.9375	411.5500
164.9125	173.9625	411.5750
164.9625		411.6250
164.9875	406.1125	411.6500
166.0500	406.2250	411.7750
166.2000	406.2500	412.0000
166.2250	406.3500	412.0250
166.2500	406.3250	412.2750
166.2750	406.3375	412.3500
166.3000	406.3750	412.4750
166.3500	406.3875	412.7500
166.3750	406.4750	413.5750
166.6125	406.6625	413.6000
166.9250	406.8125	413.6250
166.9500	406.9750	413.7000
166.9750	407.1375	413.8000
167.1250	407.1500	413.8250
167.8500	407.1750	414.1500
168.0000	407.2750	414.3250
168.2250	407.5500	414.3625
168.2750	407.6500	414.4000
168.3250	407.7250	414.4250
168.5000	407.7750	414.4500
168.5250	408.0000	414.6250
169.0000	408.0250	414.6500
169.1000	408.0500	414.7250
169.1125	408.1000	414.7500-Nationwide
169.1750	408.1250	414.7625
169.2250	408.1500	414.9750
169.2750	408.1750	415.0500-Nationwide
169.3750	408.3375	415.1500
169.5750	408.4250	415.3250
169.6000	408.4750	415.3375
169.6250	408.5250	415.3500
169.6500	408.5750	415.3750
169.8500	408.6250	415.3875
169.9000	408.8250	415.4500
170.1250	409.0250	415.4750
170.1500	409.1000	416.7250
170.1750	409.1750	416.7750
170.3500	409.2000	417.3375
170.3750	409.2750	417.7000
170.4000	409.3000	418.3000
170.5000	409.3500	

❖ Postal Inspection Service and Postal Police

Now that we have a good overview of the frequencies used by the Postal Service, let's focus on the law enforcement division of the USPS, the Postal Inspection Service (**www.usps.com/postalinspectors/**). The Postal Inspection Service is the nation's oldest federal law enforcement agency, having been established in 1772 by Benjamin Franklin. Today there are almost 2000 Postal Inspectors stationed across the United States, investigating crimes involving the mails and postal employees.

For many years the Postal Inspection Service (PIS) has used multiple UHF channels in the 406-420 MHz federal frequency band for their operations. I once caught a conversation over their airwaves that indicated the PIS radios carried over 120 channels of programmed frequencies for use around the country.

A few years ago, the PIS started re-channeling their radios with new frequencies and added APCO P-25 digital to the line-up. Postal Service frequencies also now follow the National Telecommunications Information Administration (NTIA) 9 MHz repeater offset plan, where the repeater input frequency is 9 MHz from the repeater output. They have also organized a national dispatching system referred to as NLECC or National Law Enforcement Control Center. There are two Postal Service Control Centers around the country, one located in Dulles, Virginia and the other in Fort Worth, Texas. This appears to be similar to the Federal Protective Service's "Mega Centers" that monitor alarms and dispatch for many different cities.

At one time there didn't seem to be a standard channel plan in place, but since then things have settled down and a plan has emerged. Prior to these latest frequency changes, the uniformed Postal Police were often heard using **418.3000 MHz/416.7750 MHz** for their operations. This frequency may still be in use in some areas, but for the most part the Postal Police now are dispatched on the same frequencies as the Postal Inspectors.

As you program these frequencies into your scanner, be aware that the Postal Inspection Service has apparently programmed these P-25 frequencies in the radios with the encryption

mode "strapped" on. In other words, the channels are full-time encrypted by default. That doesn't mean that everything on these frequencies will always be encrypted, but most traffic will be and cannot be monitored.

As of the writing of this column, the PIS radio systems in some areas are still in transition from analog to digital, so the current radio channels are available to their users in both analog and digital modes. Here is a confirmed list of Postal Inspection Service and US Postal Police radio channels:

Channel Name	Frequency, P-25 NAC (Network Access Code)
EMRG REPEATER	408.3375 MHz, N293
SPECIAL OPS	414.7625 MHz, N293 (simplex)
TACTICAL	415.0500 MHz, N293
BASE	414.7500 MHz, N482
RED	406.3375 MHz, N482
WHITE	407.7250 MHz, N482
BLUE	407.7750 MHz, N482
GREEN	407.1375 MHz, N482
BLACK	409.9375 MHz, N482
ABLE	414.7500 MHz, N483 (simplex)
BAKER	414.7500 MHz, N484 (simplex)
CHARLIE	414.7500 MHz, N485 (simplex)
DELTA	414.7500 MHz, N486 (simplex)
ECHO	414.7500 MHz, N487 (simplex)
FOXTROT	414.7500 MHz, N488 (simplex)
USPS	414.3625 MHz, CSQ (analog – simplex)

Of particular interest is the "Emergency Repeater" channel of 408.3375 MHz. This frequency has been heard in use at many of the National Security Special Events, such as Super Bowls and such. The traffic has been encrypted full time, as most of the PIS activity usually is, so positive ID has not been confirmed. The Postal Inspection Service has had their mobile command posts at these events, so I am fairly confident that these mobile command units have been using this frequency.

The last channel in the list, 414.3625 MHz, is a bit of a mystery. Activity on this frequency has not been reported previously. Please let me know if you come across any activity on this channel.

❖ The New TSA Radios

In case you have missed the postings on the *Fed Files* blog page (**http://mt-fedfiles.blogspot.com/**), there have been some changes to the Transportation Security Administration communications arsenal since the first of the year. Shortly before January 1, 2010, listeners were starting to report hearing the TSA security checkpoints using their same VHF frequencies, but in analog mode and using voice inversion scrambling.

This was quite a shock at first, because prior to this, the TSA has utilized APCO P-25 digital radios, sometimes with encryption. The Internet was buzzing with all sorts of questions concerning this apparent change to analog radios. Let's see if we can try to find some answers.

First, we have to go back to fall of 2008, when a request for bids on a new federal contract for 20,000 new radios went out from the TSA. It seems that the agency was trying to cut down on the noise and stress levels that seemed to occur at busy security checkpoints. In many cases, the checkpoint personnel had to shout at each other if they needed assistance or wanted to point out possible security risks. Someone decided that giving each TSA agent at the checkpoint a radio on a common channel would allow him or her to talk to each other with some level of privacy, rather than yell across the crowds.

Initially many thought that these new radios were going to possibly replace the original Motorola XTS digital radios that the TSA has been using since the agency first came into existence in 2002. However, since the new radios have been deployed, it is apparent that the digital radios are not being replaced. Just more radios were being issued to personnel that previously had not carried radios.

The newly issued transceivers are all Icom F-50 VHF model radios that include voice-inversion scrambling as a standard feature. The small size, light weight and audio scrambling capabilities were all part of the original bid specifications. They apparently are using a low-power setting, as the signals don't seem to travel very far, even within the airport terminals.

But what about this voice scrambling and these new radios? I consider this "scrambling" and not "encryption." There are methods of inversion scrambling that do add some encryption to the signal, thus making it more secure, but these F50 radios are using simple frequency inversion. This certainly adds some privacy from the average eavesdropper, but some relatively inexpensive hardware or even computer programs can monitor audio inversion. Some model scanners have even included inversion de-scrambling capabilities.

So what frequencies are these new radios using? Let's take a moment to review the standard TSA radio plan that has been in use at most airports in the US since the TSA came into existence:

01-172.1500 MHz = S1 simplex, NAC 001
02-172.1500 MHz = S1 simplex, NAC 002
03-172.1500 MHz = S1 simplex, NAC 003
04-172.1500 MHz = S1 simplex, NAC 004
05-172.9000 MHz = S2 simplex, NAC 002
06-169.3000 MHz = S3 simplex, NAC 009
07-172.9000 MHz = R1 repeater (169.300 input), NAC 001
08-172.9000 MHz = R1 repeater (169.300 input, NAC unknown)
09-172.9000 MHz = R1 repeater (169.300 input, NAC unknown)
10-172.9000 MHz = S2 simplex
11-172.9000 MHz = S2 simplex
12-166.4625 MHz = F1 simplex, analog with 103.5 CTCSS
13-166.4625 MHz = F1 simplex, NAC unknown, possibly N293

The frequencies of 169.1625 MHz & 165.0750 MHz do not show up in this channel plan, but they are confirmed and are in use at several airports, including DFW Airport and Chicago's O'Hare Airport. These additional frequencies were apparently added due to fears of frequency congestion in cities with multiple commercial airports in the area.

It appears that the new radios are using the same frequencies currently in the TSA channel plan, but in the analog mode. All channels are using a CTCSS "squelch tone" to eliminate having them hearing the P-25 digital transmissions that might be occurring on the same frequencies. We haven't yet detected a standard channel plan for these new radios, but here is a short list of what I have confirmed during my travels across the country:

Chicago (ORD)	165.0750 MHz, 131.8 PL
	169.1625 MHz, 123.0 PL
	172.1500 MHz, 123.0 PL
Dallas/Ft. Worth (DFW)	169.9125 MHz, 123.0 PL
Indianapolis (IND)	169.3000 MHz, 136.5 PL
	172.1500 MHz, 146.2 PL
	172.9000 MHz, 151.4 PL
Oakland (OAK)	169.1625 MHz, 131.8 PL
Portland (PDX)	169.3000 MHz, 146.2 PL
	172.1500 MHz, 123.0 PL
St. Louis (STL)	172.1500 MHz, 123.0 PL
Salt Lake City (SLC)	172.1500 MHz, 123.0 PL

I haven't made it to every TSA checkpoint yet, so if you have confirmed some of the analog TSA channels at your airport, please pass them along to *The Fed Files* at *Monitoring Times*.

That's all for this month – I'll be back in September with more news from the *Fed Files*.

BOATS, PLANES, AND TRAINS

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Summer Boating by Radio

English River, this is the Canadian Enterprise. Just thought you might want to know there is quite a sea running at the dock. We are going to get underway if the wind will let me get off the dock but will probably go to anchor due to

The *Canadian Enterprise* was just warning the *English River* about the weather situation at Bath as she tried to leave and the English River attempted to dock. We had had winds approaching 80 km/h and the seas had been forecast for up to 5 metres on Lake Ontario. This is just one example of the interesting traffic you can hear on the VHF marine channels.

In southern Ontario, of course, radio traffic practically ceases once it freezes up, but the summer brings a lot of interesting traffic. As the yachts get launched, the commercial shipping season starts on the St. Lawrence Seaway, and when the Coast Guard Cutter Cape Hearne resumes active duty the radio traffic increases significantly.

The most important channel is still channel 16, as it is the emergency and calling channel. As DSC becomes more active, channel 70 will be monitored more and more. However, all Mayday situations will still be in voice on channel 16.

Channels 10, 11, 12 13 and 14 are used for ship traffic control in this area. They are commonly used in most major port areas. However, there are many channels used by marine interests, and these depend on the location you are in. For instance, all Canadian marinas in this area use channel 68. The Seaway pilot station in Cape Vincent uses channel 14 to contact freighters as they enter the area. Some of the ship to shore channels are also used. Our local Coast Station, VBR Prescott, uses channels 24, 26 and 85 for this purpose.

Listings for the channels used by Coast Stations can be readily found on the internet just by using a search engine and the coast station's name or call sign. Just listening in on channel 16 will provide many of the channels used locally, as mariners shift off channel 16 after making contact.

The Coast Guard uses channels that are reserved for them. In this area the Canadian Coast Guard uses channels 82A and 65A, while the United States Coast Guard can be heard on channels 21A, 22A 23A and 81A.

The best way to find the channels used in your local area is to scan the marine VHF frequencies. This can be done with a scanner or a marine radio which has a scan feature. Once you get the local frequencies in use, you can program the radio accordingly. However, once in a while return to a general scan to see if you find channels that you have missed.

If you use a scanner, program two scan ranges. First, program the "A" frequency range from 156.05 to 157.425 MHz and scan it. You will find the majority of channels in use in your area here. Then program the "B" channel range from 160.65 to 162.025 and scan it. You will most likely discover the ship to shore channels used here.

Be sure to scan the whole marine VHF spectrum, because various marine interests use some of the simplex channels for their own business. In a busy port area you may discover several channels for ferries, tour boats, water taxis, etc. One of our local tour lines uses channel 7A, for example.

You may note signals on 161.975 and 162.025 MHz. These are now the digital channels for the AIS (Automatic Identification System) used on all commercials vessels and some private vessels.

Remember that the ship to shore channels are duplex channels with the ship in the A range and the shore station in the B range. You need to program both frequencies into your scanner to hear the whole conversation. On a marine radio you will only hear the shore station, as the ship is transmitting on a different frequency from the one you are listening on.

I use my scanner to pick up the ships and have a smaller, older scanner for the shore station. Since they are usually close and powerful, often a whip antenna will pick up the shore station transmission.

❖ U, I, C, A, B? ... Huh?

Remember to make use of the settings on your marine radio marked U, I and C. "I" stands for International, meaning that these channel frequencies are identical world-wide. "U" stands for United States and "C" stands for Canada.

The U and C settings will vary from the International frequencies. Some of the international duplex channels become simplex channels. That means that you can transmit and receive on the same frequency. For example, the St. Lawrence Seaway uses channel 83A, 157.175 MHz for emergency traffic. On your marine radio you would have to be listening to the U or C settings to hear this, as channel 83 is a duplex channel in the "I" setting. Channel 83B, 161.775 MHz, is actually a Canadian Continuous Weather broadcast channel. That is why you scan the B frequencies as well, as some of these may also be used in your area.

All marine radios sold in the United States or Canada come with a manual which shows which channels change from Duplex to Simplex. Many of the new radios will display the letter "A" beside the channel number as a reminder that you are in U or C mode and you are receiving a simplex channel.

On an older radio, you can confirm the setting by how the channel is used. In my area, if I hear weather on channel 83, then I am on the International setting. In the United States the Coast Guard gives their broadcasts on channel 22A, 157.1 MHz. If you hear the Coast Guard announce a broadcast on channel 16 and you can't hear them when you switch to channel 22, you are likely on the International Setting.

In the United States or Canada I recommend you leave the marine radio on the country's setting. Remember, we are using VHF radio which only supports line of sight transmissions. The higher your antenna, the longer the range you will receive.

There is also the phenomenon called Inversion (or ducting) which does cause VHF signals to bend and carry over long distances. In my area this usually signals very hot weather or a change in weather.

Again, a way of predicting good VHF propagation is to look at the NOAA/ Environment Weather broadcast frequencies (162.400 to 162.550 MHz). If you hear weather stations from farther away than normal, then go to the marine band and listen. (This is also a good predictor for 2 meter amateur operating.)

❖ Never a Dull Moment

You will be surprised at what you will hear on the marine bands. For example, I find it is rare to go a day without hearing at least one call to the Coast Guard for assistance during the summer season. While in South Carolina, I heard several bulletins from the USCG on Channel 16 and

22A. One was for right whale sightings, alerting mariners to avoid hitting this endangered species. Another was for a hazard to navigation in the Cape Fear area.

I believe the latter was the train derailment and bridge problem that was on the daily news. Along the Intracoastal Waterway, all the bridges are on channels 16 and 13, except in Florida and South Carolina where they are on channel 9. Channel 9 is the pleasure craft calling channel in the US.

I also use the marine control stations on the Seaway to hear the latest ship positions so I can get some good photographs.

❖ HF Listening

A contact with YO4HGX/mm, Marias, near the Bahamas, showed that the HF propagation has been improving of late. Stations like VK2KM in Dargan, Australia, UA0AZ in Krasnoyarsk, Russia, ZP6CW in Paraguay, SV1CQN in Greece, TA1C in Turkey and 4O6Z in Montenegro have added some real DX to the VE3GO amateur station log. I have even had some 10 meter contacts to the Caribbean and South America.

With the higher HF bands opening up, interesting listening should be more available, and though I do not normally tune these frequencies, I plan to do so this summer. I am hoping to add some distant marine stations to the list. Some of my above contacts were on 18 MHz CW.

John, VE3CAK, an avid local DXer, also tells me that the gray line time has produced some excellent signals. That is just before dawn or after sunset. Since the 40 meter amateur band (7MHz) has been good to Asia in this timeframe, I suspect the Australian marine stations on 8.1760 and 8.1130 MHz might also be readable. You can also try 12.3620, 12.3650, 16.5460 and 16.5280 kHz USB.

The main ITU marine frequency allocations are:

4.000 to 4.438 MHz
6.295 to 6.525 MHz
8.100 to 8.815 MHz
12.330 to 13.200 MHz
16.460 to 17.410 MHz
18.165 to 18.900 MHz
22.000 to 22.815 MHz
25.020 to 25.210 MHz
26.100 to 26.175 MHz

The main emergency frequencies in these allocations are 4.125, 6.215, 8.291, 12.290 and 16.420 MHz.

WLO Mobile can be heard on 8.788, 13.110 and 17.362 MHz. This is the last US voice public correspondence station. Also, I again remind listeners that the Canadian Arctic Stations become active from late May until late November VFF Iqualuit, and their remote stations at Killinek, Coral Harbour and Resolute can be heard on 2.514, 2.582, 4.363, 6.507 and 6.513 MHz. VFA Inuvik can be heard on 5.803 and 6218.6 MHz, while their remote stations at Hay River and Cambridge Bay use 4.363 MHz

Be sure to check the Utility World column in Monitoring Times every month for readers' HF logs, including marine stations. The Caribbean area often has communication on 4.00 to 4.057 MHz.

One station of note is the Caribbean Weather Center. Chris Parker is the man behind this service, which provides custom weather forecasts, email forecasts and voice forecasts to cruisers and racers for a fee. It sounds like it could be interesting listening this summer. Chris operates as Public Coast Station WCY from Lakeland, Florida and is hailed as "Bel Ami." Chris has taken over from the late David Jones who founded the center.

Their summer schedule is printed below.

Frequencies(USB)	Watch Times AST & EDT Watch Times UTC
4045 kHz	06:30 - 07:00 AST & EDT 1030 - 1100 UTC
8137 kHz	07:00 - 08:00 AST & EDT 1100 - 1200 UTC
4045 kHz	08:00 - 08:30 AST & EDT 1200 - 1230 UTC
8104 kHz	08:30 - 09:00 AST & EDT 1230 - 1300 UTC
12350 kHz	09:00 - 09:20 AST & EDT 1300 - 1320 UTC
16525 kHz	09:20 - 09:30 AST & EDT 1320 - 1330 UTC
6221 kHz	09:30 - 09:45 AST & EDT 1330 - 1345 UTC

In the event of tropical weather problems they will be on 8.137 MHz at 2300 for updates. Complete information on the center can be obtained at their website: www.mwxc.com/cwc_ssb_more.htm

❖ Amateur Radio Monitoring.

I need not remind anyone that this column will also be read during the Atlantic hurricane season. Last season was not a very active one, but who knows what this season will bring? Be sure to listen to the USCG on 2670 kHz and their other WX broadcasts to hear the latest information.

Of course, amateur operators and listeners are encouraged to tune into the Hurricane Watch Net on 14.325 MHz. This net operates when any tropical storm is in the Caribbean or East Coast area. Many reports are taken and storm position updates are given. The US National Hurricane Center monitors and actually shows up on the net.

The Maritime Mobile Service Net on 14.300 MHz can also be used for weather information on the half hour. This net is followed by the Pacific Seafarers Net on the same frequency.

At Myrtle Beach, SC, the Grand Strand Amateur Radio Club was part of a Hurricane Demonstration for the whole of Hory County. They have set up quite an emergency radio system, including using some radio equipment from the old county police system and computers from the local library. They also have a public service frequency they can use to connect with non amateurs. I enjoyed attending their meeting while in Myrtle Beach and I would have liked to be there for one of their events. They also have an event called Spring Tide. They provide communications between boats and the land as they try and clean up Murrell's Inlet.

While you're at it, remember to use the weather radio and amateur radio for information on tornados. I listened to one alert while in SC and the thunderstorms were quite strong; however, the tornados ended up in North Carolina not that far away.

❖ On the Down Side

LORAN

April's Utility World column carried the news that the USCG was shutting down their LORAN-C stations in the eastern US. The signals heard here are not as strong since those have disappeared. The latest information I have is that the Canadian LORAN stations will be closed by the end of October this year. Times sure are changing.

Canadian Amateurs have access to the 135 to 136 kHz band now with 1 watt ERP and non interference to beacons as a standard. Amateurs have sent a letter of request for some 5 MHz additional frequencies to correspond to those used in the United States. At the moment it will be discrete frequencies, not a segment of spectrum. More on this action will come at a future date. The 500 kHz amateur request is being studied and we have several experimental stations on the air for test purposes. It will be nice to hear some stations on 500 kHz and some good CW there.

Sad News

I was disheartened to learn that Bill Wilson, VE3NR, passed away in January. Bill was Director General for the Department of Communications, past president of the Canadian Amateur Radio Federation, and a real proponent of amateur radio. He received many awards for his work in radio. The quiet, classy gentleman will be missed. I consider it an honor to have known and worked with him.

Another great friend who has worked on radio with me since high school in the 1960s, Ben Kendall, VE6FN of Edmonton, is very ill. All our best thoughts go out to Ben, his mother and family at this time.

73s to all the readers of this column. Please let me know what you hear and what you would like to see in the column.

This is my photo of the Algoport. She was being towed this spring to China to have her entire forward section rebuilt. Five days out of China, the tow encountered stormy seas and the Algoport broke in two and sank. She is now 5 miles down in the Pacific.

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
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Broadband Loop (Part II)

We left off last time with a description of the single-turn, broadband (40-500 kHz) loop I am building based on an article by Steve McDonald, VE7SL at **http://tinyurl.com/ygt39z7**. Rather than duplicate what is already available online, my goal here is to chronicle my own experience in building and using the antenna. If you'd like to follow along, you can build one, too!

❖ Where We Stand

Last month, I got the loop formed into a circle (1-meter diameter in my case, but you can go larger if you want), and removed a small (1-inch) section of shielding at the exact top center of the loop, per the plans. We also discussed the use of a metal conduit body to secure the ends of the loop and house the preamplifier circuit.

This month, we'll mount the loop into the conduit body and begin building the preamp.

❖ Mechanical Assembly

The conduit body we showed last month has three entrance points on it, and is a good way to go. Unfortunately, when I went shopping for this item, all I could find locally (of the metal variety) was a two-hole conduit body. This looks similar to the illustration shown last month, but omits the bottom entrance point.

I'd planned on using the bottom hole for routing the coaxial feedline to the loop, but now I'll need to drill a hole at the bottom and route the cable through the hole via a rubber grommet or other "anti-chaffing" sleeve.

Figure 1 shows the loop ends inserted into the conduit body. I tightened the clamps down snugly and followed this by sealing the entrance holes carefully with silicone sealer to keep out rainwater. It is important that no water be allowed to enter the conduit body, as it will also house the preamp circuit, which must be kept dry.

The original plans call for enclosing the metal preamp box in an outer plastic utility box, but I am trying this "minimalist" approach" using a gasketed conduit body. Only time will tell how it works out. Use your own judgment here and decide if you want to try the single box, or follow the original plan on the website. I like to experiment with things, so I am giving it a try with a single (gasketed) box.

Figure 1. Loop ends secured in conduit body, cover removed.

❖ Building the Preamp

This antenna is an active loop, which requires some means of boosting the signal picked up by the one-turn loop. This will be accomplished through the use of an easily built preamplifier circuit. The preamp is made with a handful of parts that can be obtained from Mouser Electronics (**www.mouser.com**) or your favorite parts supplier. It was originally designed by the late Ralph Burhans, a well known LF experimenter. Figure 2 shows the schematic diagram of the preamp.

The circuit is simple enough to build with point-to-point wiring on a universal "perfboard." No printed circuit board is required unless you wish to go to the trouble of designing and building one. In any event, make sure your board dimensions will allow the circuit to fit inside the conduit body or whatever enclosure you are using. I used a rectangular piece of perfboard measuring about 2.25" x 1" for my circuit.

Obviously, you'll need to have some basic soldering skills to assemble this circuit, but the design is about as simple as it gets for a workable LF preamp. On my unit, I used sockets for the transistors to facilitate replacement in the future, should the need arise. Sockets are by no means essential, but since I had some lying in my junk box, I decided to use them. The complete parts list for the preamp is shown in Table 1.

Transistor J310, in particular, should be handled with care, as it is a Field Effect Transistor (FET) and is susceptible to static discharge. Take care to discharge your static electricity and minimize handing of the leads. Once it is installed in the circuit, stray static should not be a problem.

Table 1. LF Preamplifier Parts List

Ref. Designator	Part Description
T1, T2	Mouser 42TL004 Miniature Audio Transformer (Xicon)
L1	Mouser 42IF100 Miniature I.F. Transformer (Xicon)
L2	Mouser 43LH268 6.8 mH Encapsulated RF Choke (Xicon)
R1	75 ohm resistor
R2, R3	2.2K resistor
C1 - C2	470 pF capacitor
C3	33-220 pf capacitor*
C4, C6, C7	4.7 mf electrolytic cap.
C5	0.05 mF capacitor
J310	FET Transistor
2N3904	NPN Transistor

** C3 value dependent on frequency of strongest BC band signal in your area. See text and Table 1a below.*

❖ A Word about C3

Capacitor C3 and inductor L1 combine to form a "wave trap" for stray BC band signals that may appear on the LF band when using the antenna. A safe bet is to find the strongest BC signal in your area and design the trap around that frequency. If you're lucky enough to not be bothered by any local BC station, you might even be able to omit C3/L1 from the design, but I recommend including it, as your receiving conditions could change in the future.

Table 1a provides target values for C3 based on frequencies between 550 and 1600 kHz. Find the frequency range that comes closest to the potential interferor in your area, and locate C3's value in the right hand column. L1 is a tunable inductor that works in parallel with C3, so once you have the preamp up and running, L1's slug will need to be adjusted for a null in the "pest" BC band signal. This type of filter is simple, but can be very effective in eliminating BC overload interference.

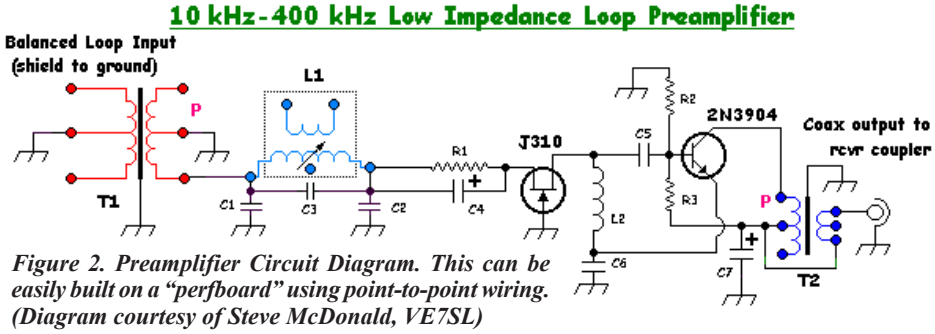


Figure 2. Preamplifier Circuit Diagram. This can be easily built on a "perfboard" using point-to-point wiring. (Diagram courtesy of Steve McDonald, VE7SL)

Table 1a. C3 Target Value (pf)

BC Band Freq.	C3 Value (pf)
550-700 kHz	220pf
700-850 kHz	120pf
850-1050 kHz	75pf
1040-1350 kHz	51pf
1300-1600 kHz	33pf

❖ Preamp Button-Up

The next step is to place the preamp board inside the enclosure body and make the required wiring connections to it. The center conductors of the two loop ends must be connected to T1 at the left hand side of the diagram (see Figure 2). This is indicated by the point marked "Balanced Loop Input." Short pieces of flexible wire can be used to make these connections. Likewise, the shield of the loop should be connected to a ground point on the board.

The coax feedline should be connected to T2 as shown at the right hand side of the diagram (at the point marked "Coax output to rcvr coupler"). The center conductor must connect to the top winding of T2, while the shield needs to be connected to ground.

If you are concerned about the preamp board touching the interior of the enclosure, it can be insulated by loosely wrapping the board in electrical or duct tape. This may not be pretty, but it should be effective. When the wiring connections are complete, install the gasketed cover over the enclosure.

❖ What's Next

We are getting to the final steps for completing the antenna. Next month we'll discuss the simple Coupler device needed to isolate the power supply voltage (12 Vdc) from the RF coming down the feedline. We'll be sending 12 volts up the feedline to power the preamp, so it's important that this not interact with the RF signals coming down the coax. The coupler takes care of this problem. It is made with just five passive components – a few capacitors and resistors. We'll describe building it next time, but if you want to jump ahead, you will find all details on the VE7SL website.

Other than the coupler, the only remaining steps are to mount the antenna, adjust the wave trap as needed, and test the directivity of the antenna.

❖ Miscellaneous Hardware

If you haven't done so already, you might want to begin gathering the rest of the hardware materials you'll need for the antenna: PVC pipe (for the mounting mast), U-clamps, tripod, rotator unit, etc. See the VE7SL website for additional details.

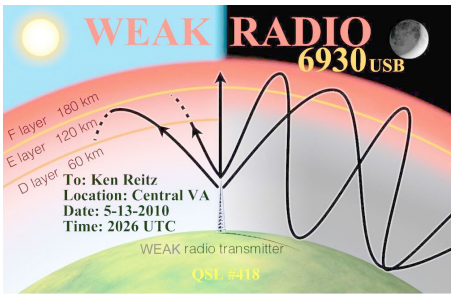
❖ Loggings

My thanks to *MT* reader John Collins, KN1H (NH) for his loggings shown in Table 2. In a first for *Below 500 kHz*, all loggings are of DGPS or NAVTEX stations, which were decoded with a PC and specialized software. John uses DSC Decoder for DGPS and YaND version 5 for NAVTEX decoding. All of the NAVTEX signals were logged on 518 kHz, the primary NAVTEX channel. He uses an Icom IC-R75 receiver with a 380-foot wire antenna for longwave.

Table 1. DGPS & NAVTEX Logs from NH

FREQ.	ID	ST/PR/ITU	CITY
286	#804	NJ	Sandy Hook
288	#942	NL	Cape Ray
290	#799	ME	Penobscot
291	#788	PA	Hawk Run
292	#778	SC	Kensington
293	#803	NY	Moriches
294	#771	NC	New Bern
295	#843	WV	St. Marys
295	#939	NB	Partridge Isl.
296	#929	QC	St. Jean Richelieu
298	#831	MI	Upper Keweenaw
300	#926	QC	Riviere du Loup
301	#847	MD	Annapolis
303	#824	NC	Greensboro
304	#777	WI	Mequon
305	#782	TN	Dandridge
306	#772	MA	Acushnet
307	#834	MD	Hagerstown
309	#927	QC	Lauzon
310	#944	NL	Cape Norman
311	#863	IL	Rock Island
312	#935	NS	Western Head
313	#821	VA	Portsmouth
313	#925	QC	Moise
314	#808	FL	Card Sound
315	#940	NL	Cape Race
316	#800	ME	Brunswick
319	#936	NB	Point Escuminac
319	#838	MI	Detroit
322	#839	NY	Youngstown
324	#834	NY	Hudson Falls
518	$04O	NL	St. Johns
518	$04Q	NS	Sydney
518	$04G	LA	New Orleans
518	$04U	NB	St. John
518	$04X	NL	Labrador
518	$15K	CHL	Puerto Montt
518	$04A	FL	Miami
518	$12D	BC	Prince Rupert
518	$04F	MA	Boston
518	$04H	ON	Prescott
518	$04N	MD	Chesapeake
518	$04P	ON	Thunder Bay
518	$04C	QC	Sept-Iles
518	$04B	BDA	Bermuda

Pirates continued from page 15



QSL from WEAK Radio (Courtesy: Author)

web site, "it is the first time the FCC has been denied an injunction to stop the broadcasts of an unlicensed radio station."

Pirate Radio on the Rise

Estimates from those involved with pirate radio and those monitoring pirate radio activities agree on one thing: pirate radio is on the rise. What they differ on is the number, placed at somewhere between several hundred and several thousand U.S. FM pirates alone.

In the first four months of this year the FCC busted some 60 illegal FM operators in the U.S., but it's considered a fraction of the number of operators on the air nationwide. Some, like WSQT-FM in Washington believe the FCC is fighting a losing battle. "The FCC cannot win," their spokesperson noted, "Enforcement is based on transmitter addresses, a new transmitter location means a new investigation, setting back the whole process…Expendable hardware makes this even more difficult."

The FCC's field agents have their hands full. With limited staff and budget they traditionally target those stations creating interference to licensed broadcasters that complain of such interference or those using their transmissions to promote illegal activities. They target FM pirates because they're so much easier to find. HF pirates stay on the air for years because they plan their broadcasts so as to not interfere with licensed HF broadcasters regardless of country of origin, keep their transmissions short and don't promote other illegal activities.

The potential for Part 15 broadcasting has yet to be reached. Even at Part 15 flea-power, it's easy to imagine an organized network of some several hundred individual legal, unlicensed FM transmitters broadcasting a single downloaded Internet stream that would let it cover a decent sized city with whatever message the network wanted, just like any other multi-million dollar area FM station.

Radio Metallica Worldwide QSL front and back, signed by Dr. Tornado himself! (Courtesy: Author)

PIRATE RADIO ON THE WEB

www.hfunderground.com
Wiki-page links to all manner of pirate radio activities.

www.piratesweek.info
News about what's on and when with HF pirates, features podcasts from various sources.

www.disgraceland.info
Excellent source of daily HF pirate action with numerous links and graphics.

www.frn.net
http://www.frn.net/vines
Top blog for HF pirate radio activity.

http://part15.us
Has links to various Part 15 web sites and a blog featuring experiences of other Part 15 operators.

www.freeradio.org
Free Radio Berkeley has extensive online videos on techniques for building radio transmitters.

Radio.indymedia.org
Hosts podcasts of various alternative radio broadcasts including WSQT-FM Washington, D.C.

www.mediaaccess.org
Media Access Project (MAP) is a non-profit law firm and advocacy organization. Their attorneys work on behalf of the public to promote freedom of expression, independent media, and low-cost, universal access to communications services.

www.fcc.gov/mb/audio/lowpwr.html#UNLICENSED
Details of Part 15 transmitters

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Down to Earth
Understanding Grounding Concepts

This month, let's talk about the concept of *ground.* This is a subject that is often confusing and poorly understood, but it's one that we need to be clear about to operate any radio station safely and effectively. It may not seem at first like the sort of thing your antenna columnist would discuss with you, but, as you'll see, the topics called *antenna* and *ground* are intimately related, on a number of levels.

Let's start by clarifying what we mean by ground. There are actually three different concepts called ground, and just to make it extra confusing, they should all be connected to the same point! These three concepts are called *AC ground, DC ground,* and *RF ground.* AC and DC ground are primarily *safety* functions, while RF ground turns out to have more to do with *performance.*

❖ AC Ground

AC ground, sometimes called the *power line ground,* is part of the service entrance to your house. If you look in your breaker panel – or fuse box, if your house is as old as mine – you'll see that the third, white wire coming in is solidly connected ("bonded") to a heavy wire running to a ground rod outside. My house, built in 1911, has this ground running to the cold-water pipe, which was very common when the water pipe was always made of metal. (See photo.)

The "antique" AC ground on cold-water pipe at my QTH. (Photo by author)

All the "neutral" connections in your house (the white wires) run to a buss in the panel that this heavy white wire is connected to. Nowadays, outlets have a third, green wire, called a safety ground, running to a second buss which is bonded to the neutral buss. If anything goes wrong – a dead short, a lightning strike, an appliance gone berserk – this solid connection to ground protects you and your house and property. Fuses will blow, breakers will pop, but you and your stuff will be unscathed. That's the intention, at any rate.

❖ DC Ground

DC ground is a concept largely fostered by ham radio enthusiasts. What's being focused on here is the fact that all that metal we hang up high in the great outdoors, be it wire antennas or beams on a tower, constitutes extremely tempting targets for lightning. Grounding these items greatly reduces the chance of a bolt from the blue obliterating your rig, your house, maybe your life. Let's look at some of the ways this "DC grounding" can be accomplished.

Cold-water pipe DC and RF grounding right above my operating position. (Photo by author)

The most obvious method is for the structure in question to be permanently grounded by dint of its construction. A tower is the best example of this. It's virtually impossible for the legs of a tower not to be firmly in contact with the ground. This structural necessity makes the tower a lot safer when lightning comes a-booming. Of course, you must still worry about the coaxial cables leading from the antennas on the tower to your rig, which brings us to the second method.

The *lightning arrestor* is very old in our hobby, but it's been one of the most enduring, because it is so simple and effective. Basically, it is nothing more than a small spark gap. One side of this gap is connected to what you're protecting – like the center conductor of a coaxial cable – and the other side is tied to a heavy, solid ground connection. Ideally this takes exactly the same form as the AC ground mentioned earlier, i.e., a ground rod or at least a metal cold-water pipe. When thunderstorms threaten, any static charge that builds up jumps across the gap to ground and is dissipated before the charge can build up to anything like the conditions for a lightning strike.

There are many of these lightning arrestors on the market that are made for use with coaxial line – they are constructed with coaxial fittings, so they can easily be inserted in a run of coax. For those of us who use ladder line, or, for that matter, any open, balanced wire feed, the options are a lot more limited. They usually take the form of a metal bar with two automotive spark pugs threaded into it. The bar is solidly grounded, and the "hot" connections of the spark plugs are connected to the two wires of the balanced feedline near the entrance to the station. Some fiddling with the size of the spark gaps is normally required to find a gap small enough to protect against lightning, yet large enough not to arc across at normal transmitting power levels. Obviously, the more power you transmit with, the more problematic this becomes.

A third option beckons, and this is the one I use at my operating position. A double-pole, double-throw knife switch is employed to ground the ladder line when not in use. The two leads of the incoming ladder line are tied to the "pivots" of the switch. The pair of "throw" contacts on one side is tied to a short piece of ladder line that connects to the BALANCED output of my trusty tuner. The other pair is tied to a #8 wire running a few feet overhead to my cold-water pipe ground (see photo). If you use a single wire feed, like a classic Windom or a longwire, same thing goes, except that you can use a single-pole double-throw knife switch.

❖ RF Ground

This brings us to the third ground concept, called *RF ground.* This is probably the hardest ground concept to understand, since it touches on both safety and performance.

The discussion of the first two types of ground makes it pretty clear that *the earth itself is a conductor.* In fact, it's the ultimate conductor – lightning always heads for it! This conductive property of the planet becomes even more apparent when we bring radio operation into the picture.

The first thing to absorb is the safety aspect of RF ground. Every ham has had the experience of shocking their lips on a metal microphone windscreen, or getting their fingers zapped on a key or keyer, or on a metal radio cabinet or knob, while transmitting. This is due to stray RF energy, and it can be embarrassing, painful, or downright dangerous, depending on its level of severity.

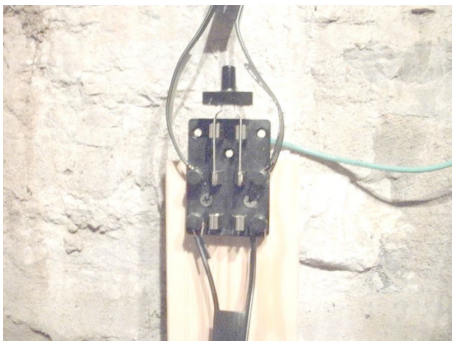
Stray RF can occur any number of ways – when we have a less than perfectly matched-to-the-antenna situation, when we use ladder

line or other open-wire feeders, when we use an end-fed wire, or even from inadequate or, heaven forbid, removed equipment cases. RF ground in these scenarios serves exactly the same purpose as in the AC and DC ground by providing a low-impedance path to ground to dissipate this extra, unwanted energy.

A "low-impedance" path to ground means a couple of things. Primarily it means making the ground wire heavy, solidly connected, and as short as possible. A good practice is to solidly ground a length of copper pipe that runs across the back of the operating position, and solidly ground each piece of equipment to this "ground buss" with heavy wire or, ideally, grounding braid, which is sold by many suppliers. "Each piece of equipment" means just that – your radio, your tuner, your keyer, your power supply, everything. If you can't manage the grounding buss, at least ground your radio solidly, and run ground wires from that point to all remaining pieces of equipment.

The other thing to keep in mind about a low-impedance ground for RF is to be aware of the length of the ground wire, that is, the one that actually runs to a ground rod or cold-water pipe. (My station uses the cold-water pipe option – see photo.)

"As short as possible" is important, not only as a general safety consideration, but because a ground wire that is a quarter-wave long, or an odd multiple thereof, becomes an *impedance inverter*. What this means is that, since the grounded end is at a very low impedance, the end connected to your equipment is at a very high impedance, and the RF shocks, burns, and



DPDT knife switch grounds my ladder line when not in use. (Photo by author)

other harmful effects, are actually made worse than if there were no ground connection!

If you're operating on HF only, at 30 MHz and lower, then keeping your ground wire shorter than 8 feet (8 feet 4 inches is a quarter-wave at 28 MHz) should keep you out of trouble. If you must use a longer grounding conductor, keep this principle in mind and try to avoid a length that is a quarter-wavelength at any of the frequencies you plan to use.

Finally, a word or two about *performance.* Any unbalanced antenna, such as a vertical or longwire or other end-fed antenna, needs a good ground for the antenna to "push" against. For a balanced antenna like a dipole or a beam, this is much less important since at any given instant one half of the antenna is acting as a "ground" for the other half to "push" against. By contrast, a vertical needs an extensive system of ground *radials* to work properly. Usually at HF these take the form of wires laid on the ground or in shallow trenches cut into the ground. And you'll notice that the literature on verticals calls for – guess what? – *quarter-wavelength* radials, usually the more the better, since the earth in your neck of the woods is likely to be a less-than-perfect conductor.

In addition, years of experience have shown us that any type of antenna is more effective and quieter *when receiving* if the station has a good RF ground. I haven't been able to find any simple, easy to understand explanation of this phenomenon, but I've seen over and over that it's true. I first observed this when I was six years old and a crystal radio pulled in local AM stations loud and clear with a solid ground connection, but *nothing at all* with the ground connection removed. I never could shake the conviction that the ground was "the other half of the antenna."

By the way, if it's not immediately apparent from all of the foregoing, don't separate these grounds in any way. In fact, make sure that your AC, DC, and RF grounds are all solidly connected together. If you can't manage ground rods, metal cold-water pipe is acceptable, but make sure that every ground is solidly connected to it. Check right at the water meter if it's inside the house to make sure they bridged the input and output of the meter with grounding strap. If they didn't, or it's not in good shape, make a good solid bridge yourself, or get your utility company to do it. It seems that the water meter itself is not a terribly good ground conductor!

That's all for now, friends. Make sure you've got all three grounds going on, and I'll see you next month with more antenna adventures. Happy operating!

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
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Starting Out in Amateur Radio - 1920s Style

❖ Another BC-344 Plateau

As frequently happens around this time of year, the lure of the outside has kept me away from my bench until a few days ago when, having located the leaky audio coupling capacitor hiding under the volume control, I had every hope of doing the alignment and completing the BC-344 project after replacing it. However,

BC-344 power supply has to be propped out of the way to get at lower i.f. adjustments.

that was not to be!

Although access was very tight, I did somehow manage to remove the old capacitor and solder a new one in its place. This operation yielded immediate results. The erratic action of the volume control in AVC mode had cleared up and I was picking up a good number of local broadcast stations on a short basement antenna.

I figured I was home free and immediately set up the radio for i.f. alignment. This meant standing the set up on one end, rotating the power supply out of the way on one hinge and supporting it with an improvised prop (see photo). All this had to be done to gain access to the lower i.f. transformer adjustments, which otherwise would be covered up by the power supply.

Now, I set the signal generator's modulated output to the set's 92.5 kHz intermediate frequency, connected it to the grid of the mixer tube through a 300-ohm resistor per the government instructions, and hooked up my a.c. vtvm to the headphone output jack. The tone signal seemed to be coming through the i.f. chain nicely and I was getting a good indication on the meter.

Breaking out my nutdriver and alignment screwdriver, I loosened the locknuts on the second i.f. transformer and proceeded to peak the lower adjustment. At least that's what I thought I was going to do. In reality, there was no detectable peak no matter how far I moved the adjustment! I don't think I've ever come across a case like this.

Of course, if the second i.f. transformer wouldn't tune, there was no sense in trying to adjust the tuned circuits ahead of it in the chain (mixer and first i.f. transformer).

The last thing I did before realizing that I wasn't going to make enough progress for a full write-up was to slip off the second i.f. transformer's cover and check for suspicious capacitors. Sure enough, there was a .01 ufd paper job that could easily be the culprit.

I clipped one of its leads to remove it from the circuit for testing. It didn't move the needle on the R X 10K scale of my multimeter, so it looked like it might be good. But when I tested for leakage, under voltage, with my capacitor checker, the meter went offscale in the wrong direction.

Looks like I will have to change that cap, and any others I may find in i.f. cans, before going much further! And casting about for another topic that might interest our readers, I hit upon this: Can you imagine what your equipment might have been like if you were a new radio amateur on a budget in, say, 1920?

In this brief and simplified overview, we won't get into a discussion of the actual construction and appearance of the equipment. We'll approach it from a more theoretical point of view through the use of schematic diagrams.

❖ In 1920 Spark Was King

Although vacuum tubes had been coming on the market in small quantities, a result of development during the World War, they were few types suitable for transmitters and they were expensive. Thus, your beginner's transmitter would almost certainly be a spark set.

The very simplest type would use a Model T Ford ignition coil as a source of high voltage (Figure 1). When the key was pressed, battery current would flow to the coil, charging the capacitor until the charge had become high enough to create a spark across the gap. Once the spark had jumped, the charge would build

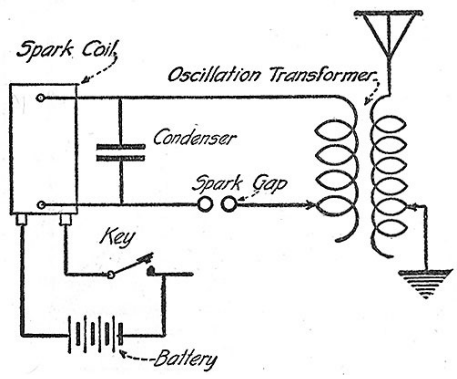


Fig. 1. Simplest transmitter used auto ignition coil and single gap.

up again, repeating the cycle over and over again at a speed too great to observe.

The result was an oscillation (radio wave) flowing through the oscillation transformer and out the antenna. Frequency? Few worried about frequency in those days. The signal was all over the place – broad as a barn.

❖ Rotary Gaps

The signal generated by such a simple spark gap was something between a rasp and a squeal. Not very pretty. So, you decide to upgrade to a system that would provide higher power and a more musical note. In those days, you would have probably resorted to using a non-synchronous rotary gap (Figure 2).

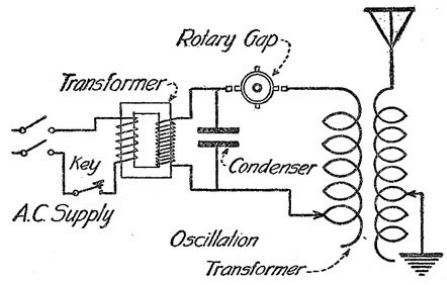


Fig. 2. Non synchronous gap was favored by amateurs. Sparking points were not related to power supply frequency.

This device has several electrodes mounted on a plate rotated by an electric motor. They are arranged so that they successively stimulate a spark between a pair of fixed electrodes. The high voltage comes from a transformer operated off the a.c. line rather than from a battery-operated coil.

The device is called *non-synchronous* because the frequency of sparking is not related to the frequency of the a.c. line (usually 60 Hz). If the electrodes were to be so arranged that the sparking opportunities coincided only with the cycles of the 60 Hz a.c. line, the "note" would be a very unattractive 120 Hz. So extra electrodes are added to give a higher note.

The smoother-operating *Synchronous Gaps* (Figure 3) were used mostly by commercial stations because they were much more expensive. If the firing of a synchronous gap were to be tied to the frequency of the power supply, a higher frequency than the nominal 60 cycles would be needed if the note were to be pleasant. And so the transmitter had to be powered from a special generator operating at that frequency (500 Hz was typical).

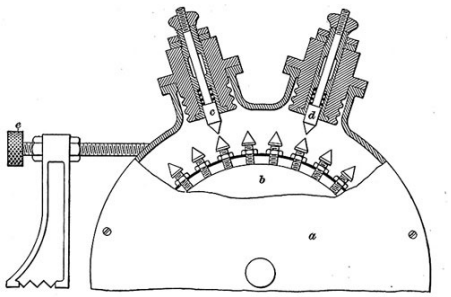


Fig. 3. Synchronous gaps required special generator power supply, tended to be used in commercial installations.

The wheel carrying the rotating electrodes of the gap was mounted on the shaft of the generator. These electrodes matched the generator pole pieces in number and arrangement so that, with proper adjustment, the gap could be made to fire at each half-cycle of generator output. The adjustment was carried out by making small changes in the position of the fixed electrodes via a micrometer screw ("e" in the diagram).

❖ The Grid Leak Detector

Low-power tubes suitable for receivers were beginning to be common at this time and were much more effective than the quirky, difficult to adjust, crystal rectifiers previously in common use. Most hams who could possibly afford it used one or more tubes in their receivers. For one thing, little or no adjustment was required for optimum detector action and, besides acting as detectors, tubes could do something crystals could not – significantly *amplify* the signal.

Figure 4 shows a simple one-tube receiver using a *grid leak detector*. This single tube is actually performing double duty.

By allowing the signal to flow between grid and filament in one direction only, it acts as a rectifier, stripping the audio component from the radio frequency signal and making it audible in the headphones.

Though not clear from the figure, the grid of the tube is physically located between the filament and the plate. And the rectified signal on the grid acts as a valve. Very small

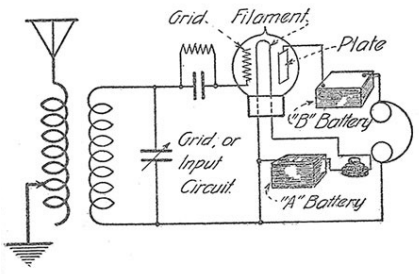


Fig. 4. Grid leak circuit offered detection and amplification in a single tube.

variations in grid current cause much larger variations in plate current. In other words, this action gives the tube the characteristics of an amplifier, in addition to its role as a detector.

Now take a look at the fixed capacitor, with its paralleled resistor, in series with the connection to the grid of the tube. We won't get involved in a deep technical explanation here, saying only that the presence of the capacitor enhances and strengthens the small signal variations appearing at the grid.

The paralleled resistor is usually referred to by the quaint designation "grid leak." Without its action of slowly dissipating the charge on the capacitor, the grid would become progressively more negative until the tube ceased to function.

Normally a very high value resistance, on the order of a couple of megohms, the grid leak has been described by one writer as a barrel with a hole near the top that keeps it from becoming too full of liquid. That may not be the most apt description in the world, but suffice it to say that the grid leak slowly drains off the charge on the grid, keeping it from building it up to the point where it cuts off the tube.

❖ The Regenerative Receiver

Many early radio amateurs made contacts over great distances using simple grid leak detectors – sometimes with extra stages of audio amplification to operate a loudspeaker. But a relatively simple addition to the circuit was to result in a tremendous increase in sensitivity. This was the brainchild of legendary radio inventor Edwin Armstrong – who later developed the superheterodyne receiver and perfected wide-band FM broadcasting.

Armstrong's innovation is shown as Figure 5. The circuit is essentially the simple grid leak detector, but with an innocent-looking innovation that was to have a profound influence on the radio art. It involves another component with a quaint name, "the tickler coil."

The action of the tickler coil is intuitively

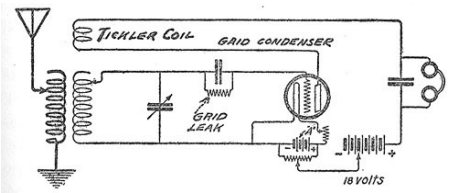


Fig. 5. Addition of tickler coil to grid leak circuit created a regenerative receiver with astounding sensitivity.

obvious from a quick examination of the schematic. Part of the signal in the plate circuit of the tube is fed back into the grid circuit via the tickler coil. Thus the signal passes through the tube again and is re-amplified – emerging in the plate circuit and once more being fed back into the grid – only to pass once more into the plate circuit *ad infinitum.*

Armstrong called the process *regeneration*, and through the use of it, signals could be amplified literally hundreds of times using very few extra parts. Needless to say, this is a circuit that was enthusiastically adopted by the great majority of the amateur radio community!

❖ The AWA World Convention

It's not too early to begin making plans to attend the Antique Wireless Association World Convention near Rochester, NY! Its enhanced four-and-a-half day schedule (August 17 - 21) offers lots of opportunities for radio enthusiasts to network, learn, buy and sell.

To start with, there's the free opening-night pizza party held under a 16,000 square foot big-top tent – which later becomes headquarters for the round-the-clock flea market. That event is ARRL-sanctioned and operated in conjunction with the Rochester Amateur Radio Association.

Among the many programs that will be presented are a Key and Telegraph Seminar, a Radio Restorations Seminar hosted by yours truly, and an array of talks that will cover midget spy radios, the history of Alaskan wireless stations, radio operator Don Mix's adventures with the Macmillan Arctic Expedition and more!

Youth Amateur Radio Advocate Carole Perry will be the keynote speaker at the banquet and, as usual, there will be historical exhibits created by AWA members on view at The Old Equipment Contest.

Auctions? Oh yes! There'll be the usual literature, vacuum tube and general auctions as well as a special estate auction of over 300 choice pieces.

See the ad on these pages for directions and a web site where you can find more information. Hope to see you there!!

"Sky-Wires & Inhalers"

Part 10: SW and MW Stations Don't Mix - or Do They?

By Walter Lindenbach

"Broadcast band stations on shortwave! Humph! So I can't listen to shortwave stations?! The nerve!" All this from Chuck as he walked into Bill's living room.

"Oh my," responded Bill, "here's my little ray of sunshine. You're making serious grumpy noises! What's up?"

"Well it's this (expletive deleted) broadcast station on 1240 kHz in my backyard," growled Chuck. "It's hard enough to hear anything on shortwave these days without any sunspots, but now I get this infernal broadcast station all over the shortwave bands! Why can't they leave me alone? What are they at?"

"Nothing."

"Nothing?" yelped Chuck, "Who's kidding who? They're all over the shortwave band from 49 m down!"

"No they're not."

"Bill, are you seriously looking for trouble, or are you just being tiresome on general principles? I can hear that @#$! 1240 kHz broadcast station on the shortwave bands! You s'pose I'm making this up?"

"Okay, 'ol buddy, that was a good sputter. Now, let's calm down and figure out what's going on. "Now, you said the broadcast station is in your backyard. Where are they, really?"

"Well, they're sort of in my backyard – just over a little hill behind my house, perhaps half a mile."

"Yes," replied Bill, "so they're putting a pretty strong signal into your receiving antenna. But unless they are operating illegally, that signal is at 1240 kHz only.

"A broadcast transmitter that is badly adjusted, or is being over-modulated can produce harmonics which are signals at multiples of its carrier frequency. Even when the transmitter is operated correctly, if the signal is very strong you can typically hear the second harmonic, which, in your case, would be 2480 kHz. But I don't think that's what you are sputtering about. What do you hear?"

"Hmmm. Let's see." Chuck was thinking. "How d'ya describe it? Well actually, it sounded something like the stuff I was getting before we built the low-pass filter. Only, instead of FM programs and TV sync buzzes, I got the broadcast station program. At what frequencies? Dunno. Oh yes, and when I did get a shortwave station, the broadcast station would be mixed in with it."

❖ All Mixed Up

"There. That's the key," interrupted Bill, "Mixing! There are other words for it."

"You can bet your boots on that! I have some, but they're not very nice. What are yours?"

"'Mixing' is a general term that refers to useful circuit functions, not just this one that is causing you grief. That's true of most of the other terms as well, such as 'modulation', demodulation', 'heterodyne', 'switching', 'detection', 'conversion', and 'intermodulation' or 'intermod'."

"Oh Mercy! If we have to lick all of those before I can listen to shortwave, it won't happen."

"Na, Na, settle down," replied Bill consolingly, "it doesn't work that way. The term that is usually applied to the effect that degrades your reception is 'intermod', and is a result of overload.

"There is a specification for really good receivers which is a measure of their ability to operate with large signals and not produce the results of overload. There is more than one specification for this quality, and they are called 'IP2', which means 'intercept point, second harmonic', or 'IIP3', which means 'intermodulation intercept point, third harmonic', or just 'IP3'."

"Is this 'intermod' business special to the shortwave bands?" Chuck wanted to know.

"Certainly not; it applies to every signal, modulation form, and receiver that there is."

❖ Dynamite Clears QRM?

"So, the way to hear a weak signal in the presence of a strong signal is to get a really good receiver – but that will make a deep dent in your wallet – or get rid of the strong signal."

"Aha!" chirped Chuck, "sounds like fun. How much dynamite d'ya think we would need?"

"No, no, no! That would get you a long term in the Government Hotel, and apparently the food is not so good there.

"No," Bill continued, "the way to do it is to use a high-pass filter which will greatly reduce the strength of the 1240 kHz signal which is troubling you. And that signal must be a real whopper because your R390 is a very good receiver. It was designed expressly to operate with large interfering signals."

"Well, be that as it may, the interference is there, so it seems that I need a high-pass filter. Where do I catch one of these beasties?"

"You make it," replied Bill. "Next you'll want to know how."

"Uh oh, here come the equations," Chuck groaned.

"Nope, no equations."

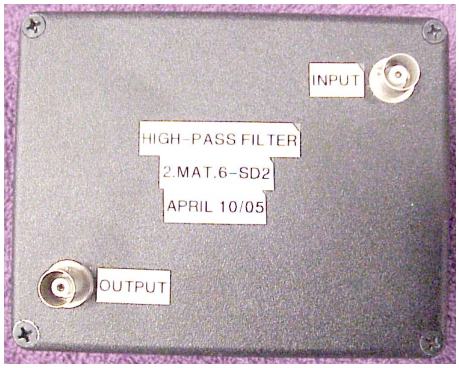
"Really? Hallelujah! How can that be?"

"It's time to tell you a little story."Bill continued, "Once upon a time, Walt – y'know the guy who writes this thing – was talking to his friend Gary at Fair Radio, and Gary told him that there was an AM broadcast station within – literally – a stone's throw of his workbench. The signal was so strong that he had trouble working on receivers that people had purchased."

❖ Nope, Ya' Just Cut It off

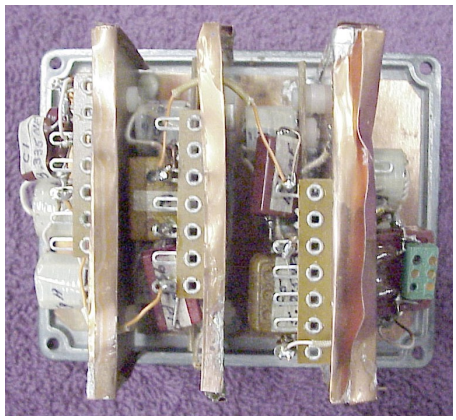
"So Walt decided to be more intelligent than usual and to build Gary a high-pass filter that would get the broadcast station signal out of the workbench antenna. It was a great satisfaction when Gary told Walt that, with a good receiver, a good ground and Walt's filter in place, he could barely hear the station next door!

"Gary sent some pictures of the filter. This is what it looks like."



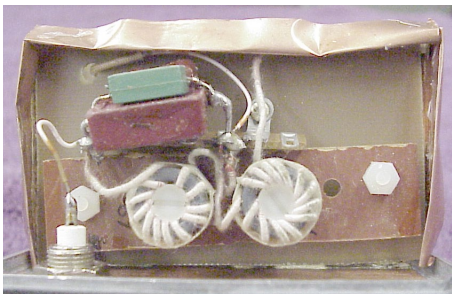
"Can we see what's inside?"

"Sure 'nuff. Here are some more of Gary's pictures."



"Yuk!" Chuck snorted, "what a mess! Why did he do that?"

"We'll find out shortly. This is what one of the end sections looks like."

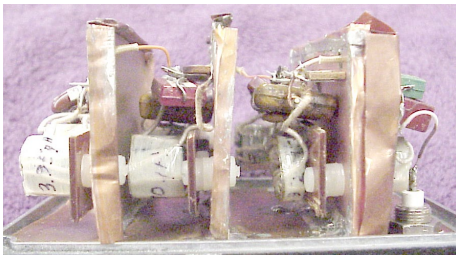


"Oh, those round things with tape around them are coils with toroids for cores, huh? But that is fairly thick wire. I wonder why."

"Because that's Litz wire, that's why. You know about that stuff, Chuck? It's like lamp cord only different. It's made of a whole bunch of little strands that are all insulated from each other, except at the ends where they are all soldered together."

"Why?" Chuck wanted to know.

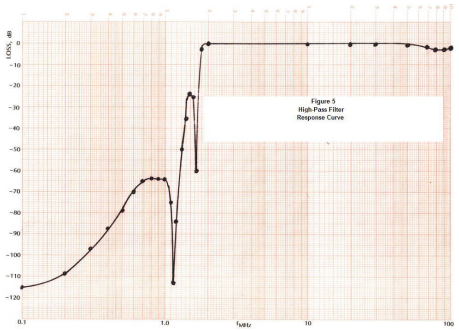
"This arrangement makes for lower RF resistance, and that's because of something called the Skin Effect. That's true up to about 2 MHz, but then there is something else called the Proximity Effect which predominates at higher frequencies and makes Litz wire less effective above 2 MHz."



"Now, if we look at the response curve, I think you'll know why it looks the way it does."

❖ Like, Real Sharp

"Oh wow!" Chuck's eyes got bigger. "That's one sharp cutoff. Let's see: about 3 dB down at



1800 kHz, and 113 dB down at 1240 kHz! No wonder the station at that frequency could not be heard."

"Yes, and that's why the copper foil is soldered to the mounting boards. Doesn't look good, but to get a cutoff that is that sharp and that deep needs shielding between sections.

"Now, to get your broadcast station interference down to a level where it does not interfere with your shortwave listening, you don't need to go to that much trouble. You could probably do without a section or two."

"Sections? What sections?"

"The ones shown in the schematic diagram. Here it is." Bill took out a drawing (below).

"Okay, I'm ready to start." replied Chuck. "Now where do I get the assembly details and such things?"

"If you ask Walt, he'll send all the information to you. His website address is lindenbachw@shaw.ca. Of course, there is no charge."

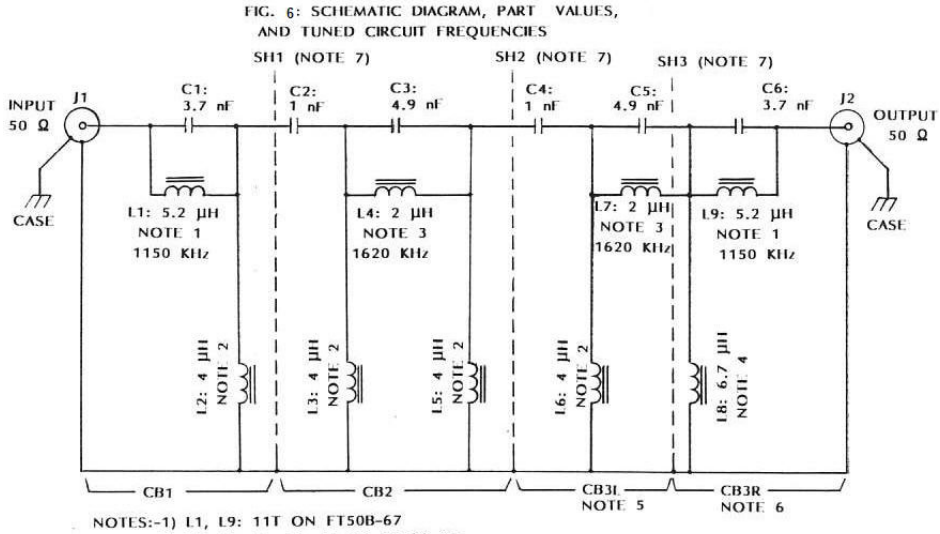
"Uh huh, good stuff. I'm going to be busy, so I'd better get going. Thanks lots, Bill."

"You're welcome. Have fun. G'nite, Chuck."

"G'nite."

This ends this series of adventures with Chuck and Bill. If you'd like to see more – such as a loop antenna project currently in development, be sure to email editor@monitoringtimes.com and also direct your comments and questions to Walter Lindenbach at lindenbachw@shaw.ca.

FIG. 6: SCHEMATIC DIAGRAM, PART VALUES, AND TUNED CIRCUIT FREQUENCIES



NOTES:-1) L1, L9: 11T ON FT50B-67
2) L2, L3, L5, L6: 9T ON FT50B-67
3) L4, L7: 10T ON FT50-67
4) L8: 12T ON FT50B-67
5) CB3L: LEFT SIDE OF CB3
6) CB3R: RIGHT SIDE OF CB3
7) SH: SHIELD (CCT. BD. COPPER)

GLOBALNET

Exploring the World of Internet Radio and Television

Loyd Van Horn, W4LVH
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Keeping an Ear on the Sky

I have always been fascinated with communications between pilots and Air Traffic Control. Who knows why?

Living in cities like New Orleans, Dallas and near Atlanta, I have spent much of my life near major international airports. Growing up in the Van Horn household of course meant there were plenty of opportunities to listen to air-traffic.

Now, living in the Upstate of South Carolina, I find myself relatively close to another international airport. As the planes fly overhead, I often find myself curious where they are coming from, where they are heading, and wish I could tune in to what they are saying.

There are a large number of streaming scanner sites on the Internet that give listeners the ability to listen in to air-traffic transmissions, but one site in particular brings all of the various airport communications into one easy-to-use source: **Liveatc.net**.

LiveATC has two products for those wanting to tune in air communications. The main product is the LiveATC Website. From this website, listeners can search for Air Traffic Control streams from just about any major airport around the world. In addition, users can pore over aerial charts for various airports, find photos of the airport, see diagrams of runways, and in some cases, even track flights both inbound and outbound to the airport (through FlightAware).

I began my search of the LiveATC site by tuning in my local airport, Greenville-Spartanburg International (GSP). There is a delay of a few minutes, per FAA regulations, but between the flight tracker, air-traffic communications, and the sound of planes powering up on the runway

close to my home, I felt like I truly had an inside glance into the operations of an international airport.

Next, I decided to go to the other side of the globe, and I was soon tuning in transmissions from Tokyo International Airport (RJTT). This made for fascinating listening, knowing that the aircraft I was listening to were on the other side of the planet, yet they could be heard as if they were at my local airport!

Just about any airport you can think of is covered by LiveATC. LaGuardia? JFK? Reagan International? Moscow? Istanbul? All these towers are to be found on LiveATC! LiveATC also has streams for Air Route Traffic Control Center transmissions (ARTCC) such as New York, Boston, Washington and Atlanta Centers.

In addition to VHF/UHF air-traffic transmissions, LiveATC streams HF trans-oceanic broadcasts as well. Many of the major HF aircraft channels are available, including Atlantic Oceanic (NAT-A), Pacific Oceanic (CEP-1/2-NP-3/4), Atlantic Caribbean (CAR-A), and more.

There is even a link on the LiveATC Website that satisfies not only my interest in air-traffic communications, but my interest in severe weather as well: bad weather areas.

Clicking on the bad weather areas link provides a list of airports from cities around the world that are notorious for having bad weather. Cities like Des Moines, Iowa, and Dallas, Texas, as well as airports in Kansas, Russia and Mexico provide an image of the local weather radar so you can see when bad weather might make for good listening.

Streams can play in Windows Media Player, Real Player, iTunes, and WinAmp, as well as in-browser Java and Flash players.

Not only does LiveATC stream air-traffic transmissions on their website, but there is now an app for the iTouch and iPhone that gives users access to hundreds of airport streams in the palm of their hand!

I have been using the LiveATC app extensively since I downloaded it about a week prior to writing this column. The app is only $2.99 from the iTunes App Store. It lacks the full functionality of the website (much of the extra navigational and tracking information is gone, although some airports do have an airport diagram) but it maintains all of the streams from the website. There is even a button on each airport's page for frequencies, giving users a handy cross-reference for those times when they bring their scanner along.

I have found the LiveATC app to be quite handy when I am near my local airport, or just for those times when I would like to listen to broadcasts from around the globe other than traditional radio broadcasts. It can even run in the background through Safari when I want to use other functions on my iPhone running (a feature that is quite handy until the release of the iPhone 4.0 OS).

Whether I am at home tracking inbound and outbound flights while listening to towers around the globe, or in my car listening to air-traffic on my iPhone, I have found LiveATC.net to be a easy-to-use and highly enjoyable source of air-traffic information and listening.

Never before has it been so easy to keep your eyes, and ears, on the skies!

❖ TV Who? TVU!

Keeping to the theme of websites that offer streaming services and mobile apps, those of you wanting to watch television streams from around the world might want to take a look at TVU.

TVU is one of the more popular streaming television services on the Internet, claiming more than 50 million downloads from 220 countries. Users can either download the TVU player for their home computer (both PC and Mac support), or the TVU app from the iTunes App Store for their iPhone or iTouch (and now, iPad!).

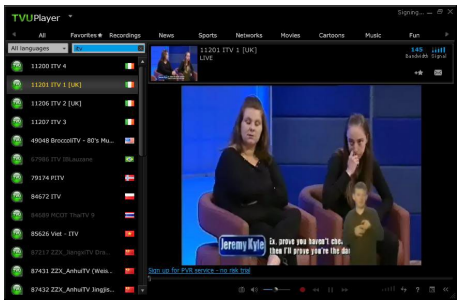
As I wrote this column (after I turned off the HF transoceanic air-traffic stream), I turned my TVU player to a television stream from ITV in England. There was a 'Jerry Springer' type show keeping the late night viewers enthralled (it was nearly 3:00 in the morning London-time when I was tuning in).

From there, it was on to a newscast from RTE-Ireland where there was discussion about issues concerning Irish farmers. I continued East in my search for television programming, stopping to watch an Egyptian soap opera. (Even in another language, it is easy to pick up on the more dramatic elements of the plot lines!)

Continuing further around the globe, RBC TV in Russia offered up news and stock updates, as well as updates on the U.S. war in Afghanistan.

In addition to the computer-based player, users can download players for their mobile Apple products. There are two versions of the TVU player for iPhone, iTouch and iPad. The TVU Lite is a free player with less functionality than that of the full version (you have to reload the video stream after two minutes of viewing), but it gives access to all 900 channels of television streams. The full version ($4.99 at press time) gives full-functionality including new support for 3G wireless service (previous versions required WiFi use).

Both the TVU Lite and the full TVU Player



can be downloaded from the iTunes App Store.

❖ 'Real' radio being turned off in autos?

Is the writing, as they say, on the wall for terrestrial radio listening in automobiles? Long the stronghold of broadcasters, listening to radio in one's vehicle may soon be a slightly more "streaming" experience.

The New York *Times* recently published an article by John Quain that has all but written radio off in favor of Internet radio in automobiles.

"...while video didn't end up killing the radio star," he writes, "this time the Internet might just succeed."

Quain points to efforts by Internet radio services such as Pandora and Slacker that are working with the automobile industry to bring their services to the masses as they go about their daily commute.

Personally, I see this as a two-fold scenario.

The automobile industry is looking for a make-over, especially domestic automakers in the U.S. Any moves they can make which will put them on the cutting edge of technology will help them restore some shine to their somewhat tarnished image of recent years.

The use of Pandora-like services is skyrocketing, thanks to a growing smartphone market (are there phones still being sold that *aren't* smartphones?) Currently these users are having to interface their phones with their car stereos. Automakers such as Ford and GM are working to put that functionality directly into their vehicles, no interface required.

By jumping on the Internet radio bandwagon, automakers can regain some of their "cool" factor and give drivers the type of programming content they want for their daily commute.

Secondly, these services, especially Pandora, have been positioning themselves to enter the local advertising market. By putting their service in automobiles, they will be able to claim door-to-door access to listeners for their potential clients.

Once the technology is released, a user could listen to Pandora in their home, in their automobile and – with their smartphone – anywhere else they please. With that kind of time-spent listening potential (a key statistic when selling advertising) advertisers would be lining up to put their message in the midst of the music.

Right now, the technology is still a bit cumbersome, making this more of a gradual move, than a tidal wave of listeners jumping ship. However, it is obvious that radio broadcasters are getting the message, as Quain points out.

Quain nods to the release of Clear Channel's iheartradio app that has helped to bring some listeners back to the radio fold, albeit in a different format. But it may be a case of too little, too late for broadcasters.

Why? Ultimately, the appealing aspect of Pandora and Slacker for listeners is *control*.

For radio to truly survive and maintain a viable medium in the future, broadcasters are going to have to figure out a way for listeners to browse through their playlist at-will, while still incorporating advertising and information into the mix. Only then will they ensure themselves a seat at the drive-time table long into the future.

❖ GlobalNet Mailbag

Loyd, I just recently subscribed to MT after years of browsing through various issues at Borders. The 1st issue I received was the one where you had brief reviews of various WiFi radios. I ended up buying the Squeezebox and love it.

In that same issue of MT was an article by a broadcast engineer describing all the reasons that something similar to WiFi can never replace standard FM radio for commuters. This reminds me of years ago when all the photography magazines told us that film is here forever – along with all the reasons why digital photography will never be able to compete with film! Keep up the good work – I enjoy your articles.

73 - John, AE5X, Texas

John – I too remember when all of the naysayers said digital photography would never be able to provide the detail and warmth of film. That is a terrific analogy for Internet versus terrestrial radio. As mentioned above, there are already great strides being made to make Internet radio more readily available to commuters. I have always said that once you replace terrestrial radio in automobiles, the broadcast industry will either have to fully get on board and adjust their way of thinking, or run the risk of becoming like the Betamax, rotary telephones and other obsolete technologies.

I don't think terrestrial radio will ever completely disappear. A more solid move to a digital radio format with options like we see with Pandora and other music services could keep terrestrial radio afloat for quite some time. Also, as we see with newspapers, the smaller towns that rely more heavily on their local radio stations for local news should keep traditional broadcasts from ever going completely away.

So, unless radio broadcasters want to one day be discarded into the "vintage" category like vinyl records and photographic film, they are going to have to embrace new technologies and methodologies for delivering programming to their listeners.

Enjoy the Squeezebox! It has quickly become one of the most used devices in my home; I actually find myself wishing I had one for every room in the house!

GLOBALNET LINKS

Internet radio moves to autos - **www.nytimes.com/2010/05/09/automobiles/09RADIO.html**
TVU Networks - **http://tvunetworks.com/**
LiveATC – **www.liveatc.net**

What's NEW

Tell them you saw it in Monitoring Times

MFJ-8310 Desktop/ Mobile Scanner

Prominent amateur radio accessory manufacturer MFJ Enterprises of Starkville, MS is venturing into the scanner market as well. Their intent is to private-label the popular scanner products manufactured by General Radio and Electronics (GRE), best known for their production of private-labeled products for Radio Shack®.

The MFJ-8310, already established in the marketplace as the GRE PSR-200, is a basic-level desktop scanner. Its small size invites mobile installation as well, although it will require a power adapter to lower the vehicle's typical 13.6 VDC down to the scanner's 9 volt requirement.

A rear-panel BNC connector is provided for use with an external antenna; a telescoping whip is included which is threaded through the top of the scanner.

The low retail price of the 8310 ($99.95) reflects its plain-vanilla design; it covers the usual VHF/UHF land mobile and civilian aircraft bands (29-54, 108-174, and 380-512 MHz), but ignores the 806-960 MHz range which is becoming increasingly populated by trunking systems in metropolitan areas.

But heartland America – our smaller communities and suburbs – still operate on the lower frequencies utilizing conventional simplex and repeater systems. There's plenty of police and fire, ham radio, aircraft, weather broadcasts, marine, railroad, business, emergency and other monitoring targets to be heard there, and the 8310 is admirably suited for such applications.

Five factory-preprogrammed memory banks allow instant scanning by the press of a key to police and fire, marine, ham radio, aircraft, and NOAA weather channels. A two-second resume scanning delay may be selected for any channel or all channels at once.

Any frequency may be temporarily locked out of the scanning/searching sequence. A two-second delay may be selected so that the scanner will stay on an active channel momentarily awaiting a reply transmission. Up/down keys allow manual tuning of search frequencies or memory channels. A single key press activates a Skywarn channel (Ch. 200) which you would have previously programmed with your local weather spotter frequency, so you can hear your local weather observer communications during severe weather events. Additionally, you can enter your county's FIPS code (it's in the manual) and the radio will automatically activate with NOAA SAME weather bulletins.

The three-inch speaker provides substantial, undistorted output and is powered by a 0.7 watt audio stage.

The specs:

Memory channels are scanned at 40 channels per second; search speed is a respectable 80 channels per second. Up to 200 channels may be stored in 20 memory banks (10 channels each). Programming can be done by a PC or by manual keypad entry. You can enter a priority channel, so you won't miss an important transmission while the radio is searching or scanning other frequencies.

The selectivity skirts for -6 and -50 dB attenuation are +/-8 and +/-17 kHz respectively. Sensitivity is 0.5-0.7 uV for FM mode and 1 uV for AM (aircraft).

Frequency programming increments accommodate the current FCC band plan, allowing 5 kHz internals from 29-54, 137-148, and 150.8-162 MHz; and 12.5 kHz intervals 108-136.9875, 148-150.8, and162-174, and 380-512 MHz.

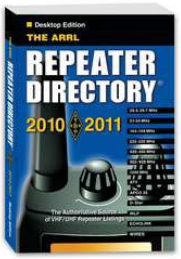
The double-conversion design (10.7 MHz/455 kHz) provides 70 dB image attenuation (150 MHz nom.).

The compact unit measures 8-1/4"W x 2-3/8"H x 6-7/8"D and weights 1-1/2 lbs. It comes supplied with a telescoping whip, 30-page instruction manual, and an AC wall adapter.

MFJ-8310 desktop scanner is available for $99.95 from MFJ Enterprises, Inc., 300 Industrial park Rd., Starkville, MS 39759. Phone (800) 647-1800, or visit the MFJ website at www.mjfenterprises.com. – *Review by Bob Grove, W8JHD*

The ARRL Repeater Directory – 2010/2011 Edition

The ARRL has recently released a new edition of their annual repeater directory in three different formats.



In print there are two different editions including a pocket-sized edition, perfect for mobile operations (size 3.75 x 5.25 inches), and a desktop edition (size 6 x 9 inches). Both editions have thousands of listings for VHF/UHF repeaters across the US and Canada and have the following features:

- Handy indexing tabs on the cover to aid in quickly finding the listings you're looking for
- Easier-to-read listings
- Key to repeater notes located right up front
- Icons make it easy to identify "Open" or limited access repeater systems
- Repeater operating practices, repeater lingo and hints for newly licensed hams
- Frequency coordinator contact information
- D-Star and APCO 25 repeaters
- Using CTCSS tones and Digital Coded Squelch (DCS)
- VHF/UHF Band Plans and 2-meter channel-spacing map
- Tips for handling interference
- IRLP, WIRES-II, and EchoLink® (Internet linked) nodes
- Emergency message handling procedures
- Transceiver memory log

The third format for this annual publication is available – CD-ROM. The TravelPlus CD-ROM with a bonus Repeater Directory, Version 14.0, is a power packed CD for hams who use electronic publications.

With TravelPlus for Repeaters™, you have the power of The ARRL Repeater Directory® on your computer. With TravelPlus for Repeaters™ as your traveling companion, and you'll never be alone on the road. Locate ham radio repeaters along US and Canadian travel routes using this map-based software package.

This feature-packed CD-ROM includes the following features:

- Map your travel route and tune in. Supports GPS with separate external hardware (cable and adapter purchased separately and not supplied with TravelPlus).
- View and print maps and repeater lists.
- Access the ARRL Repeater DataBase, global Internet linked nodes, AM/FM radio, broadcast television, and NOAA weather stations, USA and Canadian licenses, and ham radio points of interest.
- Export data. Transfer to Palm™ or Pocket PC, radio programming software, and more.

This CD requires Microsoft Windows™ XP or Vista, and a Pentium or comparable processor.

The pocket-sized book ARRL #0854 costs $10.95, and the Desktop edition ARRL #0861 sells for $15.95 plus shipping. The TravelPlus for Repeaters CD-ROM. ARRL #0878 retails for $39.95 plus shipping.

These fine amateur publications are available from the ARRL website (**www.arrl.org**), via their toll free order line at 1-888-277-5289 9 (8 a.m. to 5 p.m. Monday through Friday, except holidays), or snail mail to ARRL, 225 Main Street, Newington, CT 06111-1494. Also check your local amateur radio dealer for these and other ARRL publications.

What's New at Dayton

The 2010 Dayton Hamfest is over and several new products were released during the show.

FlexRadio showed off a number of new products. The FLEX-1500 is an all mode 5 W software defined radio (SDR) that uses the same PowerSDR™ software that runs its brethren (FLEX-3000/5000). It provides more than 80 dB of dynamic range on 160 through 6 meters. It can be used as a standalone (using a PC) low power HF transceiver, or can serve as an IF strip for V/UHF transceivers.

FlexRadio demonstrated a new version of their PowerSDR software that runs their SDRs. Version 2.0 includes a new user interface, automated wide band image rejection, enhanced noise reduction and notch filter capability, completely revamped CW timing and faster transmit-receive turnaround time, as well as other features.

FlexRadio also introduced the FLEX-VU5K. The VU5K is a 60 W 2 meter and 70 cm transverter module that fits into and operates with their FLEX-5000 software defined transceiver. There is also a low power version with 50 mW output, designed to drive microwave transverters.

Kenwood introduced an engineering model of their new HF and 6 meter transceiver – the TS-590. The 590 is a compact transceiver that features a down converting design with multiple HF roofing filters to provide good near in dynamic range. The 590 has 32 bit IF DSP filtering for operating selectivity and other filtering. The unit is scheduled for a Fall release and will be priced below $2000.

Yaesu introduced their new FTdx-5000 series of HF and 6 meter transceivers. These transceivers feature dual receivers, 200 W transmitter, and many features and options of the other FTdx series radios. The primary receiver features a 9 MHz first IF and selectable roofing filters as narrow as 300 Hz (optional in some models) that result in close spaced dynamic range.

Yaesu also displayed their new full-gallon solid-state VL-2000 amplifier.

Alinco introduced a new mobile-sized HF transceiver – the DX-SR8TE. This is a 100 Watt, 160-10 meter transceiver that includes a general

coverage receiver (135 kHz to 30 MHz). The front panel of the rig is removable for mounting the rig in a mobile environment.

Finally, Hendricks QRP Kits (**www.qrpkits.com/**) displayed two new transceiver kits from KD1JV and N7VE. Dan Tayloe is the designer of the Ft. Tuthill 15, which is a cw transceiver on 15 meters. Steve Weber has designed the Nearly All Discrete Component 40, a transceiver on 40 meters. Both of these are great start-up kits for the new builder, and will replace the popular DCxx series of crystal controlled transceivers in the Hendricks QRP Kits line.

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.

MT REVIEW

Comparison of Eton Emergency Radios

A Model For Everyone

By Gary Sargent, KE8WO

Eton has a strong history of marketing radios that provide communications capabilities during emergency situations when normal communications may not be available. Certainly there have been weather and terrorist events in the last decade where large numbers of people needed alternate means of gathering information.

I have been slowly planning my personal and family response to various emergency situations. I now have some quantities of food, water and other supplies to allow my family to hunker down for days should the need arise. I decided that I should have an emergency type radio on hand as part of this plan.

Ah, but what radio? Several manufacturers offer a bewildering array of models. The purpose of this article is to review Eton's current line of emergency radios.

Eton Emergency Radio Overview

Eton has refreshed their line of emergency radios in the last year. Part of this was prompted by the demise of the older analog television audio capabilities. Eton's primary lineup now ranges from very small ($30) basic radios to more sophisticated, larger units ($150). All of these receive AM, FM and the weather radio band. They also all feature a crank to recharge the internal battery, power an LED flashlight or charge a cell phone.

Eton offers these radios under the Eton brand name and also as American Red Cross branded units. I decided to acquire an Eton FR160, FR360 and FR600, and evaluate which would meet my needs (see chart).

My Testing

I evaluated each radio's basic performance on the various bands it receives. I have compared its reception to other receivers I have that are in this same $30 to $100 price range.

I tested each unit's ability to charge its internal battery given one minute of dynamo cranking and then listening to AM at low volume. I repeated the same test, exposing the photo cells to direct sunlight for two hours and then powering the AM radio for as long as the battery lasted.

Cranking the dynamo for each radio at a rate of about two revolutions per second quickly became very tiring. I believe that expecting to crank the dynamo for many minutes to charge a power hungry external cell phone would be unrealistic, except in the worst of cases where there was no alternative. I measured the current the dynamo could provide into a 15 ohm load and still maintain a nominal 5 volts DC (VDC). Note the FR600 could not provide 5 VDC with a 15 ohm load.

FR160 Overview

The FR160 features AM, FM (mono) and weather band reception. Power options to charge the small internal three cell 350 mAh NI-MH battery are via the solar cell or the crank dynamo. There are no other power options.

A mono headphone jack is provided. The 10-inch tilt and swivel telescopic antenna is used for FM and weather band reception. The unit has a solid feel and an attractive appearance. The English portion of the small user manual is just over two pages in length.

Radio performance is adequate and on par with the least expensive AM/FM radio you might find. Local, medium or more powerful AM stations were very receivable. Some weaker, more distant AM stations were not.

The tuned frequency drifts as the battery discharges and requires a tweaking of the tuned frequency (via the radio's tuning knob). I consider it to be a minor annoyance that seems to occur primarily during the last few minutes of battery charge life.

FM performance seemed more sensitive and selective, and all of the expected stations were receivable. AM and FM tuning is very touchy, since the analog tuning dial is so small.. Weather band reception is enabled via a slide switch that selects from the seven weather channels. The radio does not support either alert tones or SAME codes. My local weather station is received loud and clear, while another weather station 60 miles away was not detectable.

The three-LED flashlight is bright and very usable. Since you must depress a button to get light, the flashlight will be less usable in situations where you need both hands for a given task.

The FR160 is billed as being able to charge a cell phone via its dynamo. According to the user manual, "Because cell phone batteries vary in their current ratings, we cannot specify charging rates or usage time. From 10 to15 minutes of cranking may result in one or more minutes of talk-time." Further, it must be cranked at a brisk rate of two revolutions per second. The cell phone must use the now common USB port connector for recharging, but no USB cable is provided.

The FR160 is the smallest and most basic in features and performance of the Eton line-up. But it will meet all essential emergency communications needs with minimal investment.

FR360 Overview

The FR360 features digitally tuned AM, FM (mono) and weather band reception. Power options to charge the internal three cell 600 mAh NI-MH battery are the solar cell or the crank dynamo; three AAA batteries; or an external power adapter (6 VDC, positive polarity). A mono headphone jack is provided.

The short 6.5 inch tilt and swivel telescopic antenna is used for FM and weather band reception. The FR360 has a good feel and finish and a modern appearance. The English portion of the small user manual is just over five pages in length. Some radio features are omitted or not well explained.

Unlike most other digitally tuned radios, the FR360 has neither memories nor frequency scanning capabilities. There is a rotary tuning knob so one can rapidly move from one part of the band to another.

Radio performance is a mixed bag. AM is sensitive and reasonably selective, providing overall good performance. FM performance seemed less sensitive; some weaker stations needed the benefit of another foot or two of wire clipped to the short whip antenna before its FM performance came close to that of other low-cost radios.

Weather band reception is enabled via a rotary switch that selects from the seven weather channels. My local weather station was a little scratchy with drop-outs, depending on antenna orientation. A little more antenna length will help improve reception. The FR360 does have a mode where it silently monitors for the NOAA 1050 Hz "all hazard" alert signal. This worked properly on my test unit. It does not support Specific Area Message Encoding (SAME).

The four LED flashlight is bright and very usable. The clock and alarm functions are comprehensive and easy to use. The LCD display and some of the buttons have a very nice backlight when a button is pressed.

The FR360 is able to charge a mini-USB port cell phone via its dynamo. As noted in the user manual, "About 10 minutes of cranking results in one or two short emergency calls." The manual further cautions that if the specified procedures are not followed, the cell phone may be damaged. No USB cable is provided with the FR360.

FR600 Overview

The FR600 is the next step up from the FR360 and shares the same basic digital design and features. It is much larger in size and weight. The major additional features are: support for SAME weather message reception and coverage of shortwave frequencies.

Power options to charge the internal three cell 600 mAh NI-MH battery are the solar cell or the crank dynamo; three AA batteries; an external USB device; or an external power adapter (5 VDC, positive polarity). A stereo headphone jack is provided.

The 12 inch telescopic antenna is used for FM, SW and weather band reception. The antenna does not tilt or swivel. The radio has a solid feel and a modern appearance. The English portion of the small user manual is 18 pages in length. Some radio features are omitted or not well explained, especially the set-up of the SAME decoding features, which can be confusing. The radio supports a simple memory (20 FM, 10 AM, 10 for SW) and frequency scanning capability.

Overall radio performance is good or better than the FR360. A major limitation is that radio tuning is only through two up/down buttons. Depressing one button for about one second will start a signal seek action that is slow. This is especially problematic for the shortwave band.

AM and FM bands are both sensitive and reasonably selective, with overall good performance compared to the excellent, low-cost Grundig G8 radio. FM is in stereo by using headphones and sounds very good with no distortion detected. Audio from the small speaker is adequate, but not in keeping with its overall larger size.

Shortwave reception is continuous from 2.3 through 23 MHz, AM mode only, with 5 kHz step tuning rate. Again, sensitivity and selectivity are more than adequate for routine listening,

but nothing approaching radio hobby DX usage. Most signals will be receivable.

Local AM BCB interference is often detected. Either touching or lowering a section of the whip antenna often helps.

The main problem is the very slow tuning rate. I suggest that many of the 10 memories be used to store SW band starting frequencies. This will aid in moving from one band to another as quickly as possible. The FR600 would benefit from more memories, a rotary tuning knob, and/or a direct entry keyboard.

The weather band reception is set up by choosing which of the seven channels are active in your area. My local weather station was well received with the antenna extended. Weather band reception was much improved over the FR360, but not as good as the low cost FR160.

The SAME decoding capability is nicely implemented and not overly complex to set up, in spite of skimpy details in the user manual. You can select SAME codes for all of the counties within your area and enable or disable the various alert messages, such as severe thunderstorm watch, tornado watch, etc.

After these parameters are set up, placeing the FR600 in the "alert" mode, lets it silently monitor the settings you have chosen. When it detects a weather alert, the radio either opens with the weather audio for the alert or with a loud buzzer (user choice). There are red LED indicators used to indicate the nature of the alert (watch, warning, etc.). The text of the alert, such as "Tornado Warning" is displayed on the LCD. I found that the audio of the weather alert message was cut off after about two seconds, so you'll need to physically select the weather station to hear the full audio message.

The four LED flashlight is bright and very usable. The clock and alarm functions are straightforward. The LCD display has a backlight when a button is pressed.

The FR600 is able to charge a standard USB port cell phone via its dynamo. As with the FR160 and FR360, the manual cautions about following the cited procedure when charging a cell phone. No cables or adapters are provided.

FR1000 Overview

The FR1000 is the top-end of this line of Grundig models, with similar styling, but it differs considerably in other ways. I did not complete a personal test of this model, so this information is just an overview. The FR1000 is significantly larger than the FR600 and costs 50 percent more; it omits the solar power, USB capabilities, SAME decoding, and shortwave reception. In their place are FRS/GMRS transmit and receive capabilities including CTCSS/DCS privacy codes, channel scanning, dual watch and VOX operation.

Charging a cell phone is supported; however, the connector for this is a coaxial /barrel type connector and not the USB jack as on the other FR radios.

These changes position the FR1000 to functions as a communications base station in an emergency or where two-way communications are needed. Having this capability in an emergency radio could be much appreciated when the chips are down.

Summary Comparison

Features

There is an orderly progression of features as you go from the FR160 to the FR1000, along with a corresponding price increase. The old saw of you get what you pay for applies here. For long term weather alert usage, you would likely want to power the FR360 or FR600 through an external AC power adapter at an additional cost of $15 to $20.

Performance

Performance also progresses as you go up in the model numbers. The FR160's performance is inferior to the other models, since it is an analog radio, yet it meets basic reception needs. The FR360's AM, FM and weather band reception was not stellar. The FR600 had the best overall radio performance of the three.

Size

These radios range in size from very small for the FR160 to bulky for the FR360 and FR600. The FR360, FR600 and FR1000 have modern styling, but in my opinion, sacrifice compactness and ease of use for the purpose of appearance.

Bottom Line

It's up to you to decide what features you most desire in an emergency radio. There are performance differences, to be sure. For me, I want a smaller radio with basic features that I will store away, hoping I never need to use it. Since I have another SAME capable weather radio, I choose the FR160 to stash away.

Features	FR160	FR360	FR600	FR1000
AM	✓	✓	✓	✓
FM	✓	✓	✓	✓
NOAA Weather	✓	✓	✓	✓
Crank Power	✓	✓	✓	✓
Cell Phone Charger	✓	✓	✓	✓
LED Flashlight	✓	✓	✓	✓
Solar Powered	✓	✓	✓	
USB Compatible	✓	✓	✓	
Alarm Clock		✓	✓	✓
Digital Tuner		✓	✓	✓
Flashing Beacon		✓	✓	✓
S.A.M.E.			✓	
Shortwave			✓	
Emergency Siren			✓	✓
GMRS				✓
Dimensions	5.2 x 2.5 x 1.8	6.3 x 6.5 x 2.8	7.8 x 8.5 x 2.5	11.1 x 6.2 x 4.1
List Price	$40	$70	$100	$150
TEST RESULTS				
One minute crank charge test	22 minutes of AM Radio	10 minutes of AM Radio	45 minutes of AM Radio	Not tested
Two hour solar charge test	130 minutes of AM Radio	60 minutes of AM Radio	87 minutes of AM Radio	No solar capability
Ma. Dynamo Current to 15 Ohm Load	230 ma. @ 4.7 V.	240 ma. @ 4.9 V.	250 ma @ 4.0 V.	Not tested

Antennas continued from page 17

energy which reaches them.

The exception is the active (voltage probe or E-field) antenna which consists of a short (a few inches to a few feet) receiving element coupled to a wideband, small-signal amplifier. It is not used for transmitting.

While active antennas may have small size and wide bandwidth, and can deliver large signals to the receiver, they have their disadvantages. They are expensive, they require power, they may burn out or degrade in performance from nearby lightning or strong signals, they generate noise and intermodulation interference ("intermod"), and they are usually placed close to interference-generating electronic appliances. Don't use an active antenna if an adequate passive antenna is available.

Invisible Antennas

Appearances or deed restrictions sometimes require a hidden antenna. Receiving antennas are much less demanding and easier to hide, but even transmitting antennas can be inconspicuous. Of course, VHF and UHF antennas, because of their compact sizes, are easier to hide than HF antennas, but even HF antennas can be unimposing.

An attic crawl space is the first recommendation provided the antenna can be separated from large metal surfaces and electrical wiring.

Always use low-loss, well-shielded coax transmission line to prevent appliance noise pickup during receive, and stray radiation during transmit. A balun transformer and ferrite-bead choke may be useful as well.

Wire antennas may be run along baseboards, ceiling molding, behind curtains, and even under eaves, rugs or carpeting. If outdoors is accessible, a thin, high wire is virtually invisible, especially if it is covered with grey (neutral color) insulation; run it from the roof to a tree. A ground rod would be virtually invisible by its nature.

A wire antenna in a tree is also inconspicuous. It can be run vertically up the trunk, suspended in the branches, or even constructed as a wire array for gain and directivity. An antenna element doesn't have to be perfectly straight. The coax feed line can be trenched just beneath the soil.

Resourceful hams, SWLs and scanning enthusiasts have often resorted to make-do antennas. Bed springs, filing cabinets, rain gutters and downspouts, aluminum window frames, curtain rods, disconnected telephone or power lines, metal flagpoles, aluminum ladders, fences, wheelbarrows, grocery carts, and even vehicle-mounted antennas coax-fed into the radio room have been called into service!

Next Month: Now that we've discussed antenna systems, what recommended accessories can improve both transmission and reception? And finally, what are the take-home points that mean the most? Don't miss next month's conclusion to this MT exclusive series on antennas!

LETTERS

editor@monitoringtimes.com

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

Rachel Baughn
rachelbaughn@monitoringtimes.com

OTA Online Resource

Thanks for your article [May *Beginners Corner*]. I live in a rural area and I am not impressed with the FCC's Broadband Plan, but that could be another email. Many thanks for the FCC site to check your address for DTV. They have changed it some since the last time I looked at it. It still showed my address or zip code without any OTA (over the air reception).

I have been watching OTA for two years now; I dropped the cable TV (at least the video service) to save money and went to an antenna. I get my NBC, CBS and ABC station and their sub-channels, but according to the FCC map, no signal is available in my area. Needless to say I don't use their site. I have found the more accurate site to find available OTA signal is **www.tvfool.com**

I have used TV Fool for finding signals for friends for whom I have helped set up TV antennas , and it has always been accurate.

Many thanks for your column.

Warren Lambing

More Youthful Look?

I just subscribed to *MT Express* and it has been a big advantage. I simply print out what I need (so what if does cost a bit more?) but no more torn mags by the mail man....

I also just printed out the story about Mattie Clauson , AE7MC [May *First Person Radio*] and laminated it. It is put up for my own 9 year old daughter to read and be encouraged. Now she wants her license. And started studying for it the next day!

My sons are also studying now. My oldest for his General, my second just passed his Tech last week and is studying for HIS General, and my third is studying for his Tech..... Now their sister has joined the fray! My kids will benefit from the *MTX* also…

My only question now is that page 6 mentions an incident with one of the AmSats and that there was an article about beginners working sats in January's issue. I would like to read that issue very much and try to get my kids hooked on something to keep their interest in the hobby with other modes. I have no idea how to work sats and so could really use the primer.

Phillip N8AYE

Keith Baker just returned from the Dayton Hamvention where he noted a slightly more youthful look…

The DARA people tell me that all but a handful of inside booths were sold out this year. Over 9000 tickets were pre-sold and the flea market was "full"…a significant change from the recent past. Not surprisingly, preliminary estimates also indicate their overall revenue was up and several vendors were very pleased with their booth sales.

I was also pleasantly surprised to see a younger crowd... with significantly less "graying" than I had expected. Indeed, my conversations with the League VEC folks indicated that the average age of the 30,000 or so "newcomers" added to the licensing rolls in the USA in 2009 were in the 30-40 age bracket. Indeed, THAT is *very* good news for the future of the hobby.

All in all, it was a well-run show.

Keith Baker KB1SF, MT SkySurfing columnist

Ask Bob

Sharp-eyed reader Harrison Church of Lebanon, IL caught a typo in the May issue (Part 2 of this series). Under "Skin Effect," the last line should have read, "…its conductivity [not, 'its skin depth'] is about 1/7 that of copper, making it a poor choice at radio frequencies."

Because of its high permeability, the skin depth of iron at radio frequencies is only 1/9 that of copper, making it highly resistive to RF currents.

Bob Grove W8JHD

Window Dressing

After reading your *Beginners* article "Your Antenna is Up: Now What?" in the April issue of *Monitoring Times*, I happened to go into an RV dealership.

They had a short flat piece of RG-6 coax designed to allow a TV lead in to be fed through a closed RV window. The price at the RV dealership was $12.99, but they are considerably cheaper on the internet.

www.shoprvparts.com/product.do?no=14521F
www.campingworld.com/shopping/item/flat-tv-cable/14649
www.summitsource.com/product_info.php?ref=1&products_id=6965
www.summitsource.com/flat-coaxial-rg6-cable-windowdoor-satellite-hdtv-3-ghz-high-frequency-white-flexible-coax-rg6-8-f-to-f-jumper-eagle-aspen-digital-rv-camper-portable-satellite-dish-tv-antenna-coax-cable-adapter-part-8fc300lx8-p-6984.html

I thought you might be interested, since this would be an easy way to get a shortwave antenna lead in into a house without drilling any holes, etc.

Larry Durham

AWA Museum

Jeff Miller N2AWA caught an error in last month's article on museums: The address of the AWA Museum should have been 2 South Avenue, Bloomfield, NY. You can also find it at **www.antiquewireless.org/museum/musmap.htm**

Thanks, Jeff!

EDITOR'S SOAPBOX

Your Chance at FCC Reform

As shortwave listeners, licensed amateur operators, scanning enthusiasts and Internet users, *MT* readers have quite a stake in the future of the FCC and the rules that it makes. Now you can have your say. I had not been aware of the reformation, known as Reboot FCC, until I attended the Free Press Summit, a conference this past May in Washington, D.C. The annual event brought together hundreds of tech-savvy media writers, academics, and activists from around the country, in addition to key government officials including FCC Commissioner Mignon Clyburn, Sen. Byron Dorgan, FCC Associate Chief Bill Freedman, John Tate, Director of Policy and Strategy at the BBC, among a dozen others.

Subjects discussed included media consolidation, net neutrality, copyright protection, the FCC's Broadband Initiative, and spectrum reform. It was during a panel discussion at an afternoon breakout session that included the FCC's Freedman that I finally got the message: the FCC wants your input. During that session, the audience, which consisted of a very broad cross section of radio/TV activists, writers and academics, held Freedman's feet to the fire over specific issues regarding Low Power FM; rules governing minority participation; petition to deny and a general skepticism about the commission's sincerity regarding reform.

After answering each of the questions from the audience Freedman would ask the questioner, "Did you file a comment?" Most had not, so he implored them to do so. And now I'm asking *MT* readers to do so. Got to **http://reboot.fcc.gov** and spend some time. If you have a comment about the Broadband Initiative, low-power licensing, net neutrality, or the future of Over-the-Air TV, you can leave it right there. You can also comment on proposed systems such as the "spectrum dashboard" that will let citizens find out how spectrum is being used, who owns spectrum licenses around the country, and what spectrum is available in your county.

There is no time limit on Reboot FCC comment, but why wait? Get your friends in the chat rooms, ragchew nets and on the repeater to join you in making your ideas heard to move toward serious change at the FCC. It's the best opportunity we've had to do so in more than ten years.

Ken Reitz, Features Editor

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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

SCANNING REPORT
http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

UTILITY WORLD
http://mt-utility.blogspot.com/- by Hugh Stegman
www.ominous-valve.com/uteworld.html

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MT is soliciting feature articles, reviews, and how-to articles covering shortwave broadcasting, utilities, scanning, frequency profiles, construction projects or whatever excites you! Contact Feature Editor Ken Reitz at *kenreitz@monitoringtimes.com* or write c/o Monitoring Times, 7540 Hwy 64 West, Brasstown, NC 28902.

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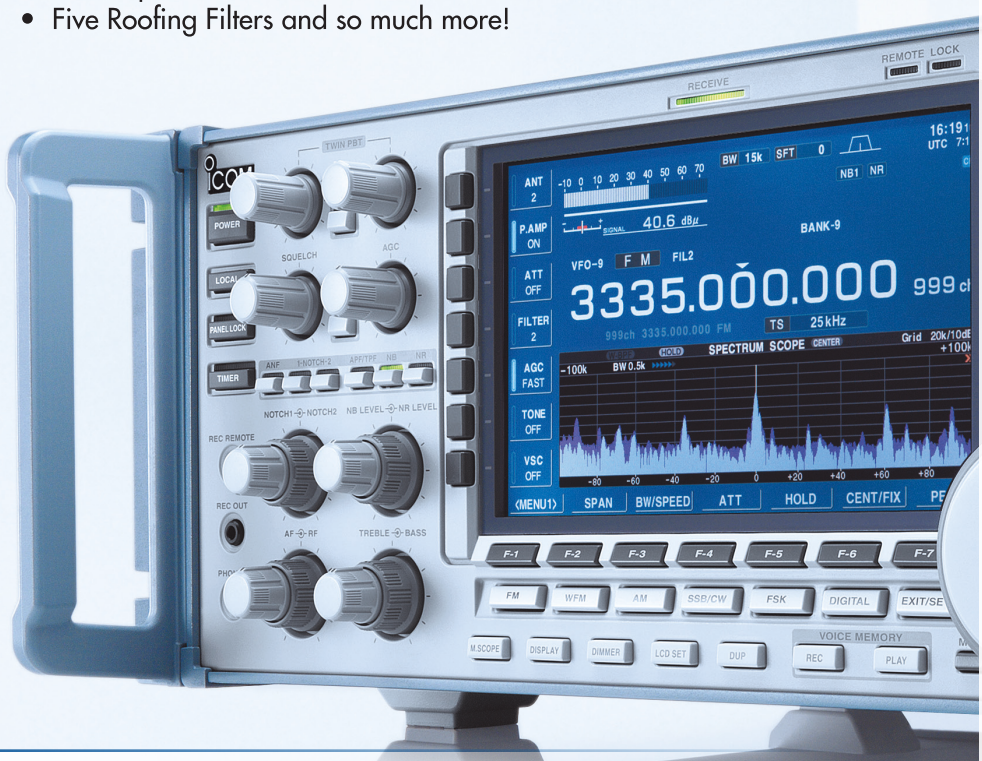

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