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

Monitoring Times®

A Publication of Grove Enterprises

Volume 30, No. 4
April 2011

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

How Green is Your Radio Hobby?

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- Power Your Ham Station from the Sun
- Old-School Wind-Powered Farm Radios
- MT Reviews: GRE-PSR800 Scanner

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AR2300 "Black Box" Professional Grade Communications Receiver

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

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- Optional AR-I/Q Windows software facilitates the easy storage and playback of transmissions captured within up to 1 MHz bandwidth or, signals can be subjected to further analysis.
- An optional GPS board can be used for an accurate time base and for time stamping digital I/Q data.
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It's a Winner!

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Overall rating: 5 stars
WRTH category award winner: Best SDR 2011

And many other independent reviewers agree:

"The Excalibur receiver is a top rate performer supported by excellent software and the spectrum displays are a superb bonus. The 16-bit analogue to digital converter results in unsurpassed strong signal performance and once again my league table of close-in dynamic range receiver performance has a new No. 1." --- *Peter Hart, RadCom*

"In my professional lifetime in communications electronics, I've never seen anything with such shortwave receiving and processing power at such a low price. In the time it took me to write this review, I have changed from a digital skeptic to a true believer. This is one amazing radio!" --- *Bob Grove, Monitoring Times*

Shouldn't you have a look, too?
www.winradio.com

Monitoring Times

Vol. 30 No. 4 April 2011

How Green is Your Radio Hobby?.....8

By Kirk Kleinschmidt NT0Z

Forty-one years ago, the viability of America's environment was in doubt. Then on April 20 of that year (known since as Earth Day), there was a nationwide awakening to the problems we faced: Rivers that would occasionally catch fire; air unfit to breathe; fresh-caught fish unfit to eat, and landfills seeping toxic waste into our water supply.

To be sure, we still face many daunting environmental problems, but the ensuing years have brought a new way of thinking about environmental issues that affect every aspect of modern life. This month *MT* looks at the greening of the radio hobby.

In this issue's cover story, Kirk Kleinschmidt NT0Z examines an area of our electronics-based modern life rarely talked about: the hundreds of millions of pounds of trashed electronics generated each year; how an EU directive relates to U.S. electronic kit builders, and how to save big by managing the batteries that power our radios. Kirk also debunks the myth of high power radio operating and extols the energy-saving beauty of the well- designed antenna.

Also in this issue, check out Ben Jandrell's "Cheap DIY Solar Power for your Radios." Using the small solar panels found in many cheap, disused solar-powered patio or garden lights, Ben shows how you can turn this trash into a reliable power supply for your portable radio.

On Our Cover

Land Rover decked out with ruggedized solar panels in the "Empty Quarter" of Saudi Arabia during a land expedition; Mt. Everest base camp powered by the Sun. Photos Courtesy: CTSolar

C O N T E N T S

R E V I E W S

GRECOM

PSR-800 EZ Scan

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- Includes a 2GB micro SD Card equipped with a special onboard library containing the entire USA and Canada database for all known digital & analog trunking systems and many conventional frequencies.
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MONITORING TIMES (ISSN: 0889-5341; Publishers Mail Agreement #1253492) is published monthly by Grove Enterprises, Inc., Brasstown, North Carolina, USA.

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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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COMMUNICATIONS

by Ken Reitz

SHORTWAVE/AMATEUR RADIO

BBC Budgets Slashed (Again)

There was universally negative reaction to the British government's new budget, announced at the end of January, which included dramatic reductions in funding for BBC World Service foreign language programs to parts of the world that had been thought sacred to the World Service's mission. In addition to lowering the ax on Mandarin programming to China and Hindi programming to India among others, the plan would also lay off nearly 25 percent of its work force, some 650 jobs, over the next three years.

The London *Telegraph* reported that the World Service had originally asked Britain's Foreign Secretary William Hague to close up to 13 language services, but the Secretary refused, agreeing only to those languages announced. It noted too that the previous government had earlier cut 10 language services. The article also noted that a National Union of Journalists (NUJ) representative suggested a strike may be called.

A London *Guardian* editorial noted, "The World Service has a unique ethos little understood in the UK. Most people in Britain know of, but seldom listen to, the English language radio service – but the bulk of the weekly 180 million audience listen in their own languages – 45 of them a decade ago, 31 of them today, 26 of them following [the] cuts."

Unfortunately for the BBC, the announcement coincided with political unrest in Egypt. It happens that the BBC plans to cut its shortwave Arabic service to the Mideast, arguing that the majority of its Egyptian listeners, which it says is 1.6 million, tune in on FM or local broadcast partners. But, an NUJ official called the move shortsighted and was quoted in a follow-up article in the *Guardian,* after Egypt had erupted, as saying, "In a volatile world the World Service needs to maintain its own network of transmitters beyond the reach of dictators so it can continue to reach its audience."

Long-time HCJB Host/Engineer Dies

Shortwave broadcaster HCJB issued a press release January 28 which said in part, "The longtime host of a popular shortwave radio listeners' program, Clayton Howard, died on Thursday, Jan. 27, in Tahlequah, Oklahoma. He was 92. He had served from 1941 to 1984 as an engineer with Radio Station HCJB, an international shortwave station in Quito, Ecuador. For more than two decades he and his wife, Helen, hosted the 'DX Partyline' program."

"A career highlight for Clayton was helping a fellow engineer at the station, Clarence Moore, design and build the world's first cubical quad antenna. Also, in an era in which Ecuador's communication resources were marginal, Clayton actively handled remote broadcasts for the Ecuadorian government. He contributed to the growth of HCJB from a small radio facility to a major international broadcaster, reaching out with the gospel message in many major languages."

PUBLIC SERVICE

Motorola System "in Shambles"

An article in the *Chicago Tribune* detailed the problems that DuPage County has had with its Motorola emergency radio network. Among the issues is the original no-bid $7 million contract with Motorola that has somehow ballooned to $28.6 million in the past four years. According to the article, the original contract didn't allow for infrastructure "such as towers or transmitters and receivers that DuPage needed."

Open Sky has Political Repercussions

The *Milwaukee Journal-Sentinel* has covered issues involving that city's Open Sky emergency radio system for years. The system, which was five years over deadline and $3 million over budget, was the source of acrimony between local politicians and local leaders of the police union during last fall's elections. The issues surrounding the system resulted in a change of political leadership in Milwaukee.

Oakland PD Radio Frustrations

Oakland, California's ABC affiliate *KGO-TV* reported on-going problems with that city's public service radio system. In the reported instance, there was an apparent glitch in the radio system that caused it to go dead during a high-speed chase. At first the mayor blamed police training, but later declared it was not clear what actually happened. According to the report, the police computer systems "only work about half the time."

There's an (illegal) App for That

According to a *McClatchy-Tribune Business News* story appearing in the *Messenger-Inquirer* (Owensboro, Kentucky), smartphone applications such as Scanner911, 5-O Radio, and Police Scanner 2, for iPhones, Androids and similar web-accessed cell phones, could be illegal. It's a new twist on an old conundrum: a citizen's right to monitor public service airways and police fears that criminals will use transmissions heard on those airways to stay a step ahead of the police.

The argument is that such apps turn smartphones into portable scanners, making them illegal to listen to outside the home in some localities. While the article quotes a local County Attorney about the legal grounds for such laws, many other legal authorities around the U.S. have voiced opposite opinions and welcome public scrutiny of police on-air activities. But, a definitive legal opinion is yet to emerge as such laws have not been tested in court.

AM/FM/TV BROADCASTING

NY Bill Targets Radio Pirates

A bill introduced January in the New York State Assembly (A00326) and New York State Senate (S2737), if passed, would make it a crime "…for those who broadcast radio transmissions without obtaining a license to do so from the FCC; the crime will be a class D felony punishable by imprisonment and a fine." There is no provision, however, for additional funding for enforcement and, as seen at the end of this column, the FCC has thrown in the towel with regards to pirate radio in New York City.

Dim-witted Thieves Steal FM Station

An article in the *Dayton Daily News* reported in January the arrest of two men who allegedly broke into the WHIO-TV transmission site and absconded with gear including a transmitter that knocked the station's FM

outlet off the air. The two and possibly a third suspect were said to have made off with the K99.1 FM transmitter among their loot, but were stymied by scrap yard employees who just happened to notice the WHIO and Cox logos that had been stuck on all the gear offered for sale. Police were called and the rest was routine.

SATELLITE

FCC: Ground-based Sirius/XM in Hawaii OK

The Honolulu *Star-Advertiser* reported in late January that the FCC granted authority to Sirius/XM to broadcast their 130 channels through a single terrestrial repeater. Prior to this authorization, Hawaii and Alaskan satellite radio service had been available only online. The agreement lets the satellite radio provider employ a 2,000 watt Honolulu-based repeater operating in the L-band to serve the thousands of, until now, useless Sirius/XM receivers in that city's cars and trucks.

The move was opposed by local broadcasters who argued that the FCC has traditionally, on the mainland, allowed use of a satellite repeater only when there was a satellite signal to be heard. The article quotes Chris Leonard, general manager of Hilo-based New West Broadcasting, Inc. as saying, "We were opposed to any measure that allows a (satellite radio) operator to skip over the satellite-delivery portion of their obligations and put up a terrestrial repeater."

Sirius/XM Seeks Price Hike OK

In late January, Sirius/XM filed a request with the FCC asking it not to extend conditions that were agreed upon when the two former competitors merged in 2008. If the FCC agrees to such a request, the path would be open for the satellite radio monopoly to increase its basic subscription fee which is currently set at $12.95 per month. The original agreement froze programming price hikes for 36 months but allowed the company to pass through costs over which it had no control such as copyright payments which began in July 2009.

The company, in its letter, detailed the fierce competition it said it now faces from "free" terrestrial AM/FM/HD Radio, web-based radio such as Pandora, smartphone web-based radio, and new technologies such as iPods and other MP3 players not even on the market when Sirius and XM originally launched. The letter concluded, "…in light of the increasingly competitive landscape for audio entertainment, there's no need for the Commission to seek to extend or modify the… rate cap…"

The letter, while questioning the FCC's legal authority to set subscription rates, did not reveal what, if any, rate increase they would seek. An argument could easily be made that such stiff (and free) competition should in fact force the company to offer subscriptions substantially lower than now on offer in order to attract new listeners and keep current ones from jumping to all those free audio services.

INTERNET COMMUNICATIONS

Egypt Unrest & Communications Questions

The unrest in Egypt in late January and early February was closely watched by everyone interested in communications. Embattled Egyptian President Mubarak apparently forced the closure of most Internet paths and disrupted cell phone service throughout Egypt late January in an effort to thwart those opposing his 30 year autocratic rule. The opposition had been organizing demonstrations using Facebook, Twitter and other available social media. According to *Wired* magazine, service to four of the country's five ISPs were cut that Friday (the fifth service hosted the Egyptian stock exchange). Those ISPs represented 88 percent of Egypt's Internet access. Still, the protests continued and grew.

But, the "Twitter Revolution" might have been oversold. *Wired* noted that only about a quarter of the Egyptian population has online access, "Street protests have grown the old-fashioned way: by leaflets and spontaneous amalgamation," one source said. A BBC report noted the use of FAX machines on land lines that were used to spread protest information around Egypt's university campuses. It was said that dial-up landline modems were also employed.

As this is written, it's hard to know exactly what workarounds were used because organizers aren't talking, fearing that those channels would be closed. But *Wired* magazine linked to various ways others have used workarounds in similar situations, including Internet circumvention tools. Despite rumors that went viral on the blogosphere at the time, there were no credible reports of amateur radio communications regarding the civil unrest.

FCC ENFORCEMENT

Non-coordinated Repeater Op Cited

FCC field agents, responding to a complaint from the American Radio Relay League (ARRL), issued a Notice of Violation (NOV) to WN6W for operating a non-coordinated and malfunctioning 2 meter repeater that was causing interference to two coordinated repeaters operating on the same frequency. According to FCC documents, the WN6W machine was transmitting a continuous unmodulated signal without any form of identification. It was only through the use of mobile direction finding techniques that the offending repeater was located. The case illustrates the importance of coordinating and monitoring repeaters or other unattended transmitting facilities, including beacon stations.

More CB Busts

FCC field agents, responding to a complaint, issued a Notice of Unlicensed Operation (NOUO) to a CB operator in Shasta Lake, California. According to FCC documents the operator was using a "Galaxy DX 2527, a KLV 1000/P High Power Linear Amplifier, a SKIPPER amplifier made by Palomar, and a no name brand modified linear amplifier" installed at his base station, none of which were FCC certified.

A CBer in Springfield, Oregon, earned a Notice of Violation (NOV) for using a Northstar NS-9500 uncertified transceiver. According to FCC documents, the transceiver was outfitted for FM modulation, which was a separate violation.

FCC NON-ENFORCEMENT

Dozens of NYC Pirates Noted

A posting on a popular radio engineering blog (**http://boards.radio-info.com**) noted the presence of more than 60 unlicensed FM broadcasters receivable while merely driving through New York City's five boroughs and Newark, New Jersey. The person making the post noted that many frequencies hosted multiple stations, adding that the list was compiled while stuck in traffic and putting his car's FM radio in "seek" mode.

While you're stopped in traffic have you ever set the seek button in motion and logged everything you hear? Let us know how many unlicensed broadcasters you've spotted where you live.

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

In a world that nervously watches the intertwined dance of technology and energy, conservation, sustainability and recycling are no longer reserved for governments and business – they're everyday considerations for consumers, citizens and radio hobbyists!

How Green is Your Radio Hobby?

By Kirk A. Kleinschmidt NT0Z

Hobby radio – whether commercial, SWL, utility or amateur – emerged from an era of discovery, excess and unparalleled industrial growth. Much like the auto industry, whose development it closely follows, the Golden Age of Radio was all about bigger, better, and more of it. Fueled by the aftermath of two World Wars and tempered only by two Great Recessions (the 1930's and today's), the Industrial Age put inexpensive food, clothes, appliances, automobiles – and radios along with other consumer electronics – on every table and in every household.

As with all consumer electronics, the products that make our hobbies possible – radios, computers, antennas, accessories, batteries, wire and cable, etc – are all subject to the forces shaping global manufacturing. They all require energy to manufacture, distribute and operate, and they all contain a mix of renewable and non-renewable components, some hazardous, some not. The "greening" of hobby radio and electronics is already well underway and if you haven't noticed its effects yet, you will.

Cheap and Dirty

Now that microscopic traces of every imaginable pollutant can be found in every desert, river and glacier the world over, and now that life expectancies in some countries have actually diminished after peaking a decade or two ago, let's not forget the upside of all of this industrious human behavior: Personal electronics now offer unequalled performance and functionality for mere pocket change!

Taking 1962 as an example (the year I was born): According to an equipment catalog of the day, an amateur radio station built around high-end Hallicrafters gear cost $3,586 (SX-115 receiver, $879; HT-32B transmitter, $1,123; HT-33 amplifier, $1,584). Even in today's economy, most hams don't spend $3,500 on ham gear. But if we poke those numbers into a calculator that factors in the U.S. Consumer Price Index (inflation), we find that what cost $3,586 in 1962 dollars costs $25,157 in 2009 dollars and even more in 2011 dollars!

Considering that modern gear offers dramatically better performance, those inflation-adjusted numbers are even more stunning! In 1962, a brand-new economy car cost $1,395, while a new four-wheel-drive International Scout off-road vehicle cost $2,100. In the era before the explosion of solid-state technology, modern design and off-shore manufacturing, a new car cost less than a new radio!

E-workers process an unending stream of used electronics; these workers actually enjoy minimal breathing protection, many don't. (Photo courtesy of EMPA / United Nations University)

RoHS: Restriction of Hazardous Substances

Even if you haven't been paying much attention to the current Green Revolution, the 2006 RoHS directive enacted by the European Union has already been impacting your enjoyment of hobby radio – especially if you like to build electronic kits.

RoHS restricts the use of six hazardous materials in the manufacture (and sale) of various types of electronic equipment in the EU. It's closely linked with other directives and legislation elsewhere aimed at solving the devastating problems created by of our society's skyrocketing amount of toxic e-waste (electronic waste).

RoHs-compliant components, assemblies and finished products contain strictly controlled amounts of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyls.

Despite the fact that RoHS *directly* impacts equipment sold only in the EU, equipment made and sold everywhere has also been affected, because manufacturers are reluctant to set up separate supply, manufacturing and distribution chains for EU and non-EU products. RoHS has redefined global electronics manufacturing.

Compounding the effects of RoHS and similar mandates, the global switch to newer, smaller surface-mount parts has "dead ended" many electronic kits and equipment built by smaller manufacturers. If older, larger through-hole parts can no longer be sourced, or if a product can't be made RoHS-compliant and remain cost effective, that product is history.

Ten-Tec Vice President Jim Wharton echoes that reality. "Every part we buy is RoHS compliant," says Wharton, "and some of our older and more recent products have become difficult or impossible to service because the availability of many older, non-compliant parts is very limited."

Known for servicing and supporting "ev-

erything we ever made since day one," Wharton says Ten-Tec feels the pressure of upholding its reputation, and that the company has employees who constantly scour the Internet and back-channel markets for sources of new, yet obsolete, service parts.

Business impact aside, Wharton says that Ten-Tec is a "very green" company that recycles "every scrap of everything" associated with its manufacturing operations, including scrapped assemblies, components and sheet metal; solder blobs; clipped component leads, computers; monitors; light bulbs – even empty WD-40 cans. For manufacturers that want to move forward in the new economy, green is the color of the day.

Batteries

It's probably safe to say that not a lot of amateur, shortwave or scanning radio gear ends up in landfills, but radio hobbyists are prodigious users of batteries, primary and rechargeable, big and small, in a variety of chemistries. And batteries can be a big problem when it comes to disposal.

According to the EPA, each year, Americans purchase nearly 3 billion dry-cell batteries to power radios, toys, cell phones, watches, laptops, and power tools, and nearly 100 million lead-acid batteries, primarily for vehicles. Car batteries are a standout success in the U.S., where 95% of them are recycled. With each battery averaging 20 pounds of lead, that's about a *million tons* of lead that's reprocessed into new batteries instead of languishing in landfills each year.

In 1996, federal legislation mandated that mercury, an especially damaging industrial pollutant, be phased out of most common battery types, but recycling all toxic battery components helps to keep heavy metals such as mercury, lead, cadmium and nickel out of landfills, air and drinking water. It also saves resources because recovered materials can be used to make new batteries.

Because of these reformulated, new-style batteries, in most parts of the country primary cells (common alkaline and carbon-zinc, non-rechargeable batteries) can be safely thrown into the trash with the rest of your non-toxic garbage. Some jurisdictions restrict this, but most do not (although many people prefer to recycle these cells as well).

One way to reduce the number of batteries in the waste stream is to use rechargeable batteries, which already account for about one in five dry-cell batteries purchased in the U.S. Over its useful life, each rechargeable battery can replace hundreds of single-use batteries.

E-waste burning; recycling needs to be environmentally friendly too. (Photo courtesy of EMPA / United Nations University)

Primary cells cost more in the long run, but offer certain benefits that secondary rechargeable cells do not. These include shelf lives of up to 10 years, common availability, and a consistent voltage output over time. Rechargeables offer significant long-term cost savings at the expense of complexity and higher initial costs.

To further complicate the issue, not every battery type (chemistry) is adequate for every task. Alkaline and carbon-zinc batteries, for example, work well in lower-current, everyday applications but can't handle high-current loads nearly as well as nickel-cadmium (NiCad) batteries, which is why NiCad batteries still power most portable power tools. Rechargeable Nickel metal hydride (NiMH) cells are often the best choice for most applications and have the added benefit of being minimally toxic to the environment (we still recycle them, of course, but the components aren't nearly as hazardous as the cadmium or lithium used in other cells). Lithium-ion (Li-ion) cells are high-performance and offer very high energy densities, but they are expensive, require precise charging and sometimes overheat or explode – real drawbacks!

You'll have to do some research to determine the best batteries for your particular applications, but to illustrate the potential savings, let's compare – somewhat unscientifically – alkaline batteries to rechargeable NiMH batteries. These could be used in hand-held radios, cameras, you name it, and both are commonly available.

Using amazon.com as a source, I found a 20-pack of Duracell-brand AA alkaline batteries for $12 (60 cents each). Although you can certainly pay more, you can usually find top-tier cells of this type on sale for similar prices. A four-pack of Duracell rechargeable NiMH cells also costs $12. A small wall-cube charger, often available as part of a starter kit and made by the battery manufacturer, costs less than $5 and is not a consideration for this comparison. Shipping costs are also excluded because these products are widely available and can almost always be purchased locally or with free shipping options.

For our seat-of-the-pants comparison, let's assume that between your hand-held radios, cameras, TV remotes, etc, you'd typically use 40 AA alkaline batteries each year (way above average, but we're hams!). With smart shopping, that puts your annual cost at about $24. Because we can't afford to be without power during recharge periods, and to make the projected cost-savings even "worse," let's purchase three packs of NiMH rechargeables instead of just two ($36, 12 batteries total).

For the first year, rechargeables cost an extra $12. That's if you're a disciplined, smart shopper who buys 20-packs when they're priced right. If you buy four-packs or eight-packs every month in the checkout line at the grocery store, all bets are off, and your costs will skyrocket!

For years two through six you save at least $24 a year, or about $120, with impulse buyers saving $250 to $500. For practical reasons I stopped at six years, but if you buy top-tier rechargeables and manage them correctly you may get 10 years and several hundred charges out of them, making your savings even greater.

Manufacturers say NiMH cells can be successfully recharged between 500 and 1,000 times. In a lab setting that may be true, but in the real world, because of charge-management issues, storage temperatures and other factors, most NiMH cells never reach that level of utilization. But they can remain viable through 150-250 charge cycles, which makes them a desirable, win-win product. You save money

Mountains of e-waste pile up at the end of one recycling road. (Photo courtesy of EMPA / United Nations University)

while keeping hundreds of alkaline cells out of the waste stream.

Whatever batteries you choose, do yourself a favor and buy name brand, top-tier rechargeable batteries. The too-good-to-be-true bargain batteries you see all over eBay are just that. Junky, no-name batteries will sour you on the many benefits of modern rechargeables. There are others, but look for brand names such as Energizer, Duracell, Rayovac, Sanyo and Sony. These big-name brands are actively being pirated, so choose your brand and vendors with care!

These S-meter readings clearly show why RF power alone is a poor and expensive way to boost your station performance. If your 100 watt signal is being received as S9, your kilowatt signal will only be S9+10 dB. Dropping your power to 10 watts still produces a strong S7 signal, and dropping it further to a mere 1 watt still tickles the other op's S-meter at S5. That's why QRP works! (Courtesy: Author)

Debunking the Myth of RF Power

At one time or another, most hams think about buying a big amplifier. Unfortunately, in almost every situation, amplifiers are definitely not the best way to achieve better station performance and are usually more trouble than they're worth. They don't do what you think they'll do, they're unnecessarily expensive, and they overconsume precious resources.

As a typical Green Revolution ham, your 100 watt HF signal should be plenty. Setting aside the fact that to get our licenses we vowed to the FCC that we'd always "use the minimum power necessary to communicate," if you need more signal, put up a better antenna or use a better feed line (or both).

Assuming you have a 100 watt transceiver feeding a coax-fed dipole antenna, let's amplify our signal to clearly see "the price of power." For budget-minded ops, a small solid-state or single-tube amplifier will boost your 100 watt signal to about 500 watts. You might think that's a big deal, but it's not. Not even close! According to the laws of physics, every time you double your power output, stations that are receiving your signal hear a 3-dB increase in strength – which is, get ready, about half an S-unit! To nudge the needle a full S-unit you need to quadruple your power output, which provides a 6-dB increase!

The mathematical progression looks like this: 100 watts doubled to 200 watts equals a 3-dB increase. Next, 200 watts doubled to 400 watts equals a 6-dB increase. Then, 400 watts doubled to 800 watts equals a 9-dB increase (beyond the capacity of our budget amplifier). Finally, 100 watts times 10 equals 1000 watts, a 10-dB increase in power output.

An amp that puts out 500 watts provides only a bit more than a 1 S-unit boost to your signal. Considering that budget amps cost between $600 and $1,200, that's a pretty bad deal. If you want still more power, using the above-mentioned progression, adding a kilowatt amplifier provides a 10-dB shot in the arm. That's better, but still less than 2 S-units on the other end. Your costs have increased to as much as $1,800!

If you go for broke (literally) and plunk down $1,500 to $5,000 for a legal-limit amplifier, your 1,500 watt signal will be about 12 dB stronger than your "barefoot" transceiver. Because of the "price of power," 1500 watts is still only two S-units stronger! That's S3 to S5, S5 to S7, and so on – rarely a big deal! In the greenest of amateur radio traditions, the same S-unit progression that works *against* us as we increase power works *for* us as we go QRP. If your 100 watt signal is S9, your 10watt signal will be about S7 and your 1watt signal about S5!

And let's not forget the hidden costs of "amping it up." Budget amplifiers can usually run well on 117-V AC, but larger units really need 240 V. Unless you want to install your amplifier in the laundry room next to the clothes dryer, you'll need to factor the cost of upgrading the electric service in your shack. Depending on specifics and geography, *safely* getting 240 V AC into your shack – while meeting all necessary building codes, etc – will cost between $500 (easy install in a small Midwestern town) and $10,000 (expensive house on either coast). Now we're talking serious money!

But, wait, there's more! Don't forget to add the extra cost of power when the amp is only in standby, more when you key up; the cost of replacing transmitter tubes ($200 and up) and shipping for inevitable repairs ($100 or more). When all is said and done, picking up a couple of transmit-only S-units could set you back $2,000 to $15,000!

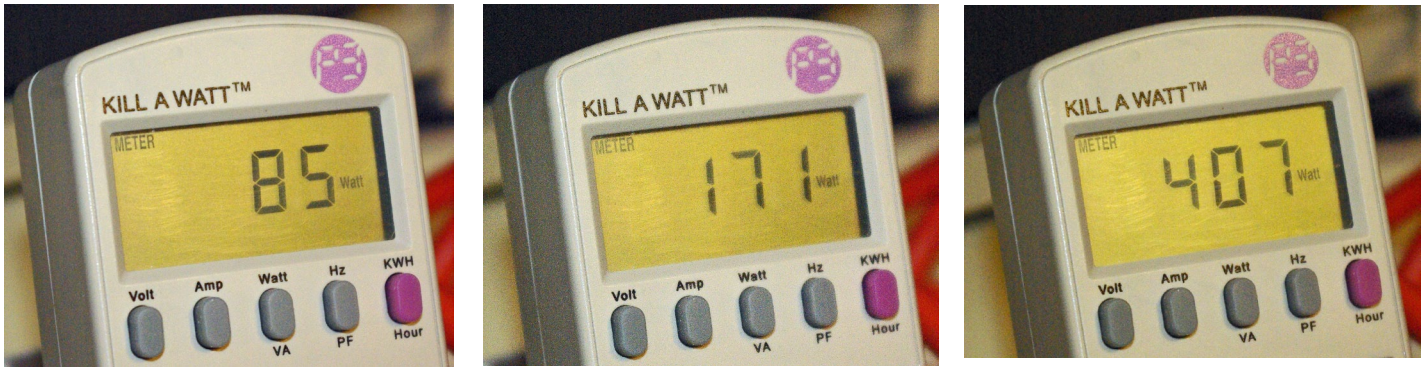
To see how that RF power relates to AC lines power, check out the meter readings related to my own transceiver's output. Now, imagine the AC wattage required to put that 1.5 legal limit RF on the air. That's the true "price of power!"

The Better Antenna Alternative

Improving your antenna system is a *much better* idea. At the most basic level, whether you need to find a taller tree, build a taller mast or even put up a tower, get your antenna farther up in the air. Within reason, that offers universally better performance. Consider replacing your coaxial feed line with open-wire line or 450-ohm ladder line. As mentioned in the February ham radio column, if you're using your dipole on multiple bands via a shack-mounted antenna tuner, feed line losses due to high SWR may slash your signal by 6, 10 or 25 dB! By using open-wire line you'll reclaim most of that lost power. That 3- to 20-dB signal boost is practically free!

Long ago, a wise ham convinced me to replace my dipole with a full-wave horizontal loop for 40 or 80 meters – and now I'm telling *you*! Feed it with coax and use a tuner on bands above the fundamental frequency (or feed it with open-wire line to use it everywhere). That's another 2 to 10 dB boost on the cheap. I detail this inexpensive "death ray" antenna in this issue's *On the Ham Bands* column.

For less than the price of a mid-level amplifier you can buy a multiband beam antenna and a decent rotator. This pair, mounted reasonably high, will offer a 5- to 7-dB directional improvement to your signal. Remember: Amplifiers only



It takes power to make power. These meter readings indicate how much AC power you have to use to put 1, 10 and 100 watts on the air. (Courtesy: Author)

boost your transmitted signal and do *nothing* to improve reception. By rotating a directional antenna you can often boost the signal you're trying to receive while attenuating unwanted signals 10 to 25 dB! The difference, more than 30 dB of signal enhancement, could never be achieved by mere amplification.

Although often desirable, towers, rotators and beams haven't kept pace with other amateur radio gear when it comes to inflation-adjusted prices. As the "real" price of radios has gone down, these items have stayed the same or even increased in cost, making them a somewhat expensive signal-boosting solution (still better than an amplifier, to be sure, but not nearly as cost-effective as the solutions mentioned above).

Amplifiers *can* be useful, but only after you've optimized your antenna and feed line systems, which provide performance gains while receiving *and* transmitting. And after those optimizations, your need for an amplifier will be slim to none. It's a Green Revolution Catch 22!

E-waste dumping; decades of rapid-expansion electronics yields untold amounts of toxic e-waste. (Photo courtesy of EMPA / United Nations University)

TAKING OUT THE E-TRASH

Although discarded electronics, including TVs, appliances, computers, monitors, cell phones, etc., make up less than 10% of the overall waste stream in the U.S., the amount of e-waste produced each year is still truly staggering. Estimates vary, but Tom Doyle, spokesperson for the Consumer Electronics Association, puts the 2010 number at 300 million pounds, up 100 million pounds from the year before!

E-waste is loaded with toxic materials that need to be kept out of landfills, but it's important to remember that there's an awful lot of reusable, recoverable materials that, even from a purely economic standpoint, are better recycled than simply disposed of safely. These materials include gold, silver, lead, mercury, platinum, copper, aluminum, and a bunch of rare-earth metals that are becoming especially valuable now that countries traditionally exporting them, such as China, India, Vietnam and others, are starting to consume them domestically. These hard-to-find materials are vitally important for defense and space technologies, so the sooner we start recovering them, the better.

Opportunities for no-cost and low-cost e-waste disposal and recycling are plentiful in urban and suburban areas, but may be somewhat lacking in rural America (which can prompt illegal dumping). See the *resources box* for more information.

Thanks to the packrat nature of radio hobbyists and the prevalence of the internet, getting rid of unwanted radio gear is trivially easy! If your radio buddies don't want whatever it is you're looking to clear out, the folks at your local radio club will likely be able to take care of it. Many items, even in non-working or parts-missing condition, sell everyday on eBay.

Alternatively, you can get rid of just about anything, including stuff you'd never imagine anyone wanting, by placing a free ad on your local Craigslist (in the Free Stuff section). Freecycle, a web-based Yahoo! group that may have an active group in your location, is even better for giving away weird stuff.

More radio-specific sites with "free stuff" classified ad sections include eHam.net and QTH.com. Some vendors, manufacturers and service depots will buy certain non-working radios for parts, take them in on trades, or make use of specialty components for servicing obsolete hardware.

Small-time e-waste worker; an impoverished life made marginally better by DIY recycling without any of the safeguards. (Photo courtesy of EMPA / United Nations University)

OUR E-WASTE CAUSES DEVASTATION ABROAD

E-waste disposal is quite a challenge in the U.S. and other developed countries, but the consequences we face are miniscule compared to those faced by the developing countries that receive our garbage. One of the dirtiest secrets of an already dirty business is that about 80% of the e-waste you submit for recycling ends up on container ships bound for China, Nigeria, India, Vietnam or Pakistan (hundreds of ships each day from the U.S. alone).

Recovering valuable metals from electronic garbage is a lucrative business, but when it's done in countries with few or no laws to protect workers or restrict methods, personal and environmental devastation results. Workers are almost always unskilled and have no protection. Toxic materials are heated or incinerated and wind up in their bodies and in the atmosphere. In some parts of China and Nigeria where this activity takes place, levels of lead and mercury in food, water and the people themselves are as much as 500 times higher than established safety norms. It's bad enough in the present, but the long-term impact on these regions and populations has yet to be fully realized.

It's not illegal to export these materials, but it is illegal (or at least unethical) for companies to portray themselves as responsible e-waste recyclers, only to secretly ship the stuff overseas to have it processed by vulnerable and exploited people who are merely trying to survive.

Greenpeace and other organizations have placed tracking devices in e-waste items in the U.S. and the U.K. and discovered that, despite recyclers' stated intentions to process the material locally, such material found its way to Nigeria for "processing." Some countries are taking steps to crack down on this kind of deadly bait and switch e-waste trade, but the U.S. is lagging in its efforts.

In the absence of pointed governmental action, various public and private organizations, including the United Nations, are implementing programs to identity and certify responsible recyclers.

E-waste reclamation; often the worst jobs in recycling go to the poorest countries. China and India employ millions in largely unsafe workplaces. (Photo courtesy of EMPA / United Nations University)

Solar Power for Amateur Radio

By Ian Cummings KB1SG
(Unless otherwise noted,
all photos courtesy the author)

Solar power is ideally suited to powering radio communications equipment in austere locations, as remote base stations/repeater installations and to provide backup power for emergency applications. It also removes 60 cycle and static noise common to stations powered by the local electric grid as well as providing a reliable and free source of power that is sustainable.

The Basic Solar Power System

The basic solar power installation is the same for portable as it would be for fixed installations: a solar panel or solar array (if more than one panel is to be combined into a larger output circuit); a battery to store power and to provide power when sun is unavailable and a charge controller to monitor the battery to provide appropriate charge control, and low voltage cutoff if the battery bank falls to a critical level. Most portable and backup solar power systems operate at DC voltages (commonly 13.2VDC, however, 28V and 48V systems are also used in some cases). Some systems employ inverters or DC-DC converters to produce other voltages or AC current. Power conversion however is less efficient as voltage conversion results in power loss related to inverter or converter inefficiencies.

Solar Cells and Solar Panels

Solar cells use the photovoltaic effect where photons striking silicon wafers dislodge electrons that are channeled on the solar cell via silver traces to two tabs, positive and negative. The most common voltage is 0.5V per cell and current outputs vary between a few mA and several amps. Solar panels are constructed of multiple cells in series-parallel circuits to create the current and voltage specified. The standard solar cell today has an efficiency of around 25 to 30% (meaning 25 to 30% of available incident solar radiation is converted to electricity, 1 square meter of area under standard conditions receives 1 kilowatt (1000 watts) of solar power (a 1 square meter solar panel should produce 250 to 350W of power).

Traditional solar panels are constructed on low sodium glass that allows efficient transmission of sunlight. This glass is very durable and faces the sun. The solar cells are embedded on the back of the glass surface using either low temperature melting ethyl vinyl acetate (EVA) plastic (similar to the glue used on hot melt glue guns) or silicone potting compound. Cells have tabs attached that connect to silver traces on the silicon solar cell material. The tabs are connected in series-parallel circuits with thin metal tape to create the appropriate panel voltage.

The back of the glass (with "potted" solar cells and interconnecting metal tape applied to the back) is then sealed with a thin Teflon plastic sheet. The resulting "sandwich" of glass, cells in potting compound and Teflon sheet backing is constructed in a heated vacuum laminator at a specific temperature. The vacuum is used to eliminate bubbles in the cell layer. The resulting laminate is then put in an aluminum frame for mounting. A junction box is attached to the back, usually with screw terminals. A variety of connectors are standard.

Solar panel voltage varies with temperature (voltage output is higher as the panel temperature cools). Mounting of solar panels with air space behind is important to permit cooler temperatures on the panel surface. There are a number of specialty solar panels: folding solar panels, ruggedized panels, thin film flexible panels and triple junction space grade panels.

Ruggedized and folding solar panels tend to use non-glass backing and the cells are laminated to the front (solar side) of the backing (commonly fiberglass reinforced plastic or fiberglass sheets). Small ruggedized sub-panels are attached to a folding rip-stop nylon backing so the panels fold into compact size.

Ruggedized solar panels used in desert expedition across Saudi Arabia.

Thin film panels are lighter weight but suffer from lower efficiencies, dramatically higher cost and lower voltage. The lower voltage of thin film panels becomes a problem especially at higher temperatures as battery voltage approaches panel voltage and charging efficiency can decrease.

Triple junction solar cells are employed generally in spacecraft and are extremely expensive. Individual cell voltages tend to be higher and efficiencies are dramatically higher than conventional solar cells.

Solar panel output is rated in a number of ways. Probably the most common rating method is to determine open circuit voltage (Voc) for the panel and the closed circuit current (Isc, current when the panel is shorted). Voc multiplied times Isc is the rated power. Another rating method involves determining the maximum power point (MPPT) by plotting voltage and current across a broad range of resistive loads. This creates a curve of power output (voltage x current) and voltage that has a broad peak somewhat below the Voc voltage, the voltage at peak where maximum power is obtained is the maximum power voltage (Vmp). The last method of rating panels involves a device designed to maintain the panel at standard temperature and flashes the panel with a bulb that creates the same radiation spectrum as the sun and with the standard radiation incidence as the sun creates under standard conditions (1KW/meter squared).

Solar panels need to be installed facing South (in the Northern Hemisphere) at an angle equal to your latitude. In actuality this angle varies with the season as the sun rises higher or lower in the sky each day based upon the season and the tilt of the Earth. Some arrays actually employ solar trackers to vary the angle of the panels and the azimuth (heading on the compass) to track the sun for maximum power harvesting. These systems are somewhat expensive, complex and prone to failure. They are impractical for most applications unless you're really dedicated to getting the increased energy harvest.

Battery Power and Chemistry

Batteries are rated in terms of their power capacity expressed in Amp-Hours (AH). The amp-hour is a rating of how many amps can be drawn in a given time frame. Example: a 100AH battery can produce 10A for 10 hours or 1A for 100hours. This allows one to determine the correct battery for a given load. There are also ratings of maximum current output (instantaneously) and internal resistance. Internal resistance is important as all batteries act as though they were connected across a resistor that is constantly discharging the battery. Some batteries have a lower internal resistance than others and therefore require less time between full charges.

Charge state (percentage of capacity present in the battery) is defined for all batteries by battery voltage. The battery voltage as a percent of maximum voltage is related to percent of charge remaining by a curve of battery voltage as it relates to percent of maximum charge remaining. These curves are temperature dependent so in order to know percent of charge remaining in a battery, one needs to consult the charge/voltage curve for that particular battery at the temperature noted at the time of measurement. Most batteries have lower power density at lower temperatures (because batteries depend upon a chemical reaction and all such reactions slow at lower temperatures).

The traditional battery used in solar power has been the flooded lead acid battery (similar to that in most cars). Improvements in lead acid battery design have resulted in the sealed lead acid battery (SLA) and adsorbed glass matt (AGM) and gel cell batteries. These newer designs eliminate the need to replace water frequently (because they are sealed) and they can generally be mounted in any orientation. AGM batteries are very popular in solar power installations. Lead acid batteries are inexpensive and reliable, but they are very heavy; a lower power density for a given weight, and have a significantly lower internal resistance compared to newer technologies (they also self-discharge faster).

Be mindful that there are two major types of lead acid batteries: starting batteries (such as you find in your car that are optimized for cold cranking current) and deep cycle batteries. The deep cycle battery is specifically designed to cycle between full charge and a fraction of charge that is much lower than cold cranking batteries are designed to withstand. Don't try to use car batteries in any serious solar power system. They just aren't designed to be deeply cycled every day.

Ruggedized solar panels help zoo researchers in Nigeria.

Lithium batteries have largely replaced other battery chemistries for low weight portable operation of electronic devices. The most common lithium battery chemistries include lithium ion, lithium polymer and lithium iron-phosphate. The lithium ion and polymer batteries are most common and have very attractive power densities. However, they have different charging regimens compared to other batteries and battery cell protection boards are critical for safety reasons. In particular, over-charge/ over-discharge and cell balancing are required as any excursion outside of normal parameters for any of these criteria can result in cell damage or in the worst case a pyrotechnic degradation (explosion or fire).

Solar panels and charge controller at base camp on 2008 Everest expedition.

Properly charged and properly balanced, these cells are safe. Some cells (such as the 18650 lithium ion battery) actually have on-board protection boards on each cell just beneath the positive terminal. Lithium iron phosphate batteries are less prone to fire or explosion but the technology is somewhat newer and is not quite as lightweight as lithium ion batteries though they are definitely an improvement upon lead-acid batteries in a number of ways.

Older technologies such as nickel cadmium (NiCad) and nickel metal hydride batteries have become much less a part of the marketplace. NiCad batteries suffer from a memory effect related to charge/discharge cycles and NiMH batteries require complex temperature monitoring during charging.

Charge Controllers

Charge controllers monitor battery voltage and assure that charge rate and duration of charge are appropriate for the size and battery chemistry of the system battery. Very basic controllers provide only these functions (rate, duration of charge and charge voltage). Most commercial controllers do so by using pulse width modulation (PWM) where the charging parameters are modulated by the pulses with duration ("width") of pulses used to control parameters of charge. Other charging methods exist with the most common alternative to PWM chargers being a load diversion charge controller. Charge diversion controllers control only the charge voltage by switching a resistive load onto the charge source when maximum voltage is reached. Another common method of charging is maximum power point (MPP) charge control where the battery is charged by constantly monitoring panel output

Children at a school in Fiji used solar panels to power their laptops.

and tracking charging voltage to match the panel MPP. Some increased charging efficiency is seen with MPP tracking controllers.

Because battery charge/voltage curves vary with temperature, as does solar panel voltage, most controllers also incorporate temperature compensation to adjust charging parameters to match effects of temperature upon battery charging. Other desirable features include either light emitting diode (LED) display of state of battery charge or more commonly liquid crystal display (LCD) of actual battery voltage.

Most sophisticated charge controllers also incorporate low voltage disconnect (LVD) to protect batteries if there is insufficient charging current to maintain minimum battery voltages (damage occurs to batteries below a critical low voltage limit, this feature prevents such damage from occurring).

Charge controllers are specifically designed for a given battery chemistry; those designed for lead-acid batteries are not appropriate for charging other battery chemistries (such as lithium batteries) and use of a charge controller for a battery type not specifically approved for that controller can be dangerous.

Sizing Solar Power System Components

Solar power systems need to be specifically matched to the load power rating (watts) and duty cycle (percent "on" time in a 24 hour period on average). Ultimately the total load must be predicted in Amp-Hours (AH). This is done by taking the nominal (average) power use in watts for each device, divide by the system voltage to determine the current consumed for that device. The duty cycle (expressed as a decimal) is multiplied by the current consumption times 24 to determine AH per 24 hour period for that device. Example: 50W transceiver operated 6 hours a day on 13.2VDC system. Current is 3.78A (50W/13.2V). Four hours of 24 hours is 25% or 0.25. Total AH used in 24 hours is 3.78 X 0.25 X 24 = 22.7AH.

As a general rule, there are around 4 hours of peak sunlight in the average day (more in Southerly locations and less in Northerly locations and length depends upon season). There are tables available to determine exactly how long you have on average at your specific location and latitude.

The size of the solar array needs to be large enough to restore the power used each 24 hours (in the example above the 22.7AH needs to be restored in the 4 hours of sunlight available daily). Simply divide the total 24 hour AH load by the hours of sunlight available (4 in this example). 22.7/4 = 5.78A. So, the solar array will need to produce 5.78A at the MPP (let's say for this example this is 17V, a common voltage for panels with Voc around 20 to 22VDC in 13.2VDC systems). You will need a 98W array of panels (5.78A X 17V = 98.2). Always use an "engineering factor," around 25%, to upsize the panel capacity to allow for voltage drops, dust on the panel surface and slight output drop of solar panels over their anticipated lifespan. So in this example around 120W of panel capacity should suffice (and this is a common panel size so you could use one panel and one frame). The assumption in this discussion is that the transceiver is 50W input. To obtain 50W output the design parameters increase in correspondence with the transmitter efficiency (often 50 percent or so).

Battery bank sizing is similar. The battery bank is designed to allow the batteries to supply the load (50W for 4 hours daily) for 3 or 4 days without sunlight. This allows the system to operate in inclement (cloudy) weather of up to 3 or 4 days duration. In this example 4 days with 22.7AH load per day is about 90AH. 100AH batteries are a common size and the next higher "common size" battery would be the best bet.

This combination of 120W of panel capacity and 100AH of battery capacity at 13VDC is the most common simple solar power installation for the "average" amateur radio solar power installation. Add in code compliance components and especially good grounding and lighting arrestors and you have an "off the grid" radio system.

System Voltage Selection

Most solar power systems for portable and expedition use are designed to operate at 13.2VDC ("12 volt systems") which is the equilibrium voltage observed for lead acid batteries at standard temperature when fully charged. These systems are readily compatible with DC adaptors available for most computer devices and most consumer electronics.

Fixed systems (such as residential power, solar backup systems and remote repeater applications) may employ higher voltages primarily because this limits voltage drops on longer cable runs to either the solar array or the load. Voltage drop is primarily dependent upon current (not voltage) and cable size. Using higher voltages permits use of smaller and longer cable runs to solar arrays. This is less of an issue in portable and expedition applications.

National Electric Code and Solar Power

The National Electrical Code (NEC) has specific sections that address permanent solar power installations. Any permanent installation should be installed in compliance with the NEC both for safety but also because most such installations require building permits and also because insurers expect code compliant installations in case of damage (e.g. lighting strike).

Radio Devices and Solar Power

Solar power is very compatible with radio devices. However the main drawback is that the PWM controllers tend to operate in the 100 kHz or higher pulse range and create RF "hash" comprised of the multiple harmonics of the charger pulse frequency. On most HF radios this sounds like white noise and can make reception impossible. This noise however is only present during solar charging (e.g. it will not be present when the panel is detached or if the battery were to be fully charged). The most expedient solution is to simply turn the controller off during operation and/or detach the solar panel.

The wiring of the solar power system actually acts as an antenna to re-radiate the RF noise created in the controller. Toroids on wires leading into and out of the controller and enclosing the controller in metal box can reduce or eliminate the noise production as would a good earth ground. This issue is less evident or not noticeable when using the frequency modulation (FM) mode.

Portable and Expedition Solar Power Systems

Solar power systems designed for portable and expedition requirements have entirely different demands. Weight becomes a key issue and carefully designing the solar panels to withstand the rigors of being assembled, disassembled and transported are all very important. Battery pack capacity needs to match the load but in most applications, and particularly when using radio gear and/or laptops, around 16AH seems to be sufficient.

Temperature compensation is important as the system will be in the environment. In very cold temperatures silicone wires are even required to prevent breakage common to plastic insulation in such environments. Lastly, an LCD display of battery voltage, panel current and load current is desirable to permit troubleshooting the system "in the wild." Reliable weatherproof connectors and power system containers are important.

Lithium batteries are well suited to portable and expedition use but there are restrictions placed upon transport of lithium batteries on commercial aircraft and if weight is not critical it may be best to use AGM SLA batteries.

Backup Solar Power for Amateur Radio Stations

Backup power systems are designed to be available constantly but used intermittently. In this case you can design your system with a smaller solar array with a commensurately larger battery bank. Your solar panel would be able to more slowly restore power from your last usage in a very large battery bank and then when you need the power you would run your system largely from the stored battery energy. This is entirely different in design from a system designed to draw a significant part of the battery bank energy every day and to restore that power the next sun cycle.

In the example above (50W transceiver), let's say it's needed once every 6 months for 8 hours of use for 6 days (e.g. during a hurricane in the South or a blizzard in the North). Eight hours of use is a duty cycle of 0.33. Total AH used in 24 hours is 3.78 X 0.33 X 24 = 29.9AH. So, you will want to have a battery bank of 6 days X 29.9AH/day = 179AH. Again, round up to the nearest common battery size so two 100AH batteries should be fine.

Now, you can design the timeframe over which you would desire the battery bank to recharge after your 6 day storm use. Let's arbitrarily pick 10 days. We would need to restore 179AH of power over 10 days. That's 17.9AH per day (179AH/day divided by 10 days). Again, we have 4 hours of useful sunlight with which to charge each day so that's 17.9AH/day divided by 4 = 4.47A of panel output. At a MPP of 17VDC that's 76W. Round up for engineering factors and we have 94W. A 100W panel would be fine in this case.

QRP/Low Power Solar Power

QRP (low power) transceivers are plentiful and lots of fun to operate from the most rugged locations. In this example we can design a system for, let's say the Elecraft K2, a popular HF amateur radio QRP transceiver. This transceiver draws about 0.15A (150mA) in receive and will transmit at 15W (standard unit, there is a 100W option but then again that's not QRP!). Let's say you would like to sit on a mountaintop for 4 hours and operate such that you are listening 60 percent of the time during those 4 hours and transmitting 40 percent of the time (probably pretty close to reality). Let's also say you'll be camping up there for 5 days. What size panel and battery pack would you need to take with you?

The power consumption calculations would then be:

Receive load: 0.15A X 0.6 (duty cycle) X 4 hours = 0.36AH

Transmit load: 1.14A (15W/13.2VDC) X 0.4 (duty cycle) X 4 hours = 1.82AH

Total load: 0.36AH receive plus 1.82AH transmit = 2.18AH

You will need sufficient panel capacity to "stuff" 2.18AH back into the battery pack each day and you would want enough battery capacity to run 3 days if there's cloudy weather so you don't spoil the intention of your trip. The solar panel capacity would be: 2.18AH/day divided by 4 hours per day of sunlight = 0.55A. At 17VDC MPP this is just shy of 10W.

Most people would upgrade to 20W to have the excess capacity and so they can operate and recharge their battery bank at the same time (takes twice as much power). The battery bank would be nearly full most of the time that way.

The battery bank would be: 2.18AH/day multiplied by 3 days = 6.54AH allowing for engineering factor that's close to 8AH of battery capacity.

VHF/UHF Repeater Solar Power

Repeater and remote base operation requires larger solar power systems both because of increased power used on transmit but also larger duty cycles. Let's look at the "average" VHF repeater. Let's assume 100W in transmit with a receive/standby current of around 5W. Let's assume the system is transmitting 30 minutes of each hour 24 hours a day. We will design at 13.2VDC.

Receive load: 0.38A X 0.5 (duty cycle) X 24 hours = 4.56AH

Transmit load: 7.57A X 0.5 (duty cycle) X 24 hours = 90.8AH

Total load: 4.56AH receive plus 90.8AH transmit = 95.4AH

You will need 95.4AH each sun cycle from your solar array.

The solar panel capacity would be: 95.4AH/day divided by 4 hours per day of sunlight = 23.8A. At 17VDC MPP this is 405.3W of panels. Adding the engineering factor, you are up to 500W of solar panel capacity!

The battery bank is equally large: 95.4AH/day multiplied by 3 days = 286AH. Rounded up to 300AH that's three 100AH deep cycle batteries.

Summary

Solar power is an attractive way to power radio devices. Proper design and installation is important. I hope this article will help you to understand solar power and to give solar powered radio operation a try.

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Photo Courtesy of Terry Bryant www.wincharger.com

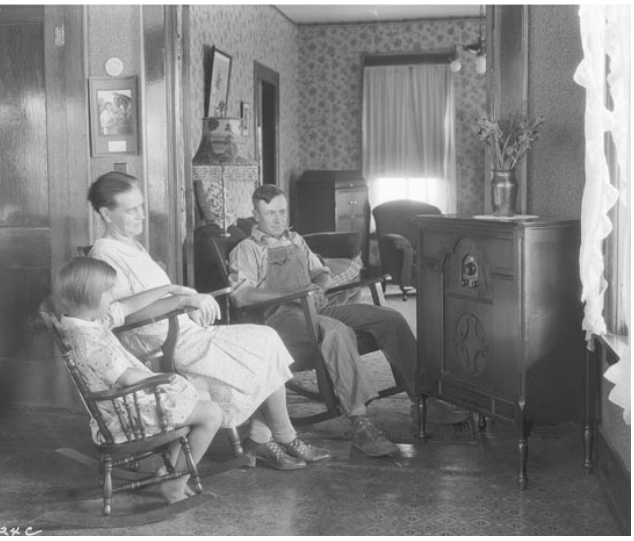
Old School Wind-Powered Farm Radios

By Ernie Franke WA2EWT and John Franke WA4WDL

The first thing my brother and I noticed about the antique radio we had just purchased at auction was a red tag attached to the line cord: "Red mark on the plug indicates the positive terminal." We discovered that the vintage radio was actually a 32 volt DC "farm radio." It was originally designed to be connected to a wind-generator, which was the only way electricity was provided to rural areas in the 1920s and '30s.

We set about reviving the radio and in the process discovered the unique history of wind-powered radios. While we couldn't fully relive those "golden days of radio," we could rejuvenate one of the many farm radios and bask in the glow of its dial lights. But first, let's examine the link between radio and wind generators.

For the rural farmer, battery-powered radio came first, then wind-generated electricity, that was eventually followed by power-line electricity. Wind-energy generation was an up-and-coming industry that the desire for radio helped to start. There was a ready market and manufacturers rose to meet that market.



A farm family from August 15, 1930, thought to be from Ingham County, Michigan, listens to the radio. (National Archives and Records Administration, Records of the Extension Service, photo by George W. Ackerman)

Old-School Wind and Radio

Back in the 1920s and 1930s, farm families throughout the Midwest used 200-watt to 3,000 watt wind generators to power Direct Current (DC) lights, radios, and kitchen appliances. Serving as a "grass-roots" effort of the modern wind-turbines, development depended on the roller-coaster economy, whimsical federal and state tax policies, and the desire to supply cheap power for the newly-emerging radio listening craze.

Once exposed to the benefits of radio, farmers quickly bumped it to the top of their "wish list." Farm radios, powered by wind-generators, proliferated because of the location of farms in the windy mid-west and the pricing strategy of bundling the generator with the radio. Wind experimenters, just as amateur radio operators on the ham bands, developed new techniques for capturing the wind.

Eventually, the modest wind industry was literally driven out of business by government policies favoring the construction of utility lines and fossil fuel power plants. But the oil shortages of the 1970s changed the energy picture for this country and for the world. It revived an interest in alternative energy sources, paving the way for the re-entry of the windmill as a power generator. Today, however, we lack the strong tie between the wind-generator and radio, because we use inverters to supply the energy in the most usable format (120 volt, 60 Hz AC) to power our current appliances.

Binding the Nation Together

At the dawn of broadcasting, there were six and a half million farms in the U.S., comprising nearly half of the population. Nowhere did the coming of radio broadcasting have more social impact than in America's rural communities. Farm families, once isolated, were brought into contact with the rest of the nation. By the end of 1923 there were over 500 radio stations broadcasting news, weather, sports, religion, music and comedy, all available with the twist of a dial.

RCA's pioneer David Sarnoff, in a 1924 speech at the University of Missouri, stated, "Radio's greatest contribution to civilization lies not so much in what it does for the city dweller, but upon the influence it can bring upon the life and action of our farm population . . . the message that radio brings to the farmer is the message of human contact, human sympathy, and culture." Even the word "broadcasting" itself came from an agricultural term, meaning "scattering seeds widely."

From 1926 through 1930, the number of radio-equipped homes increased from a little over 5 million to approximately 12 million, jumping from 20 percent to 40 percent of the population. By 1935, even after several years of the Great Depression, the number of radio homes had increased to 22 million, or about two-thirds of all homes in the nation. By 1941, radios numbered 30 million or roughly 87 percent of all homes, and 1948 saw a record 75 million broadcast radios in 95% of U.S. homes.

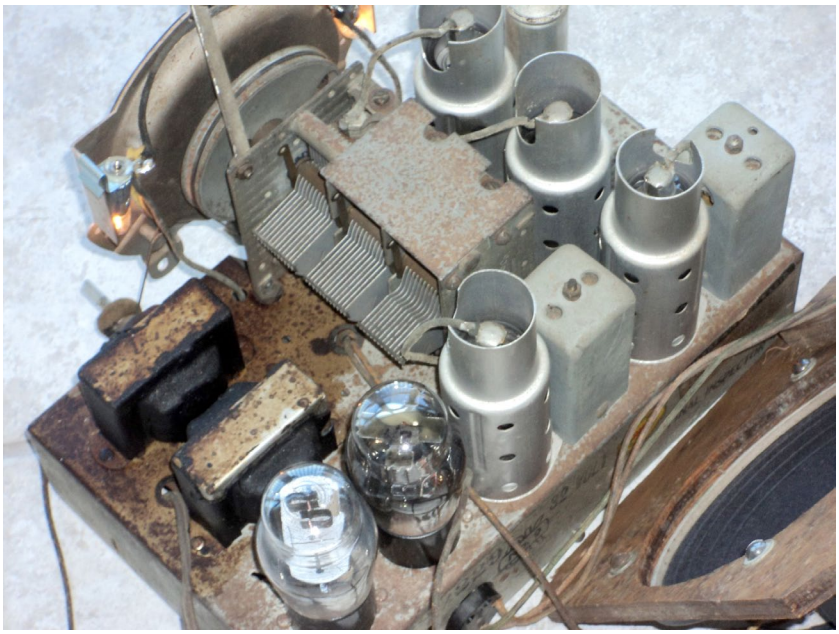
Sets continually improved in quality even as the average cost of a set dropped from around $120 in 1929, $80 in 1930, to around $40 in 1935. Even so, few farms had electric power lines.

The 32-Volt Farm Electrical System

In the late 1920s, the first radios powered by household alternating current (AC) started to appear on the market, a boon for those listeners who actually had AC power in their homes. "No more messy batteries," read a typical advertisement. Batteries were heavy jars filled with sulfuric acid that were kept in the basement. Typically, a heavy wire, passing through a hole in the living room floor, connected the battery and the radio.

The battery was often kept in the basement because the lady of the house objected to the smell and to the burnt holes in the carpet

1935 Montgomery Ward Airline 32 volt radio built to operate on wind power. (Courtesy: E. A. Franke)



Inside the 1935 Montgomery Ward Airline 32 volt radio. (Courtesy: E.A. Franke)

resulting from leaks, which were frequent. Being under the house, the hydrogen given off during charging was vented safely to the atmosphere. However, much of rural America was still not on the power grid. Not wishing to miss out on a huge market, manufacturers continued to produce radio sets powered by batteries.

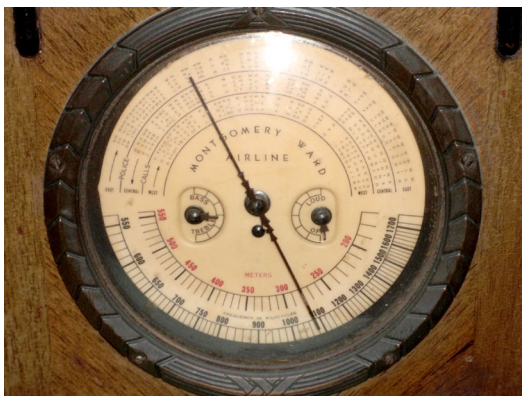
By the early 1930s, most farms across the U.S. used either 32 volt DC systems or were without electric power altogether. Radios operated by battery power used dry cells, which were prohibitively expensive to operate for long periods. Operators used auto storage batteries for the "A" or filament supply, but had to purchase the "B" batteries for the plate supply. If the A battery ran out, it had to be hauled to town and left for a few days at an auto repair shop to be recharged, while the B battery had to simply be replaced.

The B-battery (high voltage) alone cost as much as $3, a princely sum during the Great Depression. Few farmers or ranchers could afford that kind of money for only a few hours of radio time. Radio manufacturers addressed the expense and inconvenience of batteries by developing AC powered radios. But, it was not an option available to rural farms.

What was our depression-era farmer to do when the battery ran out? He hooked up his battery to one of those new-fangled Zenith Winchargers that he saw in the Montgomery Ward or Sears catalog. The Wincharger was a small generator connected directly to the shaft of a spinning turbine that cranked out the voltage. In but a few hours the battery was charged for that night's radio shows.

The success of these early 6 volt systems led to the development of higher-voltage (32 volt) wind chargers, enabling farmers to extend power over long cable runs to light their barns and outbuildings. All of his appliances ran on 32 volt DC electricity! A well-equipped farm or ranch might boast 32 volt DC lights, toasters, coffee pots, cream separators, sheep shears, and milking machines.

Radio manufacturers kept pace, with 32 volt vibrator models, as well as simpler sets that used series filaments and only 32 volts for the plates. Such sets generally had push-pull audio amplifiers in order to get adequate volume from the low plate voltage, an example of which is our 1935 Montgomery Ward (Airline) Model 62-229.



Dial from 1935 Airline farm radio (Courtesy: E.A. Franke)

Restoring the "Tombstone" Radio

In the 1930s, radio manufacturers turned their attention to designing stylish radio cabinets to look attractive in the home, a big improvement over the boxy radio cabinets of the 1920s. Cathedral and tombstone shaped wooden table radios were popular throughout the decade.

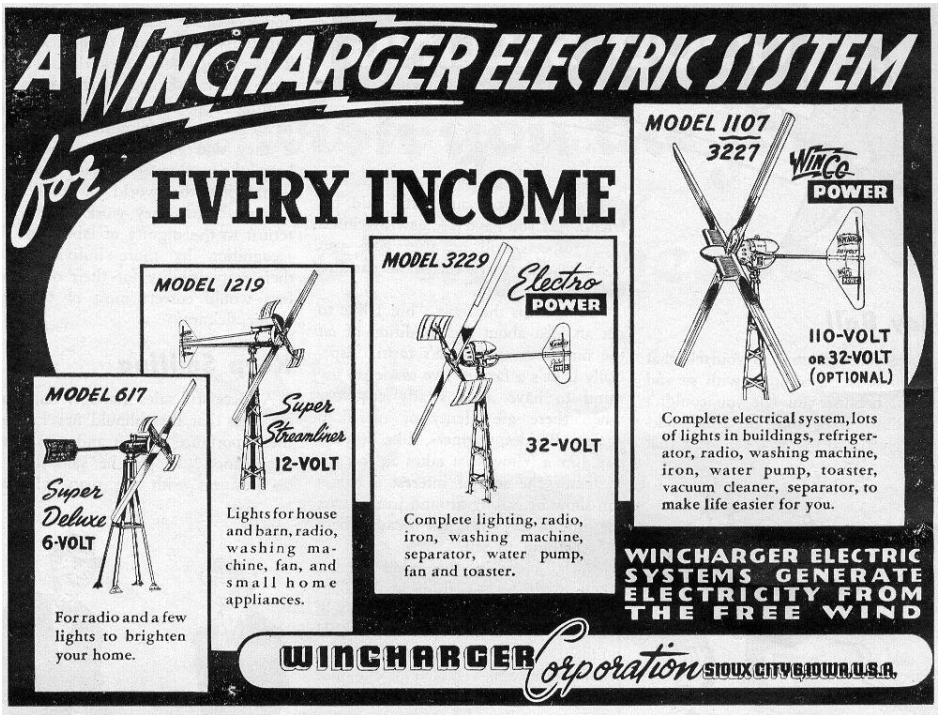
What we had acquired was a 1935 Montgomery Ward (brand name Airline), six-tube, tombstone, "farm radio" that operated from 32 volt wind-turbine power. Montgomery Ward didn't make radios, but sold ones made for it by several radio manufacturers, including Wells-Gardner, Davidson-Hayes and US Radio and TV Corp. Airline was second only to Sears' Silvertone in mail order sales.

As you might imagine for a radio that had long since been forgotten with its unusual voltage, the cabinet showed signs of its age: surface scratches, chips in the veneer, and flaking of the original finish. The grill cloth had holes and the speaker cone was torn apart. The chassis appeared to be complete with tubes and when plugged in, all the tubes lit up. Most of the capacitors had dried out and needed replacing. We found free on-line schematics, manuals, and tube data at **www.nostalgiaair.org**.

Now, after the investment of some sweat and replacement parts, it performs like a new 1935 AM radio, and we love the reassuring glow from the dial. The Universal Battery Eliminator (ARBE-III, 2.5 Amp version) at **www.radiolaguy.com/RadioPowerSupply.htm** was used to power our 32-Volt farm radio from the AC line.

With a 1935 list price of $27, the Airline model 62-229 has six tubes (6D6, 6A7, 6D6, 85, 43, 6A6) and tunes medium-wave (550-1500 kHz), including police calls. It is a super-heterodyne with AVC, a tone control, electro-dynamic speaker, 3-gang condenser and an illuminated dial. Power consumption is about 38 watts. As with many radios of this era, the field coil of the loudspeaker was powered by the supply voltage (moving-coil with field excitation coil).

By rotating the wooden knob, one would be reminded of over 150 stations that were printed on the dial, arranged by Eastern, Central and Western States; WSYR, WEAF, WLW, WGY, WESG, KDKA, WTIC, WHAM, WFBL, WNBF and Police. It was like looking at an eye-chart.



Wincharger ad circa 1930s shows four models from 6 volts to 110 volts. (Courtesy: George Greenhough, Canada)

A small loop antenna is plenty for AM reception, but a long wire is better. Back in 1935 most stations were under 1,000 watts with only seven clear channel stations. About one-third of the stations were daytime only.

An Industry is Born

Rural Free Delivery mail, hand-delivered to each farm, first broke the communications isolation of the farm. Soon, mail order catalogs and the products that could be ordered through them helped to level the differences between people who lived on farms and people who lived in towns. Sears, Roebuck & Co., and Montgomery Ward, the two leading mail order catalog firms, provided almost every product that could be purchased anywhere.

Vintage Zenith ad for "DeLuxe" 6 volt Wincharger. (Courtesy: Terry Bryant www.wincharger.com)

Among the first things people wanted on a farm were a light and a radio. But, radio manufacturers had a hard time selling radios without power. People were hauling batteries into town on the weekend and bringing them back. You needed two batteries, one you left in town and switched out at the hardware store.

The six volt wind generator provided the necessary electricity to keep the radio battery continuously charged, often with some power to spare. And, it was a small step from the wind-powered radio to wind-powered lights. The Wincharger Corporation started in 1927, and the first units were used to recharge 6-volt storage batteries for vacuum tube radios.

The new source of free energy was an almost overnight commercial success, embraced by cash-strapped farm families who couldn't afford a backup battery. The fledgling Iowa-based company found a strong partner in 1935, when Zenith Corporation purchased a controlling interest in the company. Zenith immediately implemented an aggressive advertising campaign, offering steep discounts on 6 volt Winchargers.

Now, any farmer who bought a Zenith Farm Radio received a coupon good for the purchase of a utility model Wincharger for only $10! Better yet, the $44.50 deluxe model Wincharger was a mere $15. Either offer represented a 66% discount during the hard times of the Depression Era. Needless to say, six-volt Winchargers and Zenith Farm Radios became very hot items across the Great Plains. One of their ads proclaimed, "Operate your radio for free, and charge your neighbor's batteries at a substantial profit!" By 1938 Wincharger had sold an estimated 750,000 of their wind-generators worldwide.

Wind-powered lights and radio programs proved to be so successful that farm families were soon demanding more. The little six volt radio chargers were replaced by larger 32 volt generators. Other companies followed suit, as the list of manufacturers included Jacobs, Parris Dunn, Airlite, Hebco, Allied, Wind Power, Aerodyne, Nelson, Ruralite, Kelco, Air Way, and Wind Wing, often displaying a collaborating radio company's logo on their wind mill's rudder vanes. Many of these companies merged over the following decades.

Most 32 volt radios were made by Delco, Silvertone, Coronado (Wells-Gardner), Lafayette, Parmak, Philco, Crosley, Zenith and Universal Battery Company. These wind systems and appliances were so sought after that they were occasionally given away as a grand prize on the popular radio program "Queen for a Day."

Interestingly, the farmer's 32 volt power receptacles were the same as the two-prong ones used for 120-volt AC power. As a result, many of these farm radios are destroyed because dealers today plug them into a 120-Volt socket to "test" them prior to sale.

Death by Electrification: REA

The demise of these wind-generator systems was hastened during the late 1930s and the 1940s by two factors: the demand of farmsteads for ever larger amounts of electric power and by the federal government's efforts to stimulate depressed rural economies by extending the electrical grid throughout those areas.

In an attempt to pull out of the depression, to put cheaper electricity into rural homes and farms, and to create jobs, the Roosevelt administration pushed into law the Rural Electrification Act (REA) of 1936, heralding a new era of growth and prosperity for the nation's heartland. REA oversaw low-interest loans for rural electric cooperatives which helped pay for stringing power lines out into the country and created jobs by employing thousands of workers to carry out the scheme .

While electricity was generally available in cities and towns, it was nearly unheard of on farms and ranches. Fewer than 11 percent of all farms across the country had electricity by the end of 1934. The REA was successful beyond anyone's expectations. In the first two years 100,000 miles of power lines provided electricity to 220,000 farms. Just think, one mile of lines supplied an average of only 2.2 farms. By 1942, nearly half of American farms had been electrified – and almost all were by 1952.

However, the passage of the REA signaled the death knell for the rapidly-developing wind industry. While it survived for another two decades, it eventually succumbed to the convenience of utility power by the

mid-1950s. Power lines were extended virtually everywhere, and the wind-generators had to come down or be disabled because most electric cooperatives viewed wind-generators as a competitive threat.

Power companies refused to hook up a farm with a functioning wind-generator, fearing that the farmer would keep his "free" power before using and paying for theirs. Some actually blasted their wind machines with a high-powered rifle in order to satisfy the power company and get the AC line connected. They literally "assassinated the wind industry." But, some of these machines were carefully removed from their towers and stored in sheds. These wind-generators were highly sought after during the second "discovery" of wind-power in the early '70s "oil crisis."

Refurbished 32 volt Wincharger in operation today. (Courtesy: Terry Bryant www.wincharger.com)

The High Cost of Going Green

Today, residential and farm wind-energy systems vary in price, depending on their capacity. Homeowners looking at units capable of producing 4 to 8 kilowatts can expect to pay $22,000 to $55,000; while 10-kW systems, the most common size for homes, cost $80,000 to $125,000 installed. In addition, required tower height goes up in relation to power capacity. For the 4 to 8-kW range, towers of 100 feet are needed; while 10 kW requires as much as 120 feet, an issue in most suburban neighborhoods where homeowners associations come into play. The payback period for a small wind-energy system depends on local wind patterns, the cost of electricity in the area, and the installed costs minus any tax incentives. The payback time could be anywhere from five to forty years.

In the past, reliability was the Achilles heel of small wind-turbine products. Today's products are technically advanced over those earlier units and are substantially more reliable. Small turbines are now available that operate five years or more, even at harsh sites, without need for maintenance and five-year warranties are available.

When deciding if a wind turbine is right for you, there are several factors to consider. As a rule of thumb, wind energy should only be considered if your average annual wind speed is 11 mph or better. Small wind-energy systems also require at least one-half acre of land in an area that is clear of obstructions for good wind flow. You also need to find out if your county has zoning restrictions for small wind-energy systems.

Energy-Efficient Residential Tax Credits

Changes in the cost of energy have always affected the wind-generator's popularity. As fuel prices decreased after World War II, the interest in wind-generators declined. In the late 1970s and early 1980s, when oil prices first increased dramatically, interest once again focused on wind energy as a possible solution to the energy crisis. Small wind-turbines emerged as the most cost-effective technology capable of reducing utility bills.

Tax credits and favorable federal regulations made it possible for over 5,500 small (1 to 25-kW) wind systems to be installed between 1976 and 1985. None of the small wind-turbine manufacturers were owned by large companies committed to long-term market development, so when the federal tax credits expired in late 1985 and oil prices dropped to $10 a barrel, most of the small wind-turbine industry once again disappeared. However, hundreds of homeowners who installed 4 to 12-kW wind turbines during the tax credit days of the early 1980s now have everything paid for and enjoy monthly electrical bills of $8 to $30, while their neighbors have bills in the range of $100 to $200 per month.

While the wind industry grew substantially from the early 2000s on, it suffered from a bout of boom-or-bust cycles due to the on-again, off-again nature of federal tax incentives. In 2006, a new period of federal support for wind began, leading to several years of record growth. Serious commitments to reducing global warming emissions, local development, and the determination to avoid fuel imports became the primary drivers of wind power development.

The Emergency Economic Stabilization Act of 2008 included a new federal-level investment tax credit to help consumers purchase small wind turbines for home, farm, or business use. In the last few years, small wind-energy systems have made a comeback, primarily with residential customers. The American Recovery and Re-investment Act of 2009 put a significant emphasis on renewable energy technology deployment and job expansion, improving upon the 2008 wind-tax credit by removing "cost caps," allowing consumers to receive a tax credit of 30 percent of the installed cost of a wind-turbine.

Is Wind a Realistic Source of Energy?

Wind is not the only source of renewable energy, but it has become a player, and it could play an even greater part for certain areas of the U.S. Today, wind power generates more than 15,000 megawatts of electricity every day, powering the equivalent of 3.75 million homes. *Scientific American* magazine reports that in our most barren desert land we have enough wind-power to provide all the electrical needs of the U.S. And, the amount of wind power available to harness worldwide is currently in the range of 72 terawatts, more than four times the total annual power consumption of the entire world!

The amount of electricity generated from wind has been growing fast in recent years. In 2006, wind-machines in the United States generated a total of 26.6 billion-kWh, more than double the wind generation in 2002, but it's still only a small fraction (about 0.4 percent) of the nation's total electricity production. New technologies have decreased the cost of producing electricity from wind, and growth in wind power has been encouraged by tax breaks for renewable energy and green pricing programs.

Wind-generated energy isn't for everyone. The catch can be seen on a wind-use maps compiled by the National Renewable Energy Laboratory (NREL), showing wind resources by "Power Classes," meaning the average wind speed will probably be within a certain band. The higher the Power Class, the better the resource. The American Wind Energy Association has adopted a standard method of rating energy production performance. Wind-generator manufacturers give Annual Energy Output (AEO) figures similar to the EPA Estimated Gas Mileage for your car. They allow you to compare products fairly, but they don't tell you just what your actual performance will be ("Your performance may vary").

A 2008 comprehensive study by the Department of Energy found that wind-power, providing a little more than 1% of U.S. electricity in 2007, could provide 20% of our nation's energy needs by 2030. And, even though we no longer need wind-power for radio, we still need the clean energy that radio originally helped to spur.

MT

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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www.signalharbor.com

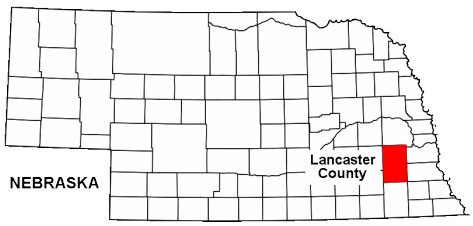
Scanning in the Heartland

With April weather bringing the Midwest out of the deep freeze, this month we answer more letters from the mailbag related to public safety activity in the heartland.

Lincoln, Nebraska

Dan,

Enclosed please find an updated frequency list for the public safety trunked radio system for Lincoln, Nebraska for your records. Please also note the enclosure of a list of AFS numbers for the above system. On the second page, the number 13-007 is for Lancaster County Sheriff civil division, i.e. service of summons, subpoenas, etc., not civil defense.



City of Lincoln Trunked Frequencies (MHz) are listed below. The system is a GE/Ericsson EDACS (Enhanced Digital Access Communications System). Frequencies must be entered in Logical Channel Number (LCN) order to track the system properly. Note that LCNs 5, 10, 15 and 20 were changed as of September 2010.

LCN	Frequency
1	856.2125
2	857.2125
3	858.2125
4	859.2125
5	854.0125
6	856.7125
7	857.7125
8	858.7125
9	859.7125
10	854.5875
11	856.4625
12	857.4625
13	858.4625
14	859.4625
15	854.1875
16	856.9625
17	857.9625
18	858.9625
19	859.9625
20	854.6875

Lincoln EDACS Talk Groups

AFS	Description
00-001	Crosspatch
00-002	Crosspatch
00-003	Crosspatch
00-007	Lincoln Police (All Points Bulletins)
00-010	Rural Fire (Southwest)
00-011	Rural Fire (All)
01-121	Radio Maintenance and Testing
02-041	Startran Buses
02-042	Startran Buses
02-043	Startran Buses
02-044	Startran Buses
02-051	Startran Buses
02-081	Lincoln Public Works
02-082	Lincoln Public Works
02-083	Lincoln Public Works
02-084	Lincoln Public Works
02-085	Lincoln Public Works
02-121	Street Repair
02-123	Lincoln Public Works
02-124	Traffic Engineering
02-127	Lincoln Public Works
02-130	Lincoln Public Works
03-001	Snow Removal
03-002	Special Operations
03-003	Lincoln Public Works
03-042	Water Pollution Control
03-043	Lincoln Public Works
03-044	Lincoln Public Works
03-046	Lincoln Public Works
03-050	Lincoln Public Works
03-081	Lincoln Public Works
03-082	Lincoln Public Works
03-084	Lincoln Public Works
06-080	Lincoln Municipal Airport (All)
06-081	Lincoln Municipal Airport (Security)
06-082	Lincoln Municipal Airport (Communications)
06-083	Lincoln Municipal Airport (Maintenance)
06-084	Lincoln Municipal Airport (Security)
07-121	Juvenile Detention
08-041	Lincoln Street Department
08-042	Lincoln Street Department
08-043	Lincoln Street Department
08-044	Lincoln Street Department
08-045	Lincoln Street Department
08-046	Lincoln Street Department
08-050	Lincoln Street Department
10-041	County Health Department
10-043	Animal Control
11-001	Police Mutual Aid
12-041	Lincoln Police (West Dispatch)
12-042	Lincoln Police (Car-to-car, channel 2)
12-043	Lincoln Police and Sheriff's Office (East Dispatch)
12-044	Lincoln Police (Car-to-car, channel 4)
12-045	Lincoln Police (Expanded Dispatch)
12-046	Lincoln Police (Car-to-car, channel 6)
12-050	Burlington Northern Santa Fe Railroad Police
12-061	Lincoln Police (Tactical, channel 20)
12-062	Lincoln Police (Tactical, channel 21)
12-087	University of Nebraska at Lincoln Police
12-090	University of Nebraska at Lincoln Police
12-092	University of Nebraska at Lincoln Police (Parking)
12-093	University of Nebraska at Lincoln shuttle bus
12-101	Nebraska State Patrol
12-103	Nebraska State Patrol
12-121	Lincoln Police (Detectives)
12-122	Lincoln Police (Detectives)
12-123	Lincoln Police (Detectives)
12-124	Lincoln Police (Detectives)
12-125	Lincoln Police (Detectives, maybe Narcotics)
12-126	Lincoln Police (Detectives)
12-127	Lincoln Police (Detectives)
12-130	Lincoln Police (channel 12)
12-137	Lincoln Police (Information, channel 50)
13-004	Lancaster County Emergency Management
13-005	Lancaster County SWAT/Special Operations
13-006	Lancaster Sheriff (Administrative and Car-to-car)
13-007	Lancaster Sheriff (Civil Division)
14-022	Lincoln Fire (Deputy Chiefs)
14-023	Lincoln Fire (Training Center)
14-024	Lincoln Fire (Maintenance Shop)
14-041	Lincoln Fire (Dispatch)
14-042	Lincoln Fire (Tactical 2)
14-043	Lincoln Fire (Tactical 3)
14-044	Lincoln Fire (Tactical 4)
14-045	Lincoln Fire (Tactical 5)
14-046	Lincoln Fire (Tactical 6)
14-047	Lincoln Fire (Tactical 7)
14-050	Lincoln Fire (Tactical 8, patch to rural ambulances)
14-051	Lincoln Fire (Talk-around)
14-061	Lincoln Fire and Emergency Medical Services (Dispatch)
14-063	Lincoln Emergency Medical Services (Talk-around)
14-064	Lincoln Medic Transfer Dispatch
14-075	Bryan Hospital
14-076	Lincoln General Hospital
14-077	Saint Elizabeth Hospital
14-081	Lincoln Fire Hazardous Materials (Tactical 1)
14-082	Lincoln Fire Hazardous Materials (Tactical 2)
14-083	Lincoln Fire Hazardous Materials (Tactical 3)
14-084	Lincoln Fire Hazardous Materials (Tactical 4)
14-101	Lincoln Fire Engine 1 Workgroup
14-102	Lincoln Fire Engine 2 Workgroup
14-103	Lincoln Fire Engine 3 Workgroup
14-104	Lincoln Fire Engine 4 Workgroup
14-105	Lincoln Fire Engine 5 Workgroup
14-106	Lincoln Fire Engine 6 Workgroup
14-107	Lincoln Fire Engine 7 Workgroup

14-110 Lincoln Fire Engine 8 Workgroup
14-111 Lincoln Fire Engine 9 Workgroup
14-112 Lincoln Fire Engine 10 Workgroup
14-113 Lincoln Fire Engine 11 Workgroup
14-114 Lincoln Fire Engine 12 Workgroup
14-115 Lincoln Fire Engine 13 Workgroup
14-116 Lincoln Fire Engine 14 and Air 14 Workgroup
14-141 Lincoln Fire Truck 1
14-142 Lincoln Fire Truck 5
14-143 Lincoln Fire Truck 7
14-144 Lincoln Fire Truck 8

15-004 Lincoln Fire Unit on Scene
15-005 Lincoln Fire Unit on Scene
15-010 Lincoln Fire Unit on Scene
15-012 Lincoln Fire Unit on Scene
15-022 Lincoln Fire Unit on Scene
15-024 Lincoln Fire Unit on Scene
15-025 Lincoln Fire Unit on Scene
15-121 Nebraska Air National Guard (Crash Rescue)

Speaking of trunked systems, has Omaha Police Department gone to that, and is it a digital voice system? I could use the information as I travel there occasionally. Also, is Douglas County Sheriff on the same system as well as Omaha Fire Department? I appreciate any help you could provide.

Jeff in Lincoln

Lincoln is the capitol of Nebraska and is also the county seat of Lancaster County, located in the southeast part of the state. The city has more than 250,000 residents.

Omaha, Nebraska

Fifty miles northeast of Lincoln is the City of Omaha. With almost half a million residents it is the largest city in Nebraska is also the county seat of Douglas County. Omaha is headquarters for a number of well-known companies, including ConAgra Foods, Mutual of Omaha, TD Ameritrade and Berkshire-Hathaway.

To answer Jeff's question, the Omaha Police Department, Omaha Fire Department and the Douglas County Sheriff are all on the Omaha Regional Interoperability Network (ORION). It is an all-digital network using APCO Project 25 standards.

ORION has a dozen repeater sites across the metropolitan area, each using anywhere from 13 to 26 frequencies. Rather than programming in all of the individual voice frequencies, it is much easier just to program the control channels and use the "control channel only" feature of the digital scanner to monitor the system. These control channel frequencies are:

852.9625, 853.7250, 853.7625, 853.9500, 854.8875, 855.9625, 856.3125, 856.4375, 856.8125, 856.9375, 857.4375, 857.9375, 857.9625, 858.2125, 858.3125, 858.4375, 858.4625, 858.4875, 858.7125, 858.9375, 859.2875, 859.3125, 859.3375, 859.4125, 859.4375, 859.4875, 859.9375, 860.3375, 860.4375, 860.4875 and 860.9375 MHz.

Because it is such a large system, ORION has too many talkgroups to list them all here. The following is a list of just the most common Sheriff, Police and Fire talkgroups that have been verified as active on the system.

Dec	Hex	Description
2	002	Douglas County Sheriff (Dispatch)
3	003	Information
5	005	Omaha Police (Northwest Dispatch)
6	006	Omaha Police (Northeast Dispatch)
7	007	Omaha Police (Southeast Dispatch)
8	008	Omaha Police (Southwest Dispatch)
9	009	Sheriff
10	00A	Warrant Service
11	00B	Courthouse
12	00C	Civic Center Common
18	012	Crime Scene Investigation
19	013	DC Event 1
20	014	DC Event 2
21	015	DC Event 3
22	016	DC Event 4
25	019	Omaha Police (Training Academy)
28	01C	Criminal Investigation Bureau
299	12B	Omaha Fire (Station Intercom)
300	12C	Omaha Fire (Main)
301	12D	Omaha Fire (Dispatch)
302	12E	Omaha Fire Rapid Intervention Team (RIT)
303	12F	Omaha Fire (Medical Dispatch)
304	130	Douglas County Fire (Dispatch)
305	131	Douglas County Fire Rapid Intervention Team (RIT)
306	132	Omaha Fire (Hazardous Materials)
308	134	Omaha Fire Block 8
309	135	Omaha Fire Block 9
310	136	Omaha Fire Block 10
311	137	Omaha Fire Block 11
312	138	Omaha Fire Block 12
313	139	Omaha Fire Block 13
316	13C	Omaha Fireground 4
317	13D	Omaha Fireground 5
318	13E	Omaha Fireground 6
319	13F	Omaha Fireground 7
320	140	Omaha Fireground 8
321	141	Omaha Fireground 9
322	142	Omaha Fireground 10
323	143	Omaha Fireground 11
324	144	Omaha Fire Block 7
325	145	Omaha Fire Block 2
326	146	Omaha Fire Block 3
327	147	Omaha Fire Block 4
328	148	Omaha Fire Block 5
329	149	Omaha Fire Block 6
330	14A	Omaha Fire (911)
342	156	Omaha Fire Emergency Medical Services
388	184	Omaha Fire Arson Investigation
389	185	Omaha Fire Arson Investigation
601	259	Omaha Police (North Information)
602	25A	Omaha Police (South Information)
603	25B	Omaha Police (Traffic)
604	25C	Omaha Criminal Investigation Bureau
605	25D	Omaha Crime Scene Investigation
608	260	Omaha Police (Events)
610	262	Omaha Police (911)
611	263	Omaha Police (Events 1)
612	264	Omaha Police (Events 2)
613	265	Omaha Police (Events 3)
614	266	Omaha Police (Events 4)
615	267	Omaha Police (Event 5/Training)
616	268	Omaha Police (Event 6/Training)
617	269	Omaha Police (Special Events 1)
618	26A	Omaha Police (Special Events 2)
619	26B	Omaha Police (Special Events 3)
620	26C	Omaha Police (Special Events 4)
623	26F	Omaha Police (Public Events 1)
624	270	Omaha Police (Public Events 2)
631	277	Omaha Police (Joint Operations)
635	27B	Omaha Police (Special Public Events 1)
636	27C	Omaha Police (Special Public Events 2)
639	27F	Omaha Police (Southwest Events 1)

640	280	Omaha Police (Southwest Events 2)
648	288	Omaha Police (Traffic Events 1)
649	289	Omaha Police (Traffic Events 2)
676	2A4	Omaha Police Crime Laboratory

Clay County, Minnesota

Dan,

I would like to find talk groups for the trunked radio systems in Clay County, Minnesota, if you could help me.

Keith in Minnesota

Clay County is on the western border of Minnesota, just across the Red River from Fargo, North Dakota. The county is home to just over 50,000 residents, with almost two-thirds of them living in the county seat of Moorhead.

Public safety calls in Clay County are dispatched by the Red River Regional Dispatch Center (RRRDC) in Fargo, the first such facility to simultaneously serve two different states. Much of the activity can be heard on conventional (non-trunked) frequencies with nearly any scanner.

Frequency	Description
151.310	Moorhead Parks
153.470	Moorhead Public Works
153.755	County Fireground
153.875	Moorhead Fireground
154.100	County Fire (South)
154.160	County Fire (West)
154.205	County Fire (East)
154.265	County Fire (North)
154.295	Statewide Fire Mutual Aid
154.355	Moorhead Fire (Dispatch)
154.680	Minnesota State Patrol (Detroit Lakes)
155.310	Moorhead Police (Signaling)
155.340	Statewide Emergency Management Services
155.370	Minnesota Incident Management System (MIMS) Point to Point
155.475	Minnesota Statewide Emergency Frequency (MINSEF)
155.790	County Jail and Court Security
156.240	Clay County Road Department
160.950	Minnesota State Patrol (Air Operations)
453.675	County Courthouse Maintenance

The local law enforcement radio traffic in the county takes place on conventional frequencies but uses the APCO Project 25 Common Air Interface (CAI). For these transmissions you will need a digital-capable scanner in order to be able to hear the voice activity.

Frequency	Description
151.235	County Sheriff (East Dispatch)
155.085	Moorhead Police (Dispatch)
155.130	County Sheriff (West Dispatch)
155.655	County Sheriff (Car-to-car)
155.955	Moorhead Police (Tactical)
159.450	County Sheriff

The local university also uses conventional analog radios.

Frequency	Description
155.9250	Moorhead State University Campus Security
154.1150	Moorhead State University Maintenance 1
155.9025	Moorhead State University Maintenance 2
154.0400	Moorhead State University Athletic Department

Fargo-Moorhead Services

Due to the close proximity of the two cities, Fargo and Moorhead operate a joint radio system. It is a Motorola Type IIi (hybrid) trunked network, meaning it can support both Type I and Type II radios. All of the voice activity on this network is analog, so any scanner capable of tracking trunked systems can monitor it without difficulty.

Licensed frequencies are shared between the two cities. The City of Fargo is licensed for five repeater frequencies on 856.2125, 857.2125, 858.2125, 859.2125 and 860.2125 MHz. The City of Moorhead is also licensed for five frequencies, specifically 856.4625, 857.4625, 858.4625, 859.4625 and 860.4625 MHz. Repeater sites are located in each of the cities.

Based on the reported talkgroups, the system appears to be oriented toward non-emergency municipal services.

Decimal	Hex	Description
9280	244	Metro Area Transit (Moorhead Operations)
9344	248	Metro Area Transit (Moorhead Administration)
64640	FC8	Moorhead School Buses
64656	FC9	Moorhead School Buses
64672	FCA	Moorhead School Buses
64688	FCB	Moorhead School Buses
64704	FCC	Red River Trails Buses
64720	FCD	Clay County Outreach Center School
64736	FCE	Moorhead School Buses
64752	FCF	Moorhead School Buses
64768	FD0	Moorhead Schools
64784	FD1	Moorhead Schools
64800	FD2	Moorhead Schools
64816	FD3	Moorhead Schools
64832	FD4	Moorhead Schools
64848	FD5	Moorhead Senior High School
64864	FD6	Moorhead Schools
64880	FD7	Moorhead Schools (All Call)
64896	FD8	Moorhead Adult Learning Center
64912	FD9	Clay County Outreach Center School
64928	FDA	Clay County Outreach Center School
64944	FDB	Moorhead Senior High School
64960	FDC	Moorhead Junior High School
64976	FDD	Clay County Outreach Center School
64992	FDE	Moorhead Senior High School
65008	FDF	Schools (All Call)
65088	FE4	Metro Area Transit (Fargo Paratransit)
65104	FE5	Metro Area Transit (Fargo)
65136	FE7	Handi-Wheels Non-Emergency Medical Transport
65152	FE8	Clay County Rural Transit
65168	FE9	Moorhead Parks (All Call)
65184	FEA	Moorhead Public Works (All Call)
65200	FEB	Moorhead Wastewater Treatment (All Call)
65216	FEC	Moorhead Sanitation (All Call)
65232	FED	Central Dispatch
65248	FEE	Moorhead Public Works
65264	FEF	Moorhead Events 1
65280	FF0	Moorhead Parks (Hjemkompst Center)
65296	FF1	Moorhead Events 2
65312	FF2	Moorhead Parks
65328	FF3	Moorhead Golf Course
65344	FF4	Moorhead Golf Course
65360	FF5	Moorhead Public Works (Lighting and Signs)
65376	FF6	Moorhead Parks
65392	FF7	Moorhead Public Works (Survey Crews)
65408	FF8	Moorhead Public Works
65424	FF9	Moorhead Public Works
65440	FFA	Moorhead Street Department
65456	FFB	Moorhead Wastewater Plant 2
65472	FFC	Moorhead Wastewater Plant 1
65488	FFD	Moorhead Public Works
65504	FFE	Moorhead Sanitation Department
65520	FFF	Moorhead Public Works

ARMER

Minnesota operates a statewide trunked radio system called ARMER (Allied Radio Matrix for Emergency Response) that also uses Project 25 standards. There are three ARMER sites within the county.

Site	Frequencies
Felton	852.2000, 852.4000, 853.4250, 856.9375 and 859.9375
Hawley	851.4750, 851.9000, 853.4750, 857.9875 and 859.9875
Moorhead	851.4250, 852.4500, 853.4500, 856.7625, 857.7625, 858.7625 and 859.7625

There are talkgroups on the ARMER system dedicated to Clay County and Moorhead law enforcement. These talkgroups are identified as "patches" to a corresponding VHF (Very High Frequency) conventional frequency. They provide a way for digital users from outside agencies to communicate directly with county and local officers who only have VHF analog radios. For instance, the Minnesota State Police have indicated they will move fully to ARMER, yet need to communicate with Clay County deputies and Moorhead officers.

Decimal	Hex	Description
48408	BD18	Clay County Sheriff's Office (Patch to 155.130 and 151.235 MHz)
48410	BD1A	Moorhead Police (Patch to 155.085)

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

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *What effect will using an 800 MHz antenna like the Max Systems have on listening to VHF signals? (Ryan, email)*

A. The short length of this 800 MHz antenna will exhibit reduced performance at VHF because of the smaller aperture (signal-gathering size).

Q. *I'm trying to power a portable TV that uses 5 VDC. I have a transformer that will give me 6 VDC. Will there be any damage from the extra volt or should I spring for the real thing? (Ken, email)*

A. It's highly unlikely that you would cause any damage by using the 6 volt power supply. You might wish to monitor the temperature of the little TV around its power supply section. If it gets uncomfortably warm after just a few minutes, then I'd say it's overpowered. If neither the TV nor the transformer isn't overly warm and the picture is just fine, have at it!

Q. *I have been hearing USB transmissions between 4100 and 4300 kHz. They exchange greetings and signal reports. They sound like amateur radio, but they are outside the ham band. They give their call signs in the format AAA#AA. Am I hearing MARS, marine, or what? (Jim Helmke, Floresville, TX)*

A. MARS (Military Affiliate Radio Service) it is! They've been occupying that and other parts of the spectrum for decades. They originally authorized frequencies adjacent to the ham bands so that amateur transceivers can be used for MARS communications. Even though military communications don't require individual operators to be licensed, MARS does require amateur radio licenses.

Q. *Can I use more than one WiFi radio tuned to different stations even if my computer is turned off? (Jim Thornton, email)*

A. Yes; the radio connects to the Internet the same way as your computer – through a wired or wireless modem. Think of the WiFi radios as simply additional computers, any one of which can be switched off without affecting the others.

Q. *I have two old degaussing coils from old tube type TV's. When I look at loop antennas and their construction, I note that some of them overlap their wiring and some don't. Is there a way to use those degaussing coils for a loop antenna on the NDB band? (Tom Hume, KF7ANQ)*

A. Theoretically, yes, a degaussing coil could make a loop antenna for VLF, depending on its naturally-resonant frequency. In other words, the coil will work best at a certain, broad, very-low-frequency range, but that all depends on how it was wound (size, number of turns, gauge of the wire, presence or absence of a core).

Test it and compare reception to a long random wire antenna. If it works better, then your answer would be yes.

Q. *Do photocells ever wear out? (Mark Burns, Terre Haute, IN)*

A. Nope, not from their conversion of photons into electric current, just from natural deterioration –"weathering" – over considerable environmental exposure time.

Q. *Do so-called "silent" dog whistles actually work? What pitch is their ultrasound? (Eric Hopkins, Ayer, MA)*

A. Yes, I have one which I've tested on my collies. It's made like a piston with an adjustable screw; as you tighten the screw, it shortens the chamber, thus raising the pitch. Most adults would choose a frequency approaching 20 kHz for it to be inaudible; for fixed-frequency whistles, it's typically 18-22 kHz.

Q. *I have been looking for a handheld ham rig in the event of a disaster. I'd like a radio that will reach at least across town. I know I need my license, but I'd like to get the rig first as an incentive to take the test. I see a lot on Craig's list, but really don't know where to start. (B.G., Frederick, MD)*

A. I'd recommend a two-meter (144-148 MHz) handy-talkie. These are widely available and inexpensive. A used one will only cost $100-$200 and can talk simplex (direct radio to radio) or through a repeater in your area for broader coverage. The Technician Class license is easy to get and there's no longer a Morse code requirement at any level.

Q. *I found this ad in a surplus catalog. How would it work? (Ben Nye, Westbury, NY)*

"(This) multipurpose antenna enhances UHF/VHF and FM reception. The compact Crystalfeeler™ is powered by quartz crystals, housed in two aluminum-lined 3 by 4 by 1-1/4 inch boxes. When assembled, the two boxes are placed 44 inches apart and joined by a 300 ohm cable with a center connector."

A. Made in Brazil, this piece of quackery purportedly contains a supply of quartz crystals, which is the same thing as sand, but prettier. The only way it can pick up signals is by the 44 inches of wire that separates them. I suspect that the choice of 44" was no coincidence; the adjoining length of wire makes a simple, half-wave dipole for the lower VHF-TV band, and a wave-and-a-half dipole for the higher VHF-TV band.

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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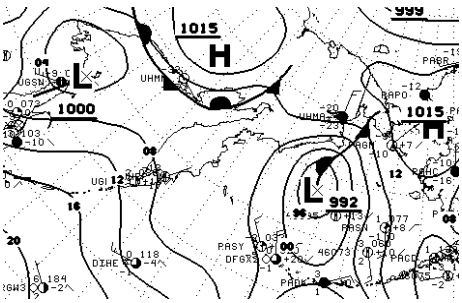
The World's Most Accurate HF Radiofax List

About one year ago, this column set out to update the old radio facsimile list that Marius Rensen maintained until late 2005. The list is devoted to fax on the high-frequency band (HF) between 3 and 30 megahertz (MHz).

The task is still not finished, but it's a lot closer. Many frequencies have been investigated by many different people. Stations have been removed from Marius' list. Surprisingly, a few have been added.

What follows here, then, is the world's most accurate radiofax list. It's not the longest, and it's not complete. For example, Russian fax is omitted. While Russian transmissions are periodically copied in Europe, verifiable information is sadly lacking. For the same reason, the far-northern Canadian Coast Guard stations aren't here. There just isn't hard data on what people are hearing.



Fax frequencies are given as the assigned information centers: reception is properly tuned when the USB radio dial reads 1.9 kilohertz (kHz) lower. This offset is caused by upper sideband (USB) reception of what is technically a frequency modulation (F3C) signal. Deviation is plus and minus 400 hertz from 1900. This gives a true black at 1500, and a peak white at 2300.

In most cases, all frequencies aren't active at once. Typically, the lowest ones light up at night (local time) and the higher ones come on during the day.

With one exception, all stations on this list transmit at 120 lines per minute (LPM or RPM), with an Index Of Cooperation of 576. The exception, Kyodo News, usually broadcasts at 60 LPM.

So here are the broadcasts confirmed to be active, alphabetically by country:

Australia: The Bureau Of Meteorology (BOM) has a full schedule from two sites. VMC, Charleville, is 2628, 5100, 11030, 13920, and 20469 kHz. VMW, Wiluna, is 5755, 7535, 10555, 15615, and 18060 kHz.

Chile: CBV, Valparaiso/ Playa Ancha Radio, runs a set of charts provided by the navy several times daily. The coverage area on some of these reaches almost to the South Pole. Frequencies are 4228, 8677, and 17146.4 kHz.

Germany: Deutsche Wetterdienst covers Europe with a full schedule from the Hamburg (Pinneberg) site. Frequencies are 3855 (DDH3), 7880 (DDK3), and 13882.5 kHz (DDK6). The frequency in the 75 meter amateur band is a legal allocation in Europe.

Japan Fishery: The fishery radio stations include JFC (Kanagawa), JFW (Fukushima), and JFX (Kagoshima). These alternate on at least 6414.5, 8658, 16907.5, and 22559.6 kHz. A 14 MHz frequency has also been reported, but not confirmed here. Transmissions include text in Japanese pertaining to market prices or navigation warnings, and maps showing weather or sea surface temperatures. The three stations mentioned are known to QSL (verify reception).

Japan Meteorological Agency: The JMA broadcasts a full schedule from JMH, which (along with the aviation weather) has moved to Kagoshima. Frequencies remain 3622.5 (JMH), 7795 (JMH2), and 13988.5 kHz (JMH4). The 7 MHz is often quite loud in the western US in the morning (local time). Again, 75 meters is legal.

Japan Kyodo News: This huge, non-profit agency broadcasts whole newspapers in Japanese (usually at 60 LPM), and sometimes English. This is a massive operation, by radiofax standards, with various products around the clock on many frequencies. JJC (old "Tokyo Radio") is long gone, and the 1999 schedules shown online are hopelessly outdated. The only clearly identified station is JSC, Kagoshima, on 16971 kHz. The other frequencies come from an unknown Asian Pacific site. These are 4316, 8467.5, 12745.5, 17069.6, and 22542 kHz. A Singapore (or Penang?) relay simulcasts on 16035 and 17430 kHz.

Korea: The Korea Meteorological Administration of the Republic of Korea ("South Korea") runs a full schedule from HLL2. It's on 3585, 5857.5, 7433.5, 9165, and 13570 kHz. These are often copyable in the western US.

New Zealand: Although the "official" schedule hasn't been updated since 2002, the MetService still broadcasts its daily charts in rotating, 15-minute time slots on the single transmitter of ZKLF. Frequencies are 3247.4 (hour+45, night), 5897 (hour), 9459 (h+15), 13550.5 (h+30), and 16340.1 (h+45, day).

South Africa: The South African Weather Service sends daily charts at widely spaced times from ZSJ (Cape Naval Radio). Frequencies are 4014, 7508, 13538, and 18238 kHz.

Taiwan (Republic of China): BMF, from the Central Weather Bureau, is heard in the western US. A full schedule, with some gaps, airs on 4616, 8140, 13900, and 18560 kHz.

Thailand: HSW, Bangkok Meteo, is confirmed as active on the single frequency of 7396.9 kHz with a full schedule.

UK: Despite rumors, the Royal Navy still transmits a full schedule. It's from GYA, Northwood, on 2618.5, 4610, 8040, and 11086.5 kHz. Other schedules depend on the needs of users. Recent examples are the (recently discontinued) Persian Gulf feed from Cyprus, and some other sporadically reported frequencies.

USA: Despite periodic budget hassles, the US Coast Guard and National Weather Service remain committed to the delivery of these products. A survey found enough of a user base to justify investing in new transmitters. The extensive schedules are well documented on the Internet, at **weather.noaa.gov/fax/marine.shtml** Participating stations are:

Boston, MA (NMF/NIK): 4235, 6340.5, 9110, 12750 kHz

New Orleans, LA (NMG): 4317.9, 8503.9, 12789.9, 17146.4 kHz

Kodiak, AK (NOJ): 2054, 4298, 8459, 12412.5 kHz

Point Reyes, CA: 4346, 8682, 12786, 17151.2, 22527 kHz

Honolulu, HI (KVM 70): 9882.5, 11090, 16135 kHz

❖ CanForce Halifax Corrections

Doug McComber served in the Canadian Navy and was posted to the "Trinity" unit mentioned in this column. He now works there as a civilian. He writes:

"Wikipedia's information on Trinity is quite wrong. The unit's name is just Trinity. HMCS *[Her Majesty's Canadian Ship] Trinity* is a minesweeper that was decommissioned in 1954. Other than ships, the only buildings that ever get the HMCS prefix are Naval Reserve units. And in those cases 'regular force' sailors will tell you HMCS stands for Her Majesty's Concrete Ship."

Regarding the military communication assets in Halifax:

"NRS is Naval Radio Section Halifax and is not part of Trinity, although they have a presence in the same building that is Trinity's headquarters. NRS is part of a unit called N6 ACOS IM. They (N6) are the IT/IM *[Information Technology/Information Management]* unit of the east coast Canadian Navy. Newport Corner and Mill Cove are called CFS (Canadian Forces Station) not NRS, but are part of NRS Halifax.

"Trinity is a unique unit in the navy as it is sort of an umbrella organization for many varied organizations that are too small to be their own units but also contribute to 'the big picture' in terms of intelligence. MetOc *[Canadian Forces Meteorology and Oceanography Centre]*, for example, is a part of Trinity. Other sections include Formation Imaging and Route Survey."

Thanks to Doug for clarifying all this.

❖ FEMA Update

4603 kHz USB is an important frequency in the core Automatic Link Establishment (ALE) network used by the US Federal Emergency Management Agency. It's part of FNARS, the FEMA National Radio System. It's very active.

While all of this is old information, somehow it got left off the ALE list on this column's web site (**www.ominous-valve.com/ale-list.txt**). John in Texas pointed this out, and sent a list of stations he'd copied. We thank John, and this omission has been rectified.

Right now, with all the snow storms, FNARS is hopping. Yesterday, several hours parked on 4603 turned up a nice list of stations, all of which were doing ALE "soundings" at hourly intervals.

Here's the list. See you next month!

ALE Address	FEMA Station	Sound Time (min after hr)
FC4FEM	Region 4 Comm. Mgr., GA	+07
FC0FEM001	Region 10 mobile	+11
FC8FEM004	Region 8 mobile	+12
FR4FEM	Region 4 HQ, GA	+14
FC1FEM	Region 1 Comm. Mgr., MA	+15
FC8FEM	Region 8 Comm. Mgr., CO	+20
FR3FEM	Region 3 HQ, PA	+24
FC8FEM001	Region 8 mobile	+26
FR2FEM	Region 2 HQ, NY	+29
FC0FEM	Region 10 Comm. Mgr., WA	+32
FR7FEM	Region 7 HQ, MO	+53
FC6FEM	Region 6 Comm. Mgr., TX	+59

ABBREVIATIONS USED IN THIS COLUMN

AFB..... Air Force Base
ALE..... Automatic Link Establishment
AM..... Amplitude Modulation
ARQ..... Automatic Repeat reQuest teleprinting
AWACS..... Airborne Warning And Control System
BOM..... Australian Bureau of Meteorology
CAMSLANT..... USCG Communications Area Master Station, Atlantic
CAMSPAC..... USCG Communications Area Master Station, Pacific
CW..... On-off keyed "Continuous Wave" Morse telegraphy
DHFCS..... UK Defence High Frequency Communications Service
DSC..... Digital Selective Calling
E07..... Russian "English Man," preamble and 5-figure groups
E10..... Israeli female phonetic voice, 5-letter groups
EAM..... Emergency Action Message
FAX..... Radiofacsimile
FEMA..... US Federal Emergency Management Agency
FSK..... Frequency-Shift Keying
G06..... Russian "German Lady," preamble and 5-figure groups
HFDL..... High-Frequency Data Link
HF-GCS..... High-Frequency Global Communication System
LDOC..... Long-Distance Operational Control
LSB..... Lower Sideband
M89..... Chinese CW "V ffff de ffff" coded markers
MARS..... US Military Auxiliary Radio System
Meteo..... Meteorological; weather office
MFA..... Ministry of Foreign Affairs
NAT..... North Atlantic oceanic air control, families A-F
NAVTEX..... Navigational Telex
PACTOR..... Packet Teleprinting Over Radio, modes I-III
RTTY..... Radio Teletype
S06..... "Russian Man," preamble and 5-figure groups
Selcal..... Selective Calling
SESEF..... Shipboard Electronics Systems Evaluation Facility
SHARES..... Shared Resources; US federal frequency pool
SITOR..... Simplex Telex Over Radio, modes A & B
UK..... United Kingdom
Unid..... Unidentified
US..... United States
USS..... United States Ship
USAF..... US Air Force
USCG..... US Coast Guard
Volmet..... Formatted aviation weather broadcasts
X06..... Russian "Mazielka" selcal, exact user unknown

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 ( ).

1677.0 EAS-Cabo Peñas Radio, Spain, weather in English and Spanish, at 1907 (PPA-Netherlands).

1698.0 EAR-La Coruña Radio, Spain, safety information in Spanish, at 1909 (PPA-Netherlands).

2070.4 BPLEZS-German Federal Police, Cuxhaven, working BP26, Police Boat Eschwege, ALE at 2245 (MPJ-UK).

2142.5 ZHEL-German Customs Cruiser Helgoland, working ZLST, Cuxhaven headquarters, then calling ZHOH, Customs Cruiser Hohwacht, also on 2673 and 3831, ALE at 2303 (MPJ-UK).

2216.0 XSS-UK DHFCS, Forest Moor, ALE sounding, also on 2705, 2784, 3226, 3236.5, 4168.5, 4239.5, 4706, and 8107; at 0010 (MPJ-UK).

2505.0 BP21-German Police Boat Bredsted, calling BPLEZS, Cuxhaven headquarters, also on 3850, ALE at 2306 (MPJ-UK).

2628.0 VMC-Australian BOM, Charleville, Queensland, FAX weather map, also heard on 5100, 11030, 13920, and 20469; at 1135 (Eddy Waters-Australia).

3216.6 EI6277-Irish Fishing Vessel Atlantic Fisher, chatting with EI6008, Fishing Vessel Golden Feather, at 2046 (PPA-Netherlands).

3799.5 RJD56-Russian Navy, calling RCP in CW, at 1758 (PPA-Netherlands).

3810.0 HD2IOA-Ecuador Navy standard time station, Guayaquil, LSB pips and Spanish time announcements at 0706 (PPA-Netherlands).

3838.0 Unid-Russian Intelligence (S06), AM preamble 349, end 00000, fast version in Russian, at 1905 (Mike-West Sussex, UK).

4039.0 RIT-Russian Navy, Severomorsk, calling RLO in CW, at 2205 (MPJ-UK).

4209.5 XVG-Haiphong Radio Viet Nam, SITOR-B Navtex at 1940 (PPA-Netherlands). TAH-Istanbul Radio, Turkey, SITOR-B Navtex in Turkish, at 2220 (MPJ-UK).

4212.0 XSQ-Guangzhou Radio, China, CW identifier in ARQ marker, at 2246 (MPJ-UK).

4270.0 PCD2-Israeli phonetic station (E10), weak null-message identifier at 1830 (Mike-UK).

4346.0 NMC-USCG CAMSPAC Point Reyes, CA, FAX weather map, also heard on 8682, at 0957 (Waters-Australia).

4450.0 AFA0WW-USAF MARS, net with AFA0TS, at 0036 (Jack Metcalfe-KY).

4495.5 NI9-Control of unknown military ALE net, link checks and modem traffic with AB2, TR3, and PL7, also on 4876.5 and 5295.5, at 2030 (PPA-Netherlands).

4519.0 Unid-Russian Intelligence (G06), AM preamble 271 654/15, end 0 0 0 0 0, at 1830 (Mike-UK).

4587.0 Unid-G06, AM callup 439, end 00000, slow version in German, at 1800 (Mike-UK).

4603.0 FC0FEM001-FEMA Region 10, WA, ALE sounding at 0708. FC1FEM-FEMA Region 1, MA, ALE sounding at 0725. FC6FEM, Region 6, TX, sounding at 0729. FC8FEM001, Region 1, sounding at 0731 (John Brewer-TX).

4616.0 BMF-Taipei Meteo, Taiwan. FAX weather map, also heard on 8140, 13900, and 18560; at 0926 (Waters-Australia).

4618.0 BP24-German Police Boat Bad Bramstedt, calling BPLEZS, ALE at 2323 (MPJ-UK).

4645.0 "Metreport Echo"-Tallinn Airport, Estonia, weather broadcast in ATIS (Automated Terminal Information System) and Volmet formats, at 0711 (ALF-Germany).

4703.0 Charlie-US military, radio check with Golf Bravo, at 2149 (Metcalfe-KY).

4900.0 JCI-Saudi Arabian Airfields Net, working RFI, ALE at 2007 (MPJ-UK).

5224.0 RCV-Russian Navy, Sevastopol, Ukraine, weather in Russian at 0525 (PPA-Netherlands).

5258.0 BP25-German Police Boat Bayreuth, calling BPLEZS, ALE at 1329 (MPJ-UK).

5446.5 Unid-US Navy, Saddlebunch Key, FL, rebroadcasting US American Forces Network interruptible voice channel, at 0654 (PPA-Netherlands).

5505.0 Shannon Volmet-European flight weather, Shannon, Ireland, observations at 0416 (Ken Maltz-NY).

5517.0 AJK4425-Allied Air (Nigeria), position for Cairo at 0118 (ALF-Germany).

5529.0 Iberia 6011-Iberia Airlines, calling Madrid Operaciones (company LDOC), Madrid, Spain, at 0130 (ALF-Germany).

5541.0 Camber 329-Atlas Air B747 (N523MC) on a USAF Air Mobility Command (AMC) contract flight, answered selcal MR-EK from Stockholm LDOC, at 0244 (ALF-Germany).

5550.0 New York Radio-Caribbean oceanic air control, position from Convoy 3305 (US military), at 0424 (Allan Stern-FL).

5585.0 "K"-Romanian forces in UN Kosovo mission, calling "B," at 1829 (PPA-Netherlands).

5598.0 OPEC 76-USAF KC-10A tanker, working New York Radio (NAT-A) while waiting to refuel AMC transport Reach 1006, at 0145 (ALF-Germany). Santa Maria Radio-NAT-A, Azores, weather for Iberia 6166 at 0315 (Maltz-NY).

5649.0 Speedbird 7TG-British Airways flight working Shanwick (NAT-C), at 1606 (MPJ-UK).
5755.0 VMW-BOM, Wiluna, Western Australia, FAX weather map, also heard on 7535, 10555, and 15615, at 0740 (Waters-Australia).
5792.0 8NNO-Russian Air Defense, repeating "8NNO" in CW, signed at 0601 (ALF-Germany).
5801.0 3A7D-Chinese military (M89), coded CW calling marker to DKG6, at 0240 (ALF-Germany).
5857.5 HLL2-Seoul Meteo, Korea, FAX weather map, also heard on 7433.5, 9165, and 13570; at 0957 (Waters-Australia).
5881.0 RMP-Russian Navy Baltic Sea Fleet, Kaliningrad, working RCB (Naval Air Transport), CW at 1110 (ALF-Germany).
6275.0 GWPWCO-Brazil Navy Frigate Constituição, ALE link check with GWPWZ33 (PWZ33, Rio de Janeiro), at 0003 (ALF-Germany).
6340.5 NMF-USCG, Boston, MA, FAX weather map at 1003 (Waters-Australia).
6379.0 4XZ-Israeli Navy, Haifa, coded CW traffic in 5-letter groups, at 1919 (PPA-Netherlands).
6390.0 AQP4-Pakistani Naval Headquarters, Islamabad, CW weather bulletin "from met Karachi to all ships," at 1710 (ALF-Germany).
6535.0 Dakar Radio-African air route control, Senegal, position report from Lufthansa 506 at 0347 (Maltz-NY).
6688.0 Capitol-French Air Force, Paris, working unknown aircraft at 0834 (PPA-Netherlands).
6721.0 288190-USAF C-17A, tail number 08-8190, raised PLA (Lajes, Azores) with ALE autodial string, then a short voice patch, at 1740 (ALF-Germany).
6733.0 IDR-Italian Navy, Rome, coordinating data comm on another frequency with DAGA88, at 0744 (PPA-Netherlands).
6785.0 SSE-Egyptian MFA, Cairo, ARQ selcal to XBVQ. Paris Embassy, at 1750 (ALF-Germany).
6798.0 Calorie-French Air Force, CW test loop of months and days, at 2130 (ALF-Germany).
6840.0 EZI2-Israeli Intelligence phonetic station (E10), AM null-message callup off at 0333 (ALF-Germany). EZI-E10, 22-group message, at 2030 (Mike-UK).
6861.0 OMEGACERO-New "ECO" net, possibly Mexican government, calling ECO09, ALE at 0536 (ALF-Germany).
6873.0 MA9-Polish Military, ALE link check with WA6, then exchanged short messages and phone patches in Polish, at 1130 (ALF-Germany).
6921.0 2014-Turkish Red Crescent, calling 2011, ALE at 0535 (PPA-Netherlands).
6982.0 Unid-Russian Intelligence (E07), AM preamble 981 000, at 2000 (Mike-UK).
6995.0 CAS-Unknown Chilean Navy, ALE with COS, then encrypted traffic, at 0530 (ALF-Germany).
6998.0 HWK7-The Italian Crazy Pirate, markers and typically strange CW religious text in Italian about the Vatican, etc., at 1420 (ALF-Germany).
7523.0 RMW32-Russian military, working RMW46 and RKW36, CW at 1132 (ALF-Germany).
7527.0 RTF-USCG Cutter Active, (NRTF; WMEC-618), ALE sounding at 0420 (PPA-Netherlands). LNT-USCG CAMSLANT Chesapeake, ALE with J12 (USCG MH-60J helo #6012), then voice taking ops-normal from Juliet 12, at 1403 (MDMonitor-MD).
7535.0 Beach Storm-US Navy, testing several voice modes with Norfolk SESEF, VA, at 1717. Twin Towers-US Navy USS New York, incorporating steel from World Trade Center, testing with Norfolk SESEF, at 2033 (Metcalfe-KY).
7566.0 RCV-Russian Navy, Sevastopol, Ukraine, CW weather in Russian, at 0454 (PPA-Netherlands).
7822.0 PD5041-Dutch Sailing vessel Aletis, calling XJN714 (SailMail, Lunenburg, Nova Scotia), in PACTOR-I at 2155 (ALF-Germany).
7899.0 HFRC-High-Frequency Radio Club, New South Wales, Australia, many mobile stations giving locations, also on 11487, at 0657 (Waters-Australia).
7906.0 XVS-Ho Chi Minh Ville Radio, Viet Nam, female with weather in Vietnamese, at 1705 (PPA-Netherlands).
7918.0 YHF1-E10 test message, jammed at 1930 (Mike-UK).
8015.0 Unid-Russian Air Defense, local time stamped CW tracking strings, at 2115 (ALF-Germany).
8022.0 SSE-Egyptian MFA, ARQ selcal to XBVY, London Embassy, at 1604 (ALF-Germany).
8050.0 CLS-US Army, Fort Campbell, KY, calling 5766 in voice after ALE exchange with 825766, at 1726 (Metcalfe-KY).
8143.0 TARIQ-Pakistan Navy Frigate Tariq, calling NRS, Naval Radio Islamabad, ALE at 1828 (ALF-Germany).
8186.5 Unid-Female reading short romance novel passages ending "over," with 30-second pause between; similar to male reading USA Today paragraphs last month on 7595; at 1700 (Metcalfe-KY).
8220.0 Unid-Unknown shipping company, probably India, discussing cargo and Mumbai, at 2016 (PPA-Netherlands).
8264.0 Overseas New York-US registry oil tanker, clearing with WLO, Mobile Radio/ Shipcom, AL, at 1937 (Metcalfe-KY).
8337.6 Shark 21-Possible USCG Cutter Gallatin (WHEC-721), encoded positions with Shark 16, at 2213 (MDMonitor-MD).
8414.5 006221111-Alexandria Radio, Egypt, DSC call to "538003347," vessel Al Rekayyat (V7QF3), at 1700 (PPA-Netherlands).
8416.5 LGV-Vardo Radio, Norway, SITOR-B warnings for Navarea 19, at 1830 (PPA-Netherlands).
8423.0 UFZ-Vladivostok Radio, Russia, CW identifier in SITOR-A sync marker, at 1155 (Waters-Australia).
8424.0 SVO-Olympia Radio, Greece, exchange rates in SITOR-B Greek text, at 1336 (MPJ-UK).
8459.0 NOJ-USCG, Kodiak, AK, FAX weather map at 1004 (Waters-Australia).
8467.5 Unid-Kyodo News, possibly Singapore, FAX morning newspaper in Japanese, strong but didn't decode right at 60 or 120, at 1510 (MPJ-UK).
8484.0 HLG-Seoul Radio, Korea, CW marker at 1330 (MPJ-UK).
8894.0 7T-WHZ-Algerian Air Force C-130H, calling Algiers at 1510 (ALF-Germany). LSX522-Beechcraft/ Hawker 750 bizjet registration EC-KXS, position for unknown ground station at 2025 (Patrice Privat-France).
8930.0 Astana 921-Air Astana (Kazakhstan) B757 reg P4-MAS, working Stockholm LDOC, at 1348 (ALF-Germany).
8957.0 "13"-HFDL ground station, Santa Cruz, Bolivia, uplink to DHL Air B767 reg G-DHLE (not heard), at 0758 (PPA-Netherlands).
8971.0 Fiddle-US Navy, FL, clear and secure with Trident 712, a P-3C, at 2213 (MDMonitor-MD).
8983.0 CAMSLANT-USCG, taking ops-normal from Coast Guard 2006, an HC-130J, at 2158 (MDMonitor-MD).
8992.0 Andrews-USAF HF-GCS, Andrews AFB, MD, 32-character EAM and "Standing by for traffic," at 2125. Offutt-USAF HF-GCS, Offutt AFB, NE, going to 11220 for a patch with Nighthawk 15, US Marine Corps presidential transport squadron, nothing heard there, at 2142 (MDMonitor-MD).
9025.0 Coast Guard 6023-USCG MH-60J Jayhawk, also identifying as "Rescue 23," calling USCG District 7 (Miami, FL), no joy, at 1355 (MDMonitor-MD). Raymond 24-USAF, ALE-initiated patch with aircraft sounding like Sentry 64 (AWACS front end callsign), at 2020 (Metcalfe-KY).
9078.7 Unid-Egyptian MFA, Cairo, passing long ARQ plain text messages with serial numbers, then selcalling RCVB (Washington, DC Embassy), no joy and gone, at 2135 (MPJ-UK). [This was at the height of the political crisis, with much to talk about. -Hugh]
9105.0 SSE-Egyptian MFA, ARQ selcal to IPTX (Havana Embassy), at 2220 (ALF-Germany).
9463.0 Unid-S06, AM preamble 801 975/40, at 1200 (Mike-UK).
10081.0 G-VFIT-Virgin Atlantic Airways A340-600 "Dancing Queen," flight VS0019, HFDL position for San Francisco at 2019. G-VYOU-Virgin Atlantic A340-600 "Emmeline Heaney," flight VS0023, HFDL position for San Francisco at 2231 (Hugh Stegman-CA).
10093.0 "09"-HFDL ground station, Barrow, AK, squitters and uplinks to AS0882 (Alaska Airlines B737 reg N584AS), at 0006 (Stegman-CA).
10730.0 Unid-Russian Intelligence, 6-tone selcal (X06), at 1245 (Mike-UK).
10945.0 CFH-Canadian Forces, Halifax, NS, RTTY test loops at 1444 (MPJ-UK).
11090.0 KVM 70-US National Weather Service, HI, FAX weather map, parallel 16135, at 0813 (Waters-Australia).
11111.0 TUD-Tunisian Ministry of Information, Tunis, calling STAT23, ALE at 1258 (PPA-Netherlands).
11155.0 RIT-Russian Navy, Severomorsk, CW message at 1230 (PPA-Netherlands).
11161.0 RHP-Saudi Air-Force, calling AAI, ALE at 1424 (PPA-Netherlands).
11175.0 Offutt-USAF HF-GCS, NE, sending Ranger 514 (US Navy, probably a P-3) to 11220 for a patch, at 2138. Navy LL 47-US Navy P-3C, called Mainsail (any station), raised Andrews (USAF HF-GCS, MD), at 2206 (MDMonitor-MD).
11220.0 Offutt, unsuccessful patch with Ranger 514 at 2139 (MDMonitor-MD).
11226.0 170044-USAF Lockheed C-5B, tail #87-0044, ALE sounding at 1354 (PPA-Netherlands).
11235.0 47-Italian Air Force, calling Charly46, ALE at 1420 (PPA-Netherlands).
11288.0 "16"-HFDL ground station, Guam, squitters at1107 (Waters-Australia).
11318.0 Novosibirsk Volmet-Russian Net 1, aviation weather in Russian, at 1111 (PPA-Netherlands).
11468.0 RDL-Russian military, strategic broadcast in FSK Morse, at 1247 (MPJ-UK).
12637.5 XSG-Shanghai Radio, China, CW identifier in SITOR-A sync marker, at 1207 (Waters-Australia).
12843.0 HLO-Seoul Radio, Korea, CW marker at 1215 (MPJ-UK).
12876.0 KW-Pakistan Navy "Karachi Wireless," calling SHAHJAHAN, destroyer Shahjahan, and KHAIBAR, frigate Khaibar, ALE at 1142 (Waters-Australia).
13077.0 BVA-Taipei Radio, Taiwan, Chinese phone patch at 1234 (PPA-Netherlands).
13083.0 XSG-Shanghai Radio, China, Chinese phone patch, at 1236 (PPA-Netherlands).
13134.0 SVO-Olympia Radio, Greece, female with broadcast in Greek, at 1153 (MPJ-UK).
13215.0 PLA-USAF, Lajes, Azores, ALE sounding at 1308. ICZ-USAF, Sigonella, Italy, ALE sounding at 1310 (MPJ-UK).
13538.0 ZSJ-Cape Naval Radio, South Africa, FAX weather map at 0642 (Waters-Australia).
13590.0 REA4-Russian military, FSK reversals and strategic air broadcast, parallel 11470, at 1200 (MPJ-UK).
13881.7 SSE-Egyptian MFA, Cairo, SITOR-A text in Arabic, also on 13981.7, 14881.7, and 14981.7; at 1325 (Waters-Australia).
13882.5 DDK6-German Weather Office, Hamburg/ Pinneberg, FAX weather map at 0947 (Waters-Australia).
13988.6 JMH4-Japan Meteorological Agency, Kagoshima, FAX weather map at 0532 (Waters-Australia).
14924.0 FUM-French Navy, Tahiti, test loop in STANAG 4285 (600/long/5N1), at 0522 (Waters-Australia).
15043.0 277-Unknown USAF, calling CRO (USAF ground station, Croughton, UK), ALE at 1323 (MPJ-UK).
15091.0 ADWSPR-USAF Secure Internet Protocol Routing Network gateway, Andrews AFB, MD, ALE sounding at 1225 (MPJ-UK).
16035.0 9VF252-Japanese Kyodo News Agency, transmitter in or near Singapore, FAX newspaper in Japanese at 60 lines per minute, at 0727 (Waters-Australia).
17430.0 9VF209-Kyodo News, Singapore, Japanese FAX newspaper at 60 lines per minute, at 0741 (Waters-Australia).
17435.0 2002-Moroccan Civil Defense, working 2002, ALE at 1058 (MPJ-UK).
18003.0 ICZ: USAF, Sigonella, Italy, ALE sounding at 1330 (MPJ-UK).
21997.0 PR-ABD-ABSA Cargo flight M38462, a B767-316F freighter, passing HFDL position and company traffic to Santa Cruz, Bolivia, at 2113 (Stegman-CA).

DIGITAL DIGEST

DIGITAL MODES ON HF

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Egyptian Diplomatic Service HF Ops

Quite by accident, last month's column featuring the Egyptian Diplomatic Service couldn't have been better timed.

As one might expect, the momentous events taking place there in these past weeks have generated a great deal of activity on their HF networks. During the height of the protests, I counted at least four and sometimes more frequencies in simultaneous use, sending messages from the MFA in Cairo to embassies around the world. Links to Washington DC and Havana were busy late into the evening and, most unusually, the network was active on Fridays, the Moslem holy day.

There was plenty of activity to copy using standard SITOR-A, and, for those with the decoder, the Codan 9001/3012 16 tone modems pushed huge amounts of traffic to key embassies like Washington and nearby capitals of Algiers, Tripoli, Tunis and Rabat. Most of the high-speed traffic is encrypted, but there were more messages than usual in the clear using this mode, perhaps due to the speed at which communications needed to be delivered.

Here are the most recently copied channels: 7777, 9077, 9045, 10171, 14925, 16066, 16221, 16340, 16342, 18036, 20025 kHz

These are the USB frequencies. For SITOR-A, tune 1.7 kHz higher for the center of data.

As this column goes to press, Mubarak has finally resigned his office and a military junta is in control of the country. Doubtless, we'll continue to see high levels of traffic from MFA Cairo continue over the coming weeks and months. Listen in to the action yourself!

❖ MFA Algiers Leaves HF?

There are now many choices to decode the French-developed 8 tone Coquelet signals used by the Algerian Diplomatic Service. However, it does appear that this long-time inhabitant of the HF world and Coquelet user may have left us for good.

The usual coordination channels of 18182 kHz and 16278 kHz have been silent for many weeks; the last embassy I heard using the mode was Dakar, Senegal on 19036.43 kHz in late November. Even the Embassy in Havana, often an outpost receiving little attention from the MFA, seems to be silent.

In case the network is merely dormant, here are some (until recently) regularly used frequencies: 10996.3, 11428.3, 16278.6, 16315.5, 17181.5, 18183.3, 19036.4 kHz.

Do drop me a line if you happen to hear MFA Algiers again.

❖ One US Mystery Net Solved?

Back in the December 2010 column, I wrote about two mysterious US military networks that appear sporadically on HF. One of those networks now appears to belong to US Navy SeeBee Readiness Groups according to some investigations by UTE listener Jack Metcalfe.

The net had been heard on the following frequencies: 4250.5, 4883, 6939.5, 7945.5, 9053, 9871.5, 10520, 11114.5, 11540.5 kHz USB.

Both MIL-188-141A ALE and MIL-188-110A high speed modem activity was noted between stations using the following identifiers: HEB, BON, TES, MII, and GUL

In January, however, there was a great deal of activity on 14650 kHz using first the identifiers BOSTONINTEL, FEARLESSINTEL and HEBREWINTEL and later switching to BON, HEW, TES and ZES. It is likely that BON = BOSTONINTEL and HEW is HEBREWINTEL. Unfortunately, all the underlying high-speed modem traffic is encrypted, as you can see from this couple of exchanges between TES and HEW:

```
11 10 9 8 7 6 5 4 3 2 1 0
DATA RATE 75 LONG INTERLEAVER
\\\"8HT8€WESEø_ç cl6
[EOM]

22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5
      4 3 2 1 0
DATA RATE 2400 LONG INTERLEAVER
\ \ \ " : H T H A 7 8 P W Í S E ø _ à • F g W 5 Y 7 • _
      Ú  Ú  Ú  Ú  Ú  Ú  Õ  ;  R̄  Ú  Ú  Ú  Ú  Ú  Ú
      Ñ . W Ú Ú Ú Q 5 ³ W Ú Ú Ú d W Ú Ú Ú Ú Ú ...
      Ú Ú Ú Ú Ú Ú Ú Ú õ § í ″ ` ` O Ú Ú Î [ Ü Ú 6 8 Ú Ú Ú }
      P Ú Ú Ú Ú Ú W Ú Ú Ú Ú Ú Ú 5 + T Ú Ú Ú e Ú õ Í T
      Ú õ e · 1 + V Ú Ú Ú Ú Ú Ú Ú Ú ú Ú Ú Ú Ú Ú Ú Ú Ú Ú
      Ú é — - Ë 0 5 Ú Ú Õ J Ú Ú Ú Ú Ú Ú Ú Ú • © { # D ]
      Ä Ú Ú Ú Ú Ú Ú û W • © { ç Ä T Ú Ú q Ú Ú Ú Ú Ú Ú
      Ú Ú Ú Ú Ú Ú Ú Ú : 1 Q õ 4 ¨ m Ú Ú Ú Ú Ú Ú Ú Ú
      Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú u³ Š Ü Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú Ú ¯ \
      Ú Ú Ú Ú Ú õ
[EOM]
```

Note that you can read the two callsigns used by the ALE in the message header of the 110A high speed traffic here, after the "\\\" text, though they must be assembled according to the rules of the FS1052 Data Link Protocol Standard. Here's how it works in this case:

Destination address part			1				3	2			
	8	H	T	8€	W	E	S	E			
Source address part			1				3	2			

Reading the parts of the source and destination address in the header, we can therefore see that this is HEW and TES communicating.

❖ Update on the ECO ALE Network

Regular readers will know about another NVIS (Near Vertical Incidence Skywave) ALE network that was covered in the March 2011 issue of this column. In one of those uncanny coincidences, I happened to be reading a message posted to the UDXF email list asking about whether the network was still active, when the very frequency I had parked the receiver on came active with one of the ECO stations – and not on a channel used before!

Knowing that the stations scan upwards in frequency, it was then a case of following stations around to determine the new channels. With the help of Jon-FL on the #WUNCLUB IRC (Internet Relay Chat) channel, the chase was on. It took us about half an hour to find most of the new channels, which are as follows:

6 MHz pool: 6843, [gap of maybe 2 channels], 6871, 6877 kHz USB
9 MHz pool: 9084, 9087, 9091, [gap], 9140, 9150 kHz USB
10 MHz pool: [gap], 10128, 10135, 10160, 10176, 10187, 10193, 10218, 10222, 10234, 10244 kHz USB

In another development, for the first time I heard two stations linking with ALE and two Spanish-speaking voices following on. You can hear the clip I recorded in the Resources section. As ever, the signals from these stations are extremely faint in northeastern US. Perhaps readers closer to the suspected location of Mexico can take a listen and gather some more evidence as to the origin of these signals?

That's all for this month. Please keep the letters and emails coming with your suggestions for what you'd like to see this column cover in future issues, or if you have any questions you'd like to ask. Until next week, enjoy your digital HF listening.

RESOURCES

ECO Net Voice Clip
http://dl.dropbox.com/u/301213/ECOnet10187usb.wav

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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One Loop to Rule Them All

At a local ham club dinner the other day, the guys were talking about moving the club's Field Day operations to a new site. The one they'd used for the past 10 years or so was outstanding, but it was a bit off the beaten path, and the thought was that if something closer to downtown could be arranged, it might garner more community participation and media exposure.

The topic soon turned to antennas, with the gang leisurely debating the merits of the usual suspects: dipoles, beams and verticals, with a few more esoteric designs thrown in for good measure. One of the most interesting was last year's half-rhombic, which seemed to work pretty well. It required only a single mid-point support and offered definite directivity.

Much like the "real world," most ops were suggesting traditional antennas, and a few were lobbying for the increased performance of various beam antennas. Rotatable, directional antennas *are* nice, as is the gain they can provide. But the downsides are many. They're much more expensive than wire antennas and they usually require a tower or other suitably sturdy – and safe – mast. Once in a while you get lucky and find a handy farm silo or other existing structure that can be pressed into service in a way that doesn't violate the precepts of Field Day, but most of the time that issue needs to be addressed.

For maximum advantage, beams also require rotators, complete with the extra complexity of control cables, power supplies, etc. And unless your Field Day site is at HCJB or an Air Force base where you can put up a log-periodic array the size of a football field, typical amateur radio beams don't cover every necessary band. You'll have to put up one or more additional antennas to get the job done.

Larger FD operations have multiple stations on multiple bands, so additional antennas are needed anyway. But what if, for Field Day or your home QTH, you need one killer antenna that can easily work all HF bands, while providing RF performance that's on par or better than traditional dipoles on the low bands, and a tri-band beam for 20 through 10 meters?

If you're willing to ignore conventional wisdom and take a leap of faith, that antenna exists. It's the horizontal loop, and it's the antenna I suggested. It's certainly nothing new, but even after years of positive feedback from a multitude of users, the antenna still gets bashed by armchair antenna designers, Monday morning quarterbacks, and the like.

No one antenna is the "best" for every particular installation, but I have no qualms about stating that the horizontal loop is the best multiband wire antenna I've ever used. It's been my secret weapon for more than 20 years. Like many ops who use them, I've been a real loop evangelist since I first tipped my vertical loop on its side in the late '80s. More than a few loopers shelved their tri-banders and their dipoles after putting up a horizontal loop. I know I did.

So, for that one backyard or Field Day antenna, why not use a dipole, vertical loop or an end-fed wire? Each of these venerable designs is can be made to perform well, especially on one or two bands, but when it comes to making a single antenna perform well over a wide frequency range, the horizontal loop is The One.

For the average ham, discovering a single, simple, inexpensive wire antenna that can provide DX and stateside performance on all HF bands that rivals dipoles and beams mounted at typical heights (i.e., too low to be really effective) is critically important. Our enjoyment of amateur radio hinges on antenna performance. Whether QRP or QRO, whether you have a garden-variety rig or a top-of-the-line transceiver, if you can't receive and transmit well, you're in a bind. Despite what Mother Teresa may have suggested, there's no extra merit in suffering with a crappy antenna!

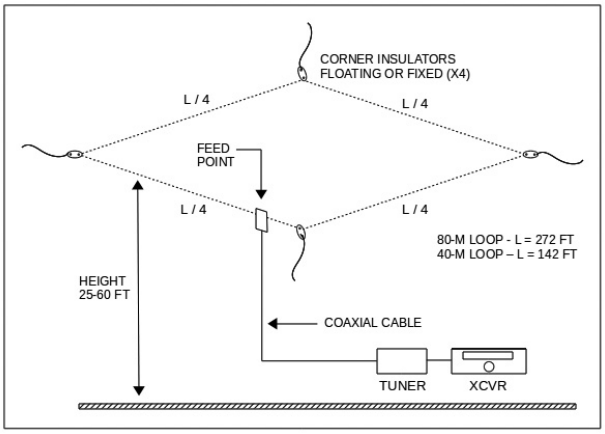

Figure 1 - The horizontal loop is a basic, yet high-performance antenna that's easy to build (once you've found three or four suitable skyhooks). The feed point is the same as that of a simple coax-fed dipole. No impedance-matching balun is required, although you can wind 10 turns of coax into a choke balun at the feed point if you wish. Use fixed or floating corner insulators as necessary. Use 50- or 75-ohm coax, or feed the loop with open-wire line. However you do it, just put one up!

Figure 2 - The author's "pre condo" loop was tuned with a backyard autocoupler on 160-6 meters. At the lower left you can see the 100-foot run of RG-8 coax and a large extension cord (used to provide 12-V dc to the tuner). The autocoupler lived inside the garbage can weather shelter, which was U-bolted to a short pipe, and a 35-foot length of open-wire line went straight up to the loop's feed point (inset photo). Placing the tuner in the backyard eliminated RFI from the shack PCs and made the tuner available for occasional use elsewhere (it would have been a pain to retrieve it if it were mast-mounted at the loop's feed point)-*NT0Z***

If you can afford to erect tall towers and stack them with high-gain antennas, you might not be interested in a "humble" loop. But, if you have a typically limited budget that allows for only one decent HF antenna, this is it! Horizontal loops work well on 6 meters, too. Some ops who have plenty of steerable aluminum in the air use loops, too, because they receive well in all directions, making them useful for finding stations that might otherwise be off the sides of the beams.

❖ Real-World Performance Benefits

As mentioned, the horizontal loop is much maligned by armchair antenna designers and hams who've never used one. If someone tries to convince you that a horizontal loop is a simple "cloud burner" that radiates straight up, just run in the other direction, especially if he's holding a radiation pattern chart that "proves" that the antenna is good only for local or NVIS communications.

HORIZONTAL LOOPS = SUPERIOR SWLING

Shortwave listeners who are looking for the best possible "single wire" reception need look no further than the horizontal loop. If you're using an entry-level receiver, however, you'll need to take a few extra precautions. Be sure to build or buy an *attenuator*, or at least have something on hand to *decrease* the strength of the received signal.

Loops and other full-size antennas can easily deliver a whopper of a signal that can wipe out radios designed to be used with short whip antennas. Potential issues include images, birdies, distortion and a bunch of other unwanted side effects. A good preselector (best) or a wide-range transmitting-type antenna tuner (better than nothing) can also help to keep out unwanted signals.

Be careful. Once you start SWLing with a big horizontal loop you'll undoubtedly start craving a high-end receiver to match its performance! *– NT0Z*

He will no doubt be comforted by his chart while you're working DX left and right!

Tradition aside, horizontal loops are fabulous stateside and DX performers. They do it all, and that's their only potential weakness. These loops receive well in *every* direction, so copying perfectly readable DX stations through pileups of strong domestic stations can be frustrating at times.

These workhorse antennas tune up easily on all bands *at or above the fundamental frequency* and can be made to work well on frequencies below their design frequencies if fed with open-wire feed lines. Dipoles and vertical loops can't do that, and even if they could, the impedance matching required is much more complex.

Loops, whether horizontally or vertically oriented, are quiet and tend to suffer less from static and man-made noise. Because of that, they "hear" well compared to most dipoles and verticals. If fed with balanced lines, they can also exhibit impressive immunity from locally generated computer noise and electrical RFI.

When mounted close to the ground – an unfortunate necessity for most of us and a real performance killer for dipoles and vees – horizontal loops really shine (actually, performance is startlingly better, which is why I don't even bother with dipoles and vees unless I can get them way up in the air).

❖ Building Horizontal Loops is Easy!

A horizontal loop is simply a full-wavelength loop (you're probably used to them being vertically oriented, like a quad loop) that's "laying on its side," supported at various points some 25 to 60 feet above the ground. In a perfect world, loops are circular, but finding enough skyhooks for a horizontal loop that's perfectly circular is needlessly tedious. Four supports gives us a "square loop" (which is ideal), while three supports provides a "triangle loop" (the geometric limit of proper function). A somewhat rectangular shape is okay, but an elongated rectangular shape starts to lose its loop-like qualities (rectangular loops are fine when oriented vertically). Don't worry if your loop isn't geometrically perfect. It will still work well if it's a bit misshapen. Just try to keep it as "loopy" as possible.

The formula for designing a full-wave loop, published in antenna books for years, is 1005 divided by the frequency (in megahertz), or 1005/f. The equation produces these common sizes: 160 m, 558 feet; 80 m, 287 feet; 40 m, 144 feet; 30 m, 100 feet; 20 m, 72 feet. Divide these lengths by four to get an idea of how big each loop is on a single side.

Fortunately, these lengths are really for reference only. In practical terms, when it comes to building horizontal loops, all you have to do is put up as much wire as possible (keeping it as circular or as square as possible) and let your antenna tuner handle the impedance tweaking.

When I put up my last pre-condo loop, I had more than enough real estate for 40 meters, but not quite enough for 80. So I split the difference. That triangular loop was resonant at about 5 MHz. It worked outrageously well on 40 meters and up, and very nice on 80 and 160. It was certainly not a "compromise antenna."

My present condo QTH also sports a horizontal loop (I just can't find anything that works better)! It's cut for about 40 meters and is stapled to the walls of my third-story attic (about 25 feet above ground, but still indoors) and fed with an LDG autotuner that's mounted at the feed point. I run 5 W or less almost 100% of the time, cranking the RF up to 20 or 40 W on isolated occasions. Even at QRP levels it DXes well. VK and ZL on 80 and 40. KH6 and KL7 on 80-10. The Caribbean on 160...QRP. Anything stateside is "duck soup" except for 160, where the small, low indoor antenna *is quite a compromise*.

To put up one of these Death Ray wires in your backyard, install a horizontal loop that simply matches your available space (40-meter loop size or larger, if possible, for best all-around performance), feed it with 50- or 75-ohm coax through a standard antenna tuner and operate with wild abandon on all bands *at or above the loop's resonant frequency*. Feed the loop anywhere along its circumference, wherever it's most convenient.

To add a high-tech twist and get a real shot in the arm for jittery band-hoppers like me, especially on frequencies that are below the loop's resonant frequency, replace your conventional shack-mounted antenna tuner with an autocoupler mounted at the loop's feed point. This will give you lightning-fast band changes and low SWR on the coax that runs from the autocoupler to your radio, and it will still allow useful performance on the lower bands that would otherwise not work so well.

If lieu of an autocoupler mounted at the antenna feed point, consider replacing the coax that runs from your rig to your antenna with 450-ohm open-wire line. Feed the antenna with a conventional tuner that incorporates a tuner-output balun (okay), a balanced tuner such as an old Johnson Matchbox (good, but hard to find), one of MFJ's balanced tuners (also good), or a balanced L-network tuner (great, but you have to build it. You can see my home-brew tuner in this column two issues back).

Using an open-wire feed line will significantly reduce the SWR losses on the feed line and help you to put out a greatly improved signal on bands below the antenna's design frequency.

I will cover some advanced topics (optimum antenna height, take-off angles, frequency scaling, etc.) in a future column, but for now, the details of how you install and feed your loop aren't that important. What is important is that, when it comes to using a single antenna on all HF bands, you just can't outperform the horizontal loop. You have been warned!

THE SOURCE OF MY LOOPINESS

My introduction to the horizontal loop was "The Loop Skywire," an article in November 1985 *QST* written by Dave Fischer, then W0MHS, now W7FB. I put up a loop as Dave suggested as soon as spring had sprung in 1986, and it quickly became my "suburban secret weapon" antenna.

When I began my stint at ARRL HQ two years later, I had the good fortune to meet Dave and kibitz about the loop. Dave (who doesn't claim to have invented the Loop Skywire, by the way) was just retiring as Chief Scientist for a big electronics company. As smart as he was (is?), Dave couldn't really explain why the antenna worked so well – only that it did!

I wasn't arguing. In fact, I took the opportunity to include the design in the antenna section of the *ARRL Handbook*, where it remained for several years. Dave's design has also appeared in other ARRL publications, including the *ARRL Antenna Book*. But it's not just me who's raving about it:

From the web site of Dave Riley, AA1A, a veteran ham, DXpeditioner and commercial/maritime radio op from Marshfield, Massachusetts: "After years of fooling around with various wire antennas, beams and verticals, I finally can say that the best overall performing wire antenna is the 'Loop Skywire' by Dave, W0MHS."

From a **www.qrz.com** forum posting, in which Marco, AA5ET, answers a question about the best multiband QRP Field Day antenna: "A single antenna that would meet your needs is a horizontal loop. I'm talking about the 'Loop Skywire' in the 1985 *QST* article by Dave Fischer, W0MHS (now W7FB). It's a great antenna. Dave, myself and another ham used one during field day in 2001 and got second place in our category. We ran no more than 5 watts. Dave just talked me into installing one above my house and I'm glad he did. It works great – much better than a dipole in my opinion and easier to load on all bands."

From W8BO, in a sidebar in the original *QST* article, on using a 40-meter horizontal loop at just 20 feet: "This antenna has to be the best-kept secret. This complete backyard antenna ragchews and DXs. While the Bog Boys are bringing their beams around you can work anybody within 360 degrees. If a station in the US doesn't come back to me, I immediately look out the window to see if the antenna has blown down. I hold 5BWAS and 5BDXCC. If I say an antenna works, you'd better believe it!"

From K4SSW in the same *QST* sidebar: "The 40-meter Loop Skywire is my only antenna now. I work 40, 20 and 15, and I enjoy ragchewing with DX ops. I work anyone I can hear, and I hear lots!"

So thanks, Dave, for making me Loopy. And in case I haven't passed on the infection, do yourself a favor and stop by your local library to find the original article or the versions in the previously-mentioned ARRL publications. *– NT0Z*

GETTING STARTED

THE BEGINNER'S CORNER

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Return of the Portable TV

Following the switch to digital TV (DTV) in June 2009, millions of Americans were left with millions of small, analog, portable TV sets that were reduced to the status of inconvenient doorstops.

Actually, those sets are still useful for those watching Free-to-Air or pay satellite television. All such satellite receivers have analog channel 3 or 4 modulators which make the continued use of analog TV sets of any size or weight possible. But, those who live in areas prone to weather-related power outages (which is to say most of the U.S.), who had previously relied on such small TVs to be able to watch local news for weather and power-related developments, were left with few options.

One option had been Radio Shack's Accurian 7 inch portable HDTV set which I reviewed in *MT* September 2008. But, the $200 price tag, 100 minute battery life, and poor reception were disappointing, and it wasn't long before that unit disappeared from store shelves. There seemed to be a lag of about a year before Radio Shack found a suitable replacement. Now The Shack has a full line-up of portable LCD TV sets ranging from 3.5 to 10 inch screens and priced from $100 to $139.

One thing to know about all these portable sets: they don't work for mobile applications. Good DTV reception is hard enough with the set perfectly still, and the physics of DTV signals in motion preclude mobile reception. That's what all the hoopla is about with the FCC wanting broadcast spectrum returned so they can sell it off to mobile TV entrepreneurs.

❖ Auvio 3.5 inch LCD TV

I was very skeptical when I saw the 3.5 inch Auvio DTV set offered on Radio Shack's web site, but with free ground shipping, an $80 price tag and a substantial number of good reviews, it seemed a good risk. Within a few days the set arrived, and I was hunting around the house for the four AA batteries to power the set. It doesn't come with an external power supply, and I soon found out that a set of fresh batteries lasts only two hours.

With nothing but its insanely small 10.5 inch telescoping whip antenna, which disappears nicely into the left side of the set when not in use, I was able to get a locking signal on a TV station 25 miles away. The picture was great: excellent color and contrast, quite a vivid picture and, even on that tiny screen, I was able to read virtually all on-screen text. When I tuned to the local weather channel it gave me exactly what

Auvio 3.5 inch portable DTV next to a coffee cup to show size; the picture is amazingly viewable. (Courtesy: Author)

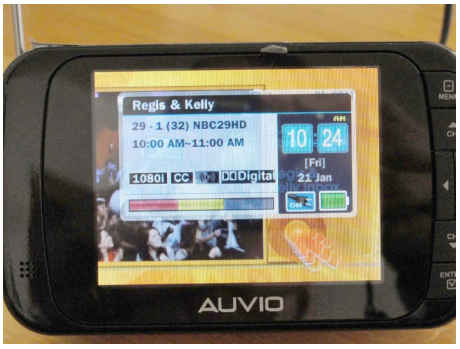
I was looking for: a view to the radar, scrolling weather alerts, and local weather data. If you live in an urban or suburban location you'll have no trouble picking up most local TV stations with the built-in antenna.

But, to get full use out of this little set I needed an external power supply and an external antenna. The trouble is the TV requires a 5 volt 1 amp D.C. supply, but the adapter Radio Shack sells costs $44, which seemed exceedingly pricey. You might get lucky and find a wall adapter in your junk box that will fit the bill. I found a six volt mobile adapter for use in the car that worked fine. The hardest part will be finding a plug that fits the very small external power jack, located on the right side of the set as you look at the screen.

For extended use in emergencies you'll need an external power supply, and more distant viewers will need to use an external antenna. (Courtesy: Author)

The second problem is finding an antenna connector that fits the peculiar antenna jack, unlabeled, not even acknowledged in the owner's manual, and hidden behind a very small rubber insert on the left side of the set just below the pull-out telescoping antenna.

Several reviewers on the product's Radio Shack web site have helpful suggestions for modifying the antenna jack for various connectors. I called the Auvio tech support number (877-400-1230) and was advised that they sell home and car power adapters as well as an antenna adapter directly. So, for $39 (cashier's check only), which including shipping, they sent an antenna adapter and home power adapter, thus pushing the total cost of the set up to $120. For emergency preparations I recommend getting the mobile power adapter, too, and running the set off a standard car battery, which should give you days of watching.



It doesn't take much signal to lock in a picture with this little set. (Courtesy: Author)

I don't have access at my desk to an external TV antenna, so I attached a small external scanner antenna and did a channel search. It worked great, pulling in three stations transmitting eight channels from up to 50 miles away. Attached to an actual amplified TV antenna, the set brought in a total of seven broadcast stations and 16 different channels.

One thing that attracted me to the unit is that it also tunes the analog channels and suddenly becomes a pocket-sized, easy-to-use, trouble shooting tool for FTA satellite TV dish peaking or for checking channels on the C and Ku-band 4DTV receiver without having to turn on the big TV set (the Auvio draws only 4 watts from the wall, according to the Kill-A-Watt meter).

This set is loaded with features, including a non-interactive, on-screen electronic program guide (EPG). In the case of this model, the EPG works only for the channel on which you are tuned and only displays a half-day's schedule at a time. Pressing the "Enter" button on the right side of the set displays current channel information, including channel number and station name, broadcast resolution, closed captioning

Used in the analog mode, this set doubles as a test monitor for FTA satellite TV dish peaking. (Courtesy: Author)

availability, multilingual audio availability, time of day, battery power status, and a bar graph depicting signal strength (red to yellow to green). I found the set easily locked onto a signal even if no green was showing on the signal strength bar.

But, there are some drawbacks to the Auvio 3.5 inch set. It would be helpful if it had a rechargeable battery pack in addition to using standard AA cells, a more standardized voltage requirement for a cheaper mobile adapter, and a more standardized external antenna jack.

❖ Other Small TV Options

There are a number of other portable LCD TV options at Radio Shack to consider, and they more or less answer the criticisms just now raised. The next TV up the line is the Haier 7-inch set with a built-in, rechargeable lithium polymer battery (with a running time projected to be 2.5 hours); remote control; 1/8 inch external antenna jack, and an RCA composite video input jack. This set runs on 12 volts and is more easily adapted to what radio hobbyists might have on hand for power supplies in the junk box.

The Haier set is particularly versatile, in that, with the standard RCA video and left/right audio inputs, it can be used as a monitor for a portable DVD player or as a 7 inch screen for a video camera or for gaming. And, the remote control means you don't have to fumble with microscopic front panel function buttons.

At 7.5 inches wide, 5.6 inches high and a little over one inch thick (about twice the size of the Auvio), and just over one pound in weight, it's not exactly a shirt pocket model. With the extras (built-in rechargeable batteries and power adapters) included, the $100 price tag for this web-only model is a good buy. This set also tunes analog NTSC as well as ATSC digital TV signals.

Bigger by one inch in screen size is the Coby TF-TV891 8-inch portable widescreen LCD TV. It measures 8.33 inches wide, 6.5 inches high and 1.18 inches thick. Unlike the previous two portables, this set displays the full 16:9 ratio screen in 480i and 480p resolution. With a much longer telescoping whip antenna and standard coax "F" connector for external antenna; built-in three-way power (with adapters included); lithium-ion rechargeable batteries, and full function remote control, this unit is much more versatile. While the extra size and weight (a little over one pound) may be more than you need, the $108 price tag for this web-purchase-only model makes it a good buy as well. This TV is also NTSC tuning capable. A 10.5 inch version of this set (Coby TF-TV109) is also available for $139.

Reviews on these three models on the Radio Sack web site varied. At the time this was written, there were no reviews on the Coby 8 inch model. The Haier 7 inch model had quite a lot of reviews posted, but customers either praised or cursed the product. Reading the reviews, it was evident that most who gave the set a poor rating were disappointed in reception, having run up against the great "digital TV deficit."

Anyone who currently receives Over-The-Air TV via cable or satellite TV will be disappointed with reception on these small TV sets with their micro-sized antennas, because, unless you live in an urban or suburban setting, your reception will not match what you're getting with cable or satellite TV. But, when the power is out and you turn to your portable set and find it can't get *any* reception, you'll really be steamed. And, if you're using either of the two bigger sets with the rechargeable batteries, you'll need a way of recharging the batteries once your 2.5 hours are up. The Auvio will keep going as long as your supply of AA batteries holds out.

❖ Bottom Line

Manufacturers were slow to respond to the need for portable DTV replacements, but last year the Chinese rallied and brought forth a number of very capable portable TV sets. Now, when weather gets bad, your power goes out or when you just want to have a portable set you can use to check on news or weather reports without needing a computer or fancy 4G cell phone, you've got a choice.

15 watt solar battery trickle charger. (Courtesy: Radio Shack)

But, there's a limit to the effectiveness of these sets. For emergency use you'll need a good passive external antenna (don't bother with powered antenna boosters in a power outage) and either a substantial quantity of AA batteries or a way to charge the built-in rechargeable batteries. That brings us to this month's theme: green radios (or, in this case TVs!).

There's no such thing as free power. And, as you've already read this month in the feature stories, millions of used batteries are piling up in America's landfills like insoluble bones. Anything you can do to reduce that number helps. So, think about investing in a solar power charger. It doesn't have to be elaborate to trickle charge a portable TV, scanner or portable radio. And, while they may seem expensive at first, think about all the batteries you won't have to buy and bury.

Radio Shack has a number of solar panel options that can help power your radio hobby, but none of them are cheap. Their Sunforce 5 watt solar battery trickle charger (available via web only) is $70 and features 5 watts at 350 mA charging for 12 volt batteries. It's complete with battery cable clamps and built-in overcharge and discharge protection. It should be enough to charge your TV set during the day for nighttime use in an extended power outage.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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China Radio International

Apparently, China Radio International didn't get the memo about the death of shortwave radio. If anything, CRI is expanding its shortwave (not to mention medium wave and internet) output to North America.

As of February 2011, CRI can be heard from 2300-0200, 0300-0700, 1100-1200, and 1300-1600 UTC, beamed to North America. In addition, they can be heard from 7pm to 7am in Toronto and Ottawa via CHIN AM and FM (1540, 91.9 FM in Toronto, 97.9 FM in Ottawa, online at **http://chinradio.com/**) and via a number of MW stations in the US for shorter periods.

Every one-hour broadcast begins with a newscast and ends with ***Chinese Studio***, a five minute Chinese language lesson, in which you can learn all kinds of useful phrases like "Do you mind if I smoke?" and "Please, pass the ketchup." Details of all the lessons are available online at **http://english.cri.cn/7106/2011/02/11/102s620153.htm**. Or better still, just google *Chinese Studio*.

One can hear ***The Beijing Hour*** at 0100, 0300, 0500, 1100, and 1500 UTC beamed to North America. *The Beijing Hour* is a fast paced news magazine featuring international stories (recent editions have featured the unrest in Egypt and arms talks in the Korean Peninsula), Chinese stories (most of which tend to be economics-oriented), Sports and Entertainment (features on NBA player Yao Ming and Chinese Films) and other items such as blogging. It's not the **Radio Peking** of Mao's day by any means. I've noted in the past that this program sounds like something from the **BBC World Service**, more often than not.

China Drive is a two-hour program that can be heard from 1300 to 1500 UTC daily. Billed as China's only bilingual lifestyle magazine show, *China Drive* covers topics such as news, showbiz, fashion, relationship advice and entertainment. (Another term might be *fluff,* but that's just my opinion.)

A typical program included a discussion of

the ban on taking photos of newborns, a round table discussion of Chinese vs. Western ideas on parenting, and ***Viva the Voice***, a program segment which looked at such diverse topics as the compensation of a dog owner whose dog was hit by a car, a French program to give beauty makeovers to unemployed women, the increasing use of pawn shops by Mexicans, a pair of British artists who try to be "subversive without being anti-establishment," and a "Taoist peace ritual" in Hong Kong. Hour One concluded with a round up of "Weird News," including a pair of "electric shoes" invented in China!

Hour 2 of ***China Drive*** consisted of a "Call In" – in this case not so much an open line show as a chat by phone with someone in Australia about online shopping. This was followed by an "Arts Guide" to entertainment events in the coming week in Beijing, and finally advice on How to be Popular at the Workplace, and How to Make Your Partner's Friends Like You.

Maybe there is a crying need for programming such as this, but I kind of doubt it. Are there ***China Drive*** fans out there that enjoy this programming block? I'd like to hear your thoughts.

Other regular features throughout the week include:

Mondays –
News and Reports and ***Frontline*** are heard in the 2300 UTC broadcast. ***Frontline*** promises "fresh stories from modern China and explores the society behind them." Many of these stories seem to concern the legal system. Recent episodes included "Employer or Benefactor?" a complicated story of two Samaritans who helped a homeless man. A troubled man subsequently beat the homeless man to death, his family sued the Samaritans on the grounds that they were his employer, not his benefactor. ***Frontline*** can be heard in the 0000, 0400, and 0600 UTC broadcasts.
People in the Know, a long running CRI program, can be heard after the news (and before ***Frontline***) at 0000, 0400 and 0600 UTC. ***People in the Know*** interviews high profile guests from China and abroad. Recent programs looked at China's relations with Japan and the EU, the Davos Economic Forum, and China's Economic and Social Development in the past decade. Interesting indeed!

Tuesdays –
People in the Know and ***Biz China*** are the Tuesday features at 0000, 0400 and 0600. ***Biz China*** is CRI's program about the Economy and Business in China. China is clearly "open for business." Programs discuss such topics as the Chinese Auto industry, the value of the Yuan and China's Home Service Industry. All the latest news from the world's newest economic powerhouse can be heard here.

Wednesdays –
People in the Know is followed by ***In the Spotlight. In the Spotlight*** focuses on the arts – film, music, design, fashion and television are all subjects for discussion. One episode featured the Canadian indie band Cowboy Junkies.

Thursdays –
People in the Know and ***Voices from Other Lands*** are the Thursday features at 0000, 0400 and 0600. ***Voices from Other Lands*** interviews people from abroad who live and work in China.

Fridays –
People in the Know is followed by ***Life in China***. As the name suggests, *Life in China* looks at the lives, struggles and triumphs of Chinese citizens as they combat desertification, engage in blogging, and deal with traffic congestion in major cities. It is an interesting look at Chinese life.

Saturdays –
At 0000, 0400 and 0600, one can hear ***Heart Beat*** and ***Listener's Garden***. *Listener's Garden* is essentially a mailbag program. *Heart Beat* looks at many topics, mostly of a cultural nature. One might tour a museum or hear an interview with a famous film director. On Saturdays, in place of the ***Beijing Hour***, you can hear ***News and Reports*** followed by *Listener's Garden*.

Sundays –
News and Reports and ***Heart Beat*** alternate each hour, followed by ***China Horizons.***

CRI can be heard on any number of frequencies in the 49 and 31mB in the evenings. As this is written, I only have the frequencies for the winter season in front of me. Check the frequency listings in this magazine for the latest times and frequencies. Or listen online at **http://english.cri.cn/08webcast/programs.html**

❖ Radio Exterior de España English

When I caught the shortwave listening bug in 1978, one of the first and most reliable sta-

tions I heard was **Radio Exterior de España**... Spanish Foreign Radio. It was an interesting time in Spain. The Franco dictatorship had just ended and democracy was returning after four decades. In 1978, many stations had recognizable voices. Distinctive voices at **Radio Moscow,** for instance, included **Joe Adamov** and **Lucy Pravdina**. **Larry Wayne** was the signature voice over at **Deutsche Welle** for many years. (He had a quirky sense of humor, and I always enjoyed his sign off saluting "Jessie, the cat what am.")

Over at **Spanish Foreign Radio** there was **Deanelle Baker**. And, there still is Deanelle Baker, still working at **REE** all these years later! While **Justin Coe** seems to do the majority of the hosting these days, you can still hear Deanelle from time to time. For me it's like hearing an old friend. Not that we are getting old, of course! ;-)

Some of the programming one can hear via **REE** includes the following features. Each broadcast opens with news, weather and sports. On Mondays the programs ***North by Southwest*** or ***Rock in Spain*** are heard. On Tuesdays, one can hear ***This, That and the Other*****,** which presents various cultural stories. ***Airwaves*** is heard on Wednesdays. Thursdays bring the listener ***Science***. And on Fridays, ***A Simple Life*** is the featured program. These feature programs are repeated on the weekends.

Try for REE daily at 0000 UTC on 5970 kHz. By the time you read this, REE will be switching to its summer frequencies, so double check with Gayle Van Horn's *Short Wave Frequency Guide* column, or MTXtra (the all-language schedules available to online subscribers).

Another interesting feature of the programming from **REE** is the opportunity to hear one of the more obscure languages on the shortwave bands. Known as Sefardi in Spanish, or Ladino, it is also known as Judeo- Spanish and is the Iberian equivalent of Yiddish. It is a Sephardic language, primarily spoken among Sephardic Jews. It is spoken by perhaps about 100,000 people in Israel and by scattered, mostly aging communities throughout the world.

REE broadcasts in "Sefardi" once a week on UTC Tuesdays at 0115 UTC on 11780 kHz and at 0415 UTC on 5970 kHz. You can also listen online or download a podcast at **www.rtve.es/podcast/radio-exterior/emision-en-sefardi/** A rare opportunity to hear a rather unique language!

❖ Speaking of Larry Wayne...

Larry is still broadcasting a program on a station in Sweden. You can hear it at 2000 UTC Mondays online via a link at Larry's website, which is **www.larryjazz.com/**

❖ Russian-language Programming

My interest in all things Russian goes back to events which took place decades before I was born. The reasons are off topic for this publication, but I will be blogging in detail about this on my website (**www.doghousecharlie.com**). As a young man, a neighbor gave my father some banknotes from the Russian Civil War. This family taught him a bit of Russian and he was able to read some of the text, a few words. I would look at these with fascination, when they were passed on to me.

In high school, a good friend of mine of Russian Mennonite stock told me of an introductory course being offered in the Russian language. We both signed up, and the class grew to the point where it was offered as a full high school credit. Thus, I am one of the few people in Ontario with two high school credits in Russian! Then I caught the DX bug, and this aspect of my education allowed me to hear and to QSL a number of Russian-language programs and stations. I would often listen to **RCI, HCJB,** the **BBC, Kol Israel, Radio Free Europe** and Soviet stations in the Russian language. I often listened to **Radio Moscow's *Russian by Radio*** course; they even corrected my homework a few times!

University soon beckoned. I was a history major, but grew disillusioned with that path. One day I walked into the registrar's office, dropped out of all my history and politics classes and signed up for every course in the Russian department that I was allowed to. For two years I was immersed in Russian language, culture and literature courses, which I look back on as one of the happiest times of my life.

What a bonus it was that I could listen to **Radio Moscow** and other related stations in English, Russian and other languages. More than once this hobby we share helped me bump up a mark here and there. The other side of the coin was also true: my studies helped me to appreciate many of the programs I subsequently heard. Many books and authors discussed on such programs as ***Audio Book Club*** from **Radio Moscow** I had already read!

The advent of the internet has only served to enhance my appreciation of the Russian language, as well as the history, culture and literature of this great country. Instead of straining to decipher some details of a program which may have been jammed, or largely inaudible due to atmospheric conditions, in the internet age one can listen to any number of Russian language programs from anywhere in the world, in near stereo quality.

Does one need to speak Russian fluently to appreciate Russian language programming? Not at all. Music is an international language, and it makes up much of the broadcast output. The breadth and variety of Russian music is equal to that of any culture. Like many languages, Russian has adopted many foreign words, so that even with no understanding of the language, one can often get a clue as to what the person is talking about by the use of some English words, proper names and such.

I am no expert on the Russian language, Russia, or the Russians. But the fascination they hold for me has led to many, many enjoyable hours of listening. Even if one does not understand much at all, one can still enjoy listening to programming in another language, whether it is Russian or another tongue (see Sefardi above).

There are many opportunities to hear Russian programming. One of my favorites is ***Радио Россия***, literally, *Radio of Russia*. Every year I try to listen to this as the New Year arrives in Moscow. President Medvedev gives a brief New Year's statement and then the chimes of the Kremlin ring in the new year. A few minutes after midnight, they played internet sensation Eduard Hill, aka Mr. Trololo! Most amusing.

Give them a try at **www.radiorus.ru/** If you need some help, get Google to translate the page for you. This doesn't always help: for instance, the link to send them an e-mail translates as "Expensive Transmission." Nevertheless, the "Listen" button should be obvious and you can enjoy the Russian language and an incredible variety of music.

Another source of Russian language radio is to go to the English Service of the Voice of Russia online, **http://english.ruvr.ru/** When you get there, look at the top left and click RUS next to the red ENG button. When the page refreshes, if live audio is available a red button with a speaker icon will be in the top right corner. Click that and you will be taken to the Russian stream.

For music lovers, go to Google and search Radio 101, Moscow, then click "Translate Page." Next, click "Radio" in the banner across the top, and you will have access to dozens of music streams, with something for every taste.

To listen old school, check out MTXtra Shortwave Guide for frequencies of your favorite stations broadcasting in Russian.

❖ Mmmm, Leftovers

Leftovers are a good thing. Food often tastes better reheated a second time. This program was left over from a recent column, which looked at food programming from around the world. This new program, called ***Polish Cuisine*** has turned up on the **Polish Radio External Service**. Maybe. It can be heard on UTC Tuesdays during the 1800 UTC broadcast, and repeated during the 0800 and 1300 UTC broadcasts on Thursdays, and 0430 on Fridays. But, I don't completely trust the veracity of this schedule as posted on their website. At some point perhaps this 7-minute program will have its own page like other programs. It would be a worthy addition to the **PRES** line-up. Stay tuned.

❖ Radio Netherlands Program Guide

Interested in knowing what is on the air via **Radio Netherlands** at any given time? This page is very handy for keeping track of what is on and what is coming up.
www.rnw.nl/english/article/hour-hour-programme-guide

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

CONVERT YOUR TIME TO UTC

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

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

FIND THE STATION YOU WANT TO HEAR

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

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

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

CHOOSE PROMISING FREQUENCIES

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

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

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

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

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

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

MT MONITORING TEAM

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

BCL News; 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, World Radio TV Handbook. Klingenfuss 2011 SW Frequency Guide.

Alokesh Gupta, New Delhi, India; Hans Johnson/WINB; Jeff White/WRMI; Mike Barraclough, UK; Ivo Ivanov/Radio Bulgaria; Tom Taylor, UK; Ron Howard, CA; Sean Gilbert, UK/WRTH; Wolfgang Büeschel, Stuttgart, Germany; Rachel Baughn/MT; Rich D' Angelo/NASWA-Flash Sheet, NASWA-Journal.

SHORTWAVE BROADCAST BANDS

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

Notes

Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.

Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.

Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007

Note 4 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

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

0000	0030		Egypt, Radio Cairo	11590am		
0000	0030		USA, Voice of America	7560af		
0000	0030		USA, Voice of America/Radio Ashna			7560as
0000	0045		India, All India Radio/External Service			6055as
			7305as	9950as	11645as	13605as
			9705al			
0000	0057		Canada, Radio Canada International			9880af
0000	0057		China, China Radio International			6005eu
			6020eu	6180eu	7350as	7425eu
			9425as	9570as	11650as	11790eu
			11885eu			
0000	0058		Germany, Deutsche Welle	9445as		9785as
0000	0100		Anguilla, Worldwide Univ Network			6090am
0000	0100		Australia, ABC NT Alice Springs			4835do
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek			4910do
0000	0100		Australia, Radio Australia	9660pa		12080pa
			13690pa	15240as	15415as	17715pa
			17750as	17795pa		
0000	0100		Bahrain, Radio Bahrain	6010me		
0000	0100		Bulgaria, Radio Bulgaria	5900na		7400na
0000	0100		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St Johns NF	6160na		
0000	0100		Canada, CKZU Vancouver BC	6160na		
0000	0100		Cuba, Radio Havana Cuba	5040ca		
0000	0100		Germany, Deutsche Welle	11855as		
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100		Micronesia, The Cross Radio/Pohnpei			4755as
0000	0100		New Zealand, Radio NZ International			15720pa
0000	0100	DRM	New Zealand, Radio NZ International			13730pa
0000	0100		Russia, Voice of Russia	7250na		7290na
0000	0100		Spain, Radio Exterior de Espana			5970na
0000	0100		Thailand, Radio Thailand World Service			13745na
0000	0100		UK, BBC World Service	5970as		6195as
			7360as	9410as	9740as	
0000	0100		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0000	0100		USA, EWTN/WEWN Irondale, AL			11520me
0000	0100		USA, FBN/WTJC Newport NC	9370na		
0000	0100		USA, WBCQ Monticello ME	5110na		7415am
			9330am			
0000	0100		USA, WHRI Cypress Creek SC			5875 ma
			7315na			
0000	0100	Sat	USA, WHRI Cypress Creek SC			5920na
0000	0100		USA, WINB Red Lion PA	9265am		
0000	0100		USA, WRNO New Orleans LA	7505am		15590al
0000	0100		USA, WTWW Lebanon TN	5080va		5755va
0000	0100		USA, WWCR Nashville TN	5070na		9980na
			13845na			
0000	0100		USA, WWRB Manchester TN	3215na		6890va
0000	0100		USA, WYFR/Family Radio Worldwide			5950am
			6085am	7360sa	9505am	11720ca
			11730ca	15440am		
0000	0100		Zambia, CVC Radio Christian Voice			4965af
0004	0100	twhfa	Canada, Radio Canada International			9755na
0030	0100	fas	Canada, Bible Voice Broadcasting			5950as
0030	0100		USA, Voice of America/Special English			6170va
			9325va	9490va	9715va	11695va
			12005va	15185va	15205va	15290va
0030	0100		USA, WHRI Cypress Creek SC			15680na
0035	0040		India, All India Radio, Delhi-Kingsway			7370do

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

0100	0104	twhfa	Canada, Radio Canada International			9755na
0100	0130		Vietnam, Voice of Vietnam	6175am		
0100	0157		China, China Radio International			6005eu
			6020eu	6075eu	6175eu	7350eu
			9410as	9420as	9570as	9580as
			11650eu	11885eu		
0100	0157	DRM	China, China Radio International			6080na
0100	0157		North Korea, Voice of Korea	7220as		9345as
			11735am	13760sa	15180sa	
0100	0200		Anguilla, Worldwide Univ Network			6090am
0100	0200		Australia, ABC NT Alice Springs			4835do
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek			4910do
0100	0200		Australia, Radio Australia	9660pa		12080pa
			13690pa	15240as	15415as	17715pa
			17750as	17795pa		
0100	0200		Bahrain, Radio Bahrain	6010me		
0100	0200		Canada, CFRX Toronto ON	6070na		
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St Johns NF	6160na		
0100	0200		Canada, CKZU Vancouver BC	6160na		
0100	0200		Cuba, Radio Havana Cuba	6000na		6050na
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200		Micronesia, The Cross Radio/Pohnpei			4755as
0100	0200		New Zealand, Radio NZ International			15720pa
0100	0200	DRM	New Zealand, Radio NZ International			13730pa
0100	0200		Romania, Radio Romania International			6145na
			7355na			
0100	0200		Russia, Voice of Russia	7250na		7290na
0100	0200		Taiwan, Radio Taiwan International			11875as
0100	0200		UK, BBC World Service	5940as		5970as
			9740as	11750as		
0100	0200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0100	0200		USA, EWTN/WEWN Irondale, AL			11520me
0100	0200		USA, FBN/WTJC Newport NC	9370na		
0100	0200		USA, Voice of America	7325va		9435va
			11705va			
0100	0200		USA, WBCQ Monticello ME	5110na		7415am
			9330am			
0100	0200		USA, WHRI Cypress Creek SC			5875na
			7315na	15680na		
0100	0200	Sat	USA, WHRI Cypress Creek SC			5920na
0100	0200		USA, WINB Red Lion PA	9265am		
0100	0200		USA, WRNO New Orleans LA	7505am		
0100	0200		USA, WTWW Lebanon TN	5080va		5755va
0100	0200		USA, WWCR Nashville TN	4840na		5935na
			7490na	9980na		
0100	0200		USA, WWRB Manchester TN	3185va		3215na
			6890va			
0100	0200		USA, WYFR/Family Radio Worldwide			6100ca
			7445am	9505am	15440am	
0100	0200		Zambia, CVC Radio Christian Voice			4965af
0104	0200		Canada, Radio Canada International			9755na
0130	0145	twhfas	Albania, Radio Tirana	6130na		
0130	0200		Iran, VOIRI/IRIB	6120na		7250na
0130	0200		Sri Lanka, SLBC	6005as		9770as
0130	0200	twhfa	USA, Voice of America/Special English			5960va
			7465va			
0130	0200	twhfa	USA, WRMI/Radio Slovakia Intl			9955ca
0140	0200		Vatican City State, Vatican Radio			5895va
			7335va			

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

0200	0204		Canada, Radio Canada International			9755na
0200	0227		Iran, VOIRI/IRIB	6120na	7250na	
0200	0230		Thailand, Radio Thailand World Service			15275na
0200	0230		USA, WINB Red Lion PA	9265am		
0200	0257		China, China Radio International			11785as
			13640as			
0200	0257		North Korea, Voice of Korea	13650as		15100as
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300		Argentina, RAE	11710na		
0200	0300		Australia, ABC NT Alice Springs			4835do
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek			4910do
0200	0300		Australia, Radio Australia	9660pa		12080pa
			13690pa	15240as	15415as	15515as
			17750as	21725va		
0200	0300		Bahrain, Radio Bahrain	6010me		
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St Johns NF	6160na		
0200	0300		Canada, CKZU Vancouver BC	6160na		
0200	0300		Cuba, Radio Havana Cuba	6000na		6050na
0200	0300		Egypt, Radio Cairo	6270na		
0200	0300		Indonesia, Voice of Indonesia/Jawa Barat			
			9525va	15150va		
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		Micronesia, The Cross Radio/Pohnpei			4755as
0200	0300		New Zealand, Radio NZ International			15720pa
0200	0300	DRM	New Zealand, Radio NZ International			13730pa
0200	0300		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	17710me		
0200	0300		Russia, Voice of Russia	7250na		7290na
0200	0300		South Korea, KBS World Radio			9580sa
0200	0300		Sri Lanka, SLBC	6005as		9770as
0200	0300		Taiwan, Radio Taiwan International			5950na
			9680ca			
0200	0300		UK, BBC World Service	5875me		5940as
			7445af			
0200	0300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		

0200 0300 USA, EWTN/WEWN Irondale, AL 11520me
0200 0300 USA, FBN/WTJC Newport NC 9370na
0200 0300 USA, KJES Vado NM 7555na
0200 0300 USA, WBCQ Monticello ME 5110na 7415am 9330am
0200 0300 USA, WHRI Cypress Creek SC 5875na 5920na 7315na 7385na 15680na
0200 0300 USA, WRNO New Orleans LA 7505am
0200 0300 USA, WTWW Lebanon TN 5080va 5755va
0200 0300 USA, WWCR Nashville TN 3215na 4840na 5890na 5935na
0200 0300 USA, WWRB Manchester TN 3145va 3185va 5050va
0200 0300 USA, WYFR/Family Radio Worldwide 5930sa 5985ca 6885ca 6890ca 7455am 9505am 9525am
0200 0300 Zambia, CVC Radio Christian Voice 4965af
0215 0227 Nepal, Radio Nepal 5005as
0230 0255 China, Voice of the Strait (News Channel) Fuzhou 9505do
0230 0300 USA, WINB Red Lion PA 9405am
0230 0300 Vietnam, Voice of Vietnam 6175am
0245 0300 twhfas Albania, Radio Tirana 6130na
0245 0300 Australia, HCJB Global Voice Australia 15400as
0245 0300 India, All India Radio, Delhi-Kingsway 6030do 7235do 11830do 15135do
0245 0300 India, All India Radio/Gorakhpur 3945do
0250 0300 Vatican City State, Vatican Radio 6040am 7305am
0250 0300 Zambia, Zambia Broadcasting Corp 6165do
0255 0300 Sun Swaziland, TWR Swaziland 3200af

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

0300 0310 Pakistan, Azad Kashmir Radio/Islamabad 7265do
0300 0310 Pakistan, Azad Kashmir Radio/Rawalpindi 4790do
0300 0315 Croatia, HRT Voice of Croatia 3985eu 7375am
0300 0320 Vatican City State, Vatican Radio 7305as
0300 0325 Sun Swaziland, TWR Swaziland 3200af
0300 0330 Philippines, PBS/ Radyo Pilipinas 11880me 15285me 17710me
0300 0330 Sri Lanka, SLBC 6005as 9770as 15745as
0300 0330 USA, KJES Vado NM 7555na
0300 0330 Vatican City State, Vatican Radio 7360af 9660af
0300 0330 DRM Vatican City State, Vatican Radio 9660af
0300 0357 China, China Radio International 6190na 9460na 9690as 9790as 11785eu 13620as 15110as 15120as
0300 0357 North Korea, Voice of Korea 7220as 9345as 9730as
0300 0358 Germany, Deutsche Welle 11695as
0300 0400 Anguilla, Worldwide Univ Network 6090am
0300 0400 Australia, ABC NT Alice Springs 4835do
0300 0400 Australia, ABC NT Katherine 5025do
0300 0400 Australia, ABC NT Tennant Creek 4910do
0300 0400 Australia, Radio Australia 9660pa 12080pa 13690pa 15240as 15415as 15515as 17750as 21725va
0300 0400 Bahrain, Radio Bahrain 6010me
0300 0400 Bulgaria, Radio Bulgaria 5900na 7400na
0300 0400 twhfas Canada, CBC Northern Quebec Service 9625na
0300 0400 Canada, CFRX Toronto ON 6070na
0300 0400 Canada, CFVP Calgary AB 6030na
0300 0400 Canada, CKZN St Johns NF 6160na
0300 0400 Canada, CKZU Vancouver BC 6160na
0300 0400 Cuba, Radio Havana Cuba 6000na 6050na
0300 0400 Italy, IRRS-Shortwave/NEXUS 9670af
0300 0400 Malaysia, RTM/Traxx FM 7295do
0300 0400 Micronesia, The Cross Radio/Pohnpei 4755as
0300 0400 New Zealand, Radio NZ International 15720pa
0300 0400 DRM New Zealand, Radio NZ International 13730pa
0300 0400 Oman, Radio Sultanate of Oman 15355af
0300 0400 Russia, Voice of Russia 7250na 7290na 7440na 12030na 12040na 13735na
0300 0400 South Africa, Channel Africa 3345af 6120af
0300 0400 Taiwan, Radio Taiwan International 6875na 15320as
0300 0400 UK, BBC World Service 3255af 5940va 6100af 6145af 6190af 7255af 7445af 9410as 9460af
0300 0400 USA, American Forces Network 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0300 0400 USA, EWTN/WEWN Irondale, AL 11520me
0300 0400 USA, FBN/WTJC Newport NC 9370na
0300 0400 USA, Voice of America 4930af 6080af 9885af 15580af
0300 0400 USA, WBCQ Monticello ME 5110na 7415am 9330am
0300 0400 USA, WHRI Cypress Creek SC 5920na 7315na 7385na 7590na 15680na
0300 0400 USA, WINB Red Lion PA 9405am
0300 0400 USA, WRNO New Orleans LA 7505am
0300 0400 USA, WTWW Lebanon TN 5080va 5755va
0300 0400 USA, WWCR Nashville TN 3215na 4840na 5890na 5935na
0300 0400 USA, WWRB Manchester TN 3145va 3185va 5050va
0300 0400 USA, WYFR/Family Radio Worldwide 7455am 9505am 9930ca 9985ca
0300 0400 Zambia, CVC Radio Christian Voice 4965af
0300 0400 Zambia, Zambia Broadcasting Corp 6165do
0330 0400 twhfas Albania, Radio Tirana 6100na
0330 0400 Sun Sri Lanka, SLBC 6005as 9770as 15745as
0330 0400 UK, BBC World Service 11860af
0330 0400 Vietnam, Voice of Vietnam 6175am
0335 0340 India, All India Radio, Delhi-Kingsway 7235do 11830do 15135do

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

0400 0430 mtwhf France, Radio France Internationale 7315af 9805af
0400 0455 Turkey, Voice of Turkey 7240as 9655va
0400 0457 China, China Radio International 6190na 9460na 13620as 15120eu 17725as 17855af
0400 0457 Germany, Deutsche Welle 5905eu 5945eu 6180af 9450af 15600af
0400 0458 New Zealand, Radio NZ International 15720pa
0400 0458 DRM New Zealand, Radio NZ International 13730pa
0400 0500 Anguilla, Worldwide Univ Network 6090am
0400 0500 Australia, ABC NT Alice Springs 4835do
0400 0500 Australia, ABC NT Katherine 5025do
0400 0500 Australia, ABC NT Tennant Creek 4910do
0400 0500 Australia, Radio Australia 9590pa 12080pa 13690pa 15240as 15515as 21725va
0400 0500 Bahrain, Radio Bahrain 6010me
0400 0500 twhfas Canada, CBC Northern Quebec Service 9625na
0400 0500 Canada, CFRX Toronto ON 6070na
0400 0500 Canada, CKZN St Johns NF 6160na
0400 0500 Canada, CKZU Vancouver BC 6160na
0400 0500 Cuba, Radio Havana Cuba 6000na 6050na
0400 0500 Italy, IRRS-Shortwave/NEXUS 9670af
0400 0500 Malaysia, RTM/Traxx FM 7295do
0400 0500 Micronesia, The Cross Radio/Pohnpei 4755as
0400 0500 Romania, Radio Romania International 6130na 7305na 9690as 11895as
0400 0500 Russia, Voice of Russia 7290na 12030na 12040na 13735na 15250as 15520as
0400 0500 DRM Russia, Voice of Russia 15735as
0400 0500 South Africa, Channel Africa 7230af
0400 0500 South Africa, CVC 1 Africa Christian Radio 9430af
0400 0500 Sun Sri Lanka, SLBC 6005as 9770as 15745as
0400 0500 UK, BBC World Service 3255af 6055af 6190af 7255af 9410as 9460af 11860af
0400 0500 USA, American Forces Network 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0400 0500 USA, EWTN/WEWN Irondale, AL 11520me
0400 0500 USA, FBN/WTJC Newport NC 9370na
0400 0500 USA, Voice of America 4930af 4960af 6080af 9885af 15580af
0400 0500 USA, WBCQ Monticello ME 5110na 7415am 9330am
0400 0500 USA, WHRI Cypress Creek SC 5920na 7315na 7385na
0400 0500 smtwhf USA, WHRI Cypress Creek SC 7465na
0400 0500 Sat USA, WHRI Cypress Creek SC 9640na
0400 0500 USA, WINB Red Lion PA 9405am
0400 0500 USA, WRNO New Orleans LA 7505am
0400 0500 USA, WTWW Lebanon TN 5080va 5755va
0400 0500 USA, WWCR Nashville TN 3215na 4840na 5890na 5935na
0400 0500 USA, WWRB Manchester TN 3145va 3185va 5050va
0400 0500 USA, WYFR/Family Radio Worldwide 5950am 7455am 9505am 9680am 9715am
0400 0500 Zambia, CVC Radio Christian Voice 4965af

0400	0500		Zambia, Zambia Broadcasting Corp			6165do
			4828al			
0430	0500	twhfas	Albania, Radio Tirana	6100na		
0430	0500		Australia, Radio Australia	15415as		
0430	0500	mtwhf	Swaziland, TWR Swaziland	3200af		4775af
0430	0500		USA, WHRI Cypress Creek SC			15680na
0455	0500		Nigeria, Voice of Nigeria/Ikorodu			15120va
0459	0500		New Zealand, Radio NZ International			11725pa
0459	0500	DRM	New Zealand, Radio NZ International			11675pa

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

0500	0507	twhfas	Canada, CBC Northern Quebec Service			9625na
0500	0527		Germany, Deutsche Welle	9755af		
0500	0530		Eritrea, Radio Bana	5060do		
0500	0530	mtwhf	France, Radio France Internationale			9805af
			11995af			
0500	0530		Germany, Deutsche Welle	6130af		6155af
			6180af	12045af		
0500	0530		Japan, Radio Japan NHK World			5975eu
			6110na	9770af	15205as	17810as
0500	0530		Vatican City State, Vatican Radio			7360af
			9660af	11625af		
0500	0557		China, China Radio International			7220na
			11880na	15350me	15465as	17505as
			17540as	17725af	17855as	
0500	0600		Anguilla, Worldwide Univ Network			6090am
0500	0600		Australia, ABC NT Alice Springs			4835do
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek			4910do
0500	0600		Australia, Radio Australia	9590pa		12080pa
			13630as	15160pa	15240pa	17750as
0500	0600		Bahrain, Radio Bahrain	6010me		
0500	0600		Bhutan, Bhutan Broadcasting Service			6035do
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St Johns NF	6160na		
0500	0600		Canada, CKZU Vancouver BC	6160na		
0500	0600		Cuba, Radio Havana Cuba	6010na		6060na
			6150na			
0500	0600		Italy, IRRS-Shortwave/NEXUS	9670af		
0500	0600		Liberia, Star Radio	3960do		
0500	0600		Malaysia, RTM/Traxx FM	7295do		
0500	0600		Micronesia, The Cross Radio/Pohnpei			4755as
0500	0600		New Zealand, Radio NZ International			11725pa
0500	0600	DRM	New Zealand, Radio NZ International			11675pa
0500	0600		Nigeria, Voice of Nigeria/Ikorodu			15120va
0500	0600		Russia, Voice of Russia	12030na		15250as
			15520as			
0500	0600	DRM	Russia, Voice of Russia	15735as		
0500	0600		South Africa, Channel Africa	7230af		
0500	0600		South Africa, CVC 1 Africa Christian Radio			
			9430af			
0500	0600		Swaziland, TWR Swaziland	4775af		9500af
0500	0600		Taiwan, Radio Taiwan International			6875na
0500	0600		UK, BBC World Service	3255af		5875eu
			6005eu	6190af	7255af	9410as
			11770as	11860af		
0500	0600	DRM	UK, BBC World Service	3955af		
0500	0600		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0500	0600		USA, EWTN/WEWN Irondale, AL			11520af
0500	0600		USA, FBN/WTJC Newport NC	9370na		
0500	0600		USA, Voice of America	4930af		6080af
			9885af	15580af		
0500	0600		USA, WHRI Cypress Creek SC			7315va
			7465va	11565va		
0500	0600		USA, WINB Red Lion PA	9405am		
0500	0600		USA, WRNO New Orleans LA	7505am		
0500	0600		USA, WTWW Lebanon TN	5080va		5755va
0500	0600		USA, WWCR Nashville TN	3215na		4840na
			5890na			
0500	0600		USA, WWRB Manchester TN	3185va		
0500	0600		USA, WYFR/Family Radio Worldwide			5950am
			9680am			
0500	0600		Zambia, CVC Radio Christian Voice			6065af
0500	0600		Zambia, Zambia Broadcasting Corp			6165do
0502	0600		Swaziland, TWR Swaziland	6120af		
0505	0600		Russia, Voice of Russia	9855na		
0530	0600		Clandestine, Sudan Radio Service/SRS			13720af
0530	0600		Palau, T8WH/World Harvest Radio International			
			15680as			
0530	0600		Thailand, Radio Thailand World Service			11730va
0530	0600		USA, WHRI Cypress Creek SC			15680va

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

0600	0620	mtwhfa	Vatican City State, Vatican Radio			4005eu
			7250eu			
0600	0629		Germany, Deutsche Welle	5945af		7240af
			15205af			
0600	0630	Sat/Sun	Australia, Radio Australia	15290pa		15415as
0600	0630	mtwhf	France, Radio France Internationale			9765va
			13680af	15160af		
0600	0630		Laos, Lao National Radio	7145as		
0600	0630	mtwhfa	Vatican City State, Vatican Radio			5965eu
0600	0657		China, China Radio International			11750af
			11770af	11880as	13645as	15145af
			15350as	15465as	17505af	17540as
			17710as			
0600	0658		New Zealand, Radio NZ International			11725pa
0600	0658	DRM	New Zealand, Radio NZ International			11675pa
0600	0700		Anguilla, Worldwide Univ Network			6090am
0600	0700		Australia, ABC NT Alice Springs			4835do
0600	0700		Australia, ABC NT Katherine	5025do		
0600	0700		Australia, ABC NT Tennant Creek			4910do
0600	0700		Australia, Radio Australia	9590pa		12080pa
			13630as	13690pa	15160pa	15240pa
			17750as			
0600	0700		Bahrain, Radio Bahrain	6010me		
0600	0700		Canada, CFRX Toronto ON	6070na		
0600	0700		Canada, CFVP Calgary AB	6030na		
0600	0700		Canada, CKZN St Johns NF	6160na		
0600	0700		Canada, CKZU Vancouver BC	6160na		
0600	0700		Cuba, Radio Havana Cuba	6010na		6060na
			6150na			
0600	0700		Greece, Voice of Greece	11645eu		
0600	0700		Liberia, Star Radio	3960do		
0600	0700		Malaysia, RTM/Traxx FM	7295do		
0600	0700		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0600	0700		Micronesia, The Cross Radio/Pohnpei			4755as
0600	0700		Nigeria, Voice of Nigeria/Ikorodu			15120va
0600	0700		Palau, T8WH/World Harvest Radio International			
			15680as			
0600	0700		Papua New Guinea, Radio Fly	3915do		5960do
0600	0700		Russia, Voice of Russia	9855na		12030na
0600	0700		South Africa, Channel Africa	7230af		15255af
0600	0700		South Africa, CVC 1 Africa Christian Radio			
			13590af			
0600	0700		Swaziland, TWR Swaziland	4775af		6120af
			9500af			
0600	0700		UK, BBC World Service	3995eu		5875eu
			6005af	6190af	9410af	9860af
			11760as	11770af		
0600	0700		UK, BBC World Service	3955eu		
0600	0700		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0600	0700		USA, EWTN/WEWN Irondale, AL			11520af
0600	0700		USA, FBN/WTJC Newport NC	9370na		
0600	0700		USA, Voice of America	6080af		9885af
			15580af			
0600	0700		USA, WHRI Cypress Creek SC			7385va
			9615va	15680va		
0600	0700		USA, WINB Red Lion PA	9405am		
0600	0700		USA, WRNO New Orleans LA	7505am		
0600	0700		USA, WTWW Lebanon TN	5080va		5755va
0600	0700		USA, WWCR Nashville TN	3215na		4840na
			5890na	5935na		
0600	0700		USA, WWRB Manchester TN	3185va		
0600	0700		USA, WYFR/Family Radio Worldwide			5745va
			6000ca	9680am	9885af	11530va
0600	0700		Zambia, CVC Radio Christian Voice			6065af
0600	0700		Zambia, Zambia Broadcasting Corp			6165do
0630	0700		Australia, Radio Australia	15415as		
0630	0700		Congo Dem. Republic, Radio Kahuzi			6209do
0630	0700		Romania, Radio Romania International			7370eu
			17780pa	21600pa		
0630	0700	DRM	Romania, Radio Romania International			6020eu
0630	0700		Vatican City State, Vatican Radio			7360af
			9660af	11625af		
0659	0700		New Zealand, Radio NZ International			9765pa
0659	0700	DRM	New Zealand, Radio NZ International			11675pa

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

0700	0705	mtwhf	Croatia, HRT Voice of Croatia			6165eu
			17860pa			
0700	0730		China, Xizang People's Broadcasting Sta/Lhasa			
			4905do	4920do	5240do	6110do
			6130do	9490do	9580do	

0700	0730		France, Radio France Internationale			15605af
0700	0730		USA, WRMI/Radio Prague	9955na		
0700	0757		China, China Radio International			11785as
			13645as	15125me	15350as	15465as
			17490as	17540as	17710af	
0700	0758		New Zealand, Radio NZ International			9765pa
0700	0758	DRM	New Zealand, Radio NZ International			11675pa
0700	0800		Anguilla, Worldwide Univ Network			6090am
0700	0800		Australia, ABC NT Alice Springs			4835do
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek			4910do
0700	0800		Australia, Radio Australia	9475pa	9590pa	
			9710pa	11945pa	12080pa	15160pa
			15240as			
0700	0800		Bahrain, Radio Bahrain	6010me		
0700	0800	m/DRM	Belgium, TDP Radio	6015eu		
0700	0800		Canada, CFRX Toronto ON	6070na		
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St Johns NF	6160na		
0700	0800		Canada, CKZU Vancouver BC	6160na		
0700	0800		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
0700	0800		Liberia, Star Radio	3960do		
0700	0800		Malaysia, RTM/Traxx FM	7295do		
0700	0800		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0700	0800		Micronesia, The Cross Radio/Pohnpei			4755as
0700	0800		Palau, T8WH/World Harvest Radio International			
			9930as	15680as		
0700	0800		Papua New Guinea, Radio Fly	3915do		5960do
0700	0800		Russia, Voice of Russia	15700as		17665pa
			17805pa			
0700	0800	DRM	Russia, Voice of Russia	11635eu		
0700	0800		South Africa, CVC 1 Africa Christian Radio			
			13590af			
0700	0800		Swaziland, TWR Swaziland	4775af		6120af
			9500af			
0700	0800		UK, BBC World Service	6190af		9860af
			11760me	11770af		
0700	0800	DRM	UK, BBC World Service	3955eu		5875eu
0700	0800		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0700	0800		USA, EWTN/WEWN Irondale, AL			11520af
0700	0800		USA, FBN/WTJC Newport NC	9370na		
0700	0800		USA, WHRI Cypress Creek SC			9615va
			15680va			
0700	0800		USA, WINB Red Lion PA	9405am		
0700	0800		USA, WRNO New Orleans LA	7505am		
0700	0800		USA, WTWW Lebanon TN	5080va		5755va
0700	0800		USA, WWCR Nashville TN	3215na		4840na
			5890na	5935na		
0700	0800		USA, WWRB Manchester TN	3185va		
0700	0800		USA, WYFR/Family Radio Worldwide			5950am
			5745va	6875am	7455am	9495ca
			11580af			
0700	0800		Zambia, CVC Radio Christian Voice			6065af
0700	0800		Zambia, Zambia Broadcasting Corp			6165do
0709	0712	mtwhf	Austria, Radio Austria International			6155eu
0730	0735		India, All India Radio, Delhi-Kingsway			15185do
			15260do			
0730	0745	mtwhf	Vatican City State, Vatican Radio			5965eu
			7250eu	9645eu		
0730	0745	mtwhfa	Vatican City State, Vatican Radio			4005eu
			11740eu	15595eu		
0730	0800		Australia, HCJB Global Voice Australia			11750as
0730	0800		Bulgaria, Radio Bulgaria	5900eu		7400eu
0730	0800	Sun	USA, WHRI Cypress Creek SC			11565va
0745	0800	Sun	Germany, TWR Europe	6105eu		
0745	0800	Sun	Monaco, TWR Europe	9800eu		
0759	0800	DRM	New Zealand, Radio NZ International			9870pa

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

0800	0820		Indonesia, RRI Cimanggis/Jawa Barat			9680do
0800	0830		Australia, ABC NT Alice Springs			4835do
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek			4910do
0800	0830	Sun	Canada, Bible Voice Broadcasting			7220eu
0800	0845	Sat	Canada, Bible Voice Broadcasting			7220eu
0800	0850	mtwhf	Germany, TWR Europe	6105eu		
0800	0850	mtwhf	Monaco, TWR Europe	9800eu		
0800	0857		China, China Radio International			9415as
			11785as	11880as	15350as	15465as
			15625as	17490as	17540as	
0800	0900		Anguilla, Worldwide Univ Network			6090am
0800	0900		Australia, HCJB Global Voice Australia			11750pa
0800	0900		Australia, Radio Australia	5995as		9475pa
			9485pa	9580va	9590pa	11945pa
			12080pa	13630pa		
0800	0900		Bahrain, Radio Bahrain	6010me		
0800	0900	t/DRM	Belgium, TDP Radio	6015eu		
0800	0900		Canada, CFRX Toronto ON	6070na		
0800	0900		Canada, CFVP Calgary AB	6030na		
0800	0900		Canada, CKZN St Johns NF	6160na		
0800	0900		Canada, CKZU Vancouver BC	6160na		
0800	0900		Equatorial Guinea, Radio African 2/Malabo			
			15190af			
0800	0900		Equatorial Guinea, Radio East Africa/Malabo			
			15190af			
0800	0900		Greece, Voice of Greece	11645eu		
0800	0900		Liberia, Star Radio	3960do		
0800	0900		Malaysia, RTM/Traxx FM	7295do		
0800	0900		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0800	0900		Micronesia, The Cross Radio/Pohnpei			4755as
0800	0900		New Zealand, Radio NZ International			9765pa
0800	0900	DRM	New Zealand, Radio NZ International			9870pa
0800	0900		Palau, T8WH/World Harvest Radio International			
			9930as	15680as		
0800	0900		Papua New Guinea, Radio Fly	3915do		5960do
0800	0900		Russia, Voice of Russia	15700as		17650pa
			17665pa	17805pa		
0800	0900	DRM	Russia, Voice of Russia	11635eu		
0800	0900		South Africa, CVC 1 Africa Christian Radio			
			13590af			
0800	0900	Sun	South Africa, SA Radio League			7205af
			17860af			
0800	0900		South Korea, KBS World Radio			9570as
0800	0900		UK, BBC World Service	6190af		9860af
			11760me			
0800	0900	DRM	UK, BBC World Service	5875eu		
0800	0900		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0800	0900		USA, EWTN/WEWN Irondale, AL			11520af
0800	0900		USA, FBN/WTJC Newport NC	9370na		
0800	0900		USA, KNLS Anchor Point AK	7355as		
0800	0900		USA, WHRI Cypress Creek SC			11565va
			15680va			
0800	0900		USA, WINB Red Lion PA	9405am		
0800	0900		USA, WRNO New Orleans LA	7505am		
0800	0900		USA, WTWW Lebanon TN	5080va		5755va
0800	0900		USA, WWCR Nashville TN	3215na		4840na
			5890na	5935na		
0800	0900		USA, WWRB Manchester TN	3185va		
0800	0900		USA, WYFR/Family Radio Worldwide			5950am
			6875am	7455am	11580af	
0800	0900		Zambia, CVC Radio Christian Voice			6065af
0800	0900		Zambia, Zambia Broadcasting Corp			6165do
0815	0827		Nepal, Radio Nepal	5005as		
0815	0850	Sat	Germany, TWR Europe	6105eu		
0815	0850	Sat	Monaco, TWR Europe	9800eu		
0820	0900	mtwhfs	Guam, TWR Asia/KTWR	15170pa		
0830	0840		India, All India Radio, Delhi-Kingsway			15185do
			15260do			
0830	0900		Australia, ABC NT Alice Springs			2310do
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek			2325do
0830	0900	mtwhfa	Guam, TWR Asia/KTWR	11840pa		
0840	0855		Mongolia, Mongolian Radio 2/Murun			4895do
0840	0855		Mongolia, Mongolian Radio 2/Ulaanbaatar			
			7260do			

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

0900	0910	mtwhfa	Guam, TWR Asia/KTWR	11840pa		
0900	0910		Papua New Guinea, Wantok Radio Light			7325do
0900	0930		Australia, HCJB Global Voice Australia			11750pa
0900	0957		China, China Radio International			9415as
			15210as	15270as	15350as	17490eu
			17570eu	17690eu	17750as	
0900	0958		Germany, Deutsche Welle	21780as		
0900	1000		Anguilla, Worldwide Univ Network			6090am
0900	1000		Australia, ABC NT Alice Springs			2310do
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, Radio Australia	9475pa	9485pa	
			9580va	9590pa	11945pa	12080pa
			13630pa			
0900	1000		Bahrain, Radio Bahrain	6010me		
0900	1000	w/DRM	Belgium, TDP Radio	6015eu		
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		

0900 1000 Canada, CKZN St Johns NF 6160na
0900 1000 Canada, CKZU Vancouver BC 6160na
0900 1000 Equatorial Guinea, Radio African 2/Malabo 15190af
0900 1000 Equatorial Guinea, Radio East Africa/Malabo 15190af
0900 1000 2nd Sun Germany, Blue Star Radio 6140eu
0900 1000 Germany, Deutsche Welle 17710as
0900 1000 3rd Sat Germany, Radio City 9510eu
0900 1000 1st Sat Germany, Radio Joystick 9510eu
0900 1000 3rd Sat Italy, IRRS-Shortwave/NEXUS 9510va
0900 1000 Malaysia, RTM/Traxx FM 7295do
0900 1000 Malaysia, RTM/Voice of Malaysia 6175as 9750as 15295as
0900 1000 Micronesia, The Cross Radio/Pohnpei 4755as
0900 1000 New Zealand, Radio NZ International 9765pa
0900 1000 DRM New Zealand, Radio NZ International 9870pa
0900 1000 Nigeria, Voice of Nigeria/Ikorodu 9690af
0900 1000 Palau, T8WH/World Harvest Radio International 9930as 15680as
0900 1000 Papua New Guinea, Radio Fly 3915do 5960do
0900 1000 Russia, Voice of Russia 15700as 17650pa 17665pa 17805pa
0900 1000 South Africa, CVC 1 Africa Christian Radio 13590af
0900 1000 Tajikistan, Voice of Tajik 7245va
0900 1000 UK, BBC World Service 6195as 9740as 9860af 11760me 11895as
0900 1000 USA, American Forces Network 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0900 1000 USA, EWTN/WEWN Irondale, AL 9390as
0900 1000 USA, FBN/WTJC Newport NC 9370na
0900 1000 USA, WHRI Cypress Creek SC 9840va 11565va 15680va
0900 1000 USA, WINB Red Lion PA 9405am
0900 1000 USA, WRNO New Orleans LA 7505am
0900 1000 USA, WTWW Lebanon TN 5080va 5755va
0900 1000 USA, WWCR Nashville TN 3215na 4840na 5935na
0900 1000 USA, WWRB Manchester TN 3185va
0900 1000 USA, WYFR/Family Radio Worldwide 5950am 6875am 7455am 9465as
0900 1000 Zambia, CVC Radio Christian Voice 6065af
0900 1000 Zambia, Zambia Broadcasting Corp 6165do
0930 0945 Papua New Guinea, Radio Fly 3915do 5960do
0930 1000 China, Voice of the Strait/Fuzhou 6115do

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

1000 1025 China, Voice of the Strait (News Channel) Fuzhou 9505do
1000 1030 Sat/Sun/DRM Bulgaria, Radio Bulgaria/Euranet 11900eu
1000 1030 Japan, Radio Japan NHK World 9605as 9625pa 9840pa 11780as
1000 1030 USA, WINB Red Lion PA 9405am
1000 1030 mtwhf USA, WRMI/Radio Prague 9955na
1000 1030 Vietnam, Voice of Vietnam 9840as 12020as
1000 1040 Micronesia, The Cross Radio/Pohnpei 4755as
1000 1057 China, China Radio International 5955as 7215eu 7255eu 11640as 13590as 13720as 15190pa 15210pa 15350as 17490as 17690as
1000 1057 Netherlands, R Netherlands Worldwide 9720as 12065as
1000 1057 North Korea, Voice of Korea 6185as 6285sa 9335sa 9850as
1000 1058 New Zealand, Radio NZ International 9765pa
1000 1058 DRM New Zealand, Radio NZ International 9870pa
1000 1100 Anguilla, Worldwide Univ Network 11775am
1000 1100 Australia, ABC NT Alice Springs 2310do
1000 1100 Australia, ABC NT Katherine 2485do
1000 1100 Australia, ABC NT Tennant Creek 2325do
1000 1100 Australia, Radio Australia 6140as 9475pa 9485va 9580pa 9590pa 11945pa 12080pa
1000 1100 Bahrain, Radio Bahrain 6010me
1000 1100 h/DRM Belgium, TDP Radio 6015eu
1000 1100 Canada, CFRX Toronto ON 6070na
1000 1100 Canada, CFVP Calgary AB 6030na
1000 1100 Canada, CKZN St Johns NF 6160na
1000 1100 Canada, CKZU Vancouver BC 6160na
1000 1100 Equatorial Guinea, Radio African 2/Malabo 15190af
1000 1100 Equatorial Guinea, Radio East Africa/Malabo 15190af
1000 1100 3rd Sun Germany, European Music Radio 6140eu
1000 1100 4th Sun Germany, Radio Gloria International 6140eu
1000 1100 India, All India Radio/External Service 7270as 13710pa 15235as 15260as 17510pa 17800as 17895pa 13695al 15020al
1000 1100 Indonesia, Voice of Indonesia/Jawa Barat 9525va 11785va
1000 1100 Malaysia, RTM/Traxx FM 7295do
1000 1100 Nigeria, Voice of Nigeria/Ikorodu 9690af
1000 1100 Palau, T8WH/World Harvest Radio International 9930as
1000 1100 Russia, Voice of Russia 7205as 15700as 17650pa 17665pa 17805pa
1000 1100 Saudi Arabia, BSKSA/Saudi Radio 15250af
1000 1100 South Africa, CVC 1 Africa Christian Radio 13590af
1000 1100 UK, BBC World Service 6195as 9605as 9740as 9860af 11760me 11895as
1000 1100 USA, American Forces Network 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1000 1100 USA, EWTN/WEWN Irondale, AL 9390as
1000 1100 USA, FBN/WTJC Newport NC 9370na
1000 1100 USA, KNLS Anchor Point AK 7355as
1000 1100 USA, WHRI Cypress Creek SC 11565va
1000 1100 USA, WRNO New Orleans LA 7505am
1000 1100 USA, WTWW Lebanon TN 5080va 5755va
1000 1100 USA, WWCR Nashville TN 4840na 5890na 5935na 9985na
1000 1100 USA, WWRB Manchester TN 3185va
1000 1100 USA, WYFR/Family Radio Worldwide 5950am 6890am 6895na 7455am 9465as
1000 1100 Zambia, CVC Radio Christian Voice 6065af
1000 1100 Zambia, Zambia Broadcasting Corp 6165do
1030 1100 Iran, VOIRI/IRIB 15460as 17630as
1030 1100 Sun Italy, IRRS-Shortwave/NEXUS 9510va
1030 1100 Mongolia, Voice of Mongolia 12085as
1030 1100 Sun USA, WHRI Cypress Creek SC 7385va
1030 1100 USA, WINB Red Lion PA 9265am
1059 1100 New Zealand, Radio NZ International 13660pa
1059 1100 DRM New Zealand, Radio NZ International 9870pa

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

1100 1105 Pakistan, Azad Kashmir Radio/Islamabad 7265do
1100 1110 Pakistan, PBC/Radio Pakistan 15100eu 17700eu
1100 1127 Iran, VOIRI/IRIB 15460as 17630as
1100 1130 Sat/DRM South Korea, KBS World Radio 9760eu
1100 1130 Sun Vatican City State, Vatican Radio 7250eu
1100 1130 Vietnam, Voice of Vietnam 7280as
1100 1157 China, China Radio International 5955as 5960na 9570as 11650as 11795na 13590as 13645as 13665as 13720as 17490eu
1100 1158 DRM New Zealand, Radio NZ International 9870pa
1100 1200 Anguilla, Worldwide Univ Network 11775am
1100 1200 Australia, ABC NT Alice Springs 2310do
1100 1200 Australia, ABC NT Katherine 2485do
1100 1200 Australia, ABC NT Tennant Creek 2325do
1100 1200 Australia, Radio Australia 5995as 6020pa 6140as 9475pa 9485pa 9560va 9580va 9590pa 11945pa
1100 1200 DRM Australia, Radio Australia 12080as
1100 1200 Bahrain, Radio Bahrain 6010me
1100 1200 f/DRM Belgium, TDP Radio 6015eu
1100 1200 Sat/Sun Canada, CBC Northern Quebec Service 9625na
1100 1200 Canada, CFRX Toronto ON 6070na
1100 1200 Canada, CFVP Calgary AB 6030na
1100 1200 Canada, CKZN St Johns NF 6160na
1100 1200 Canada, CKZU Vancouver BC 6160na
1100 1200 Equatorial Guinea, Radio African 2/Malabo 15190af
1100 1200 Equatorial Guinea, Radio East Africa/Malabo 15190af
1100 1200 Sun Italy, IRRS-Shortwave/NEXUS 9510va
1100 1200 Malaysia, RTM/Traxx FM 7295do
1100 1200 New Zealand, Radio NZ International 13660pa
1100 1200 Nigeria, Voice of Nigeria/Ikorodu 9690af
1100 1200 Russia, Voice of Russia 7205as
1100 1200 Saudi Arabia, BSKSA/Saudi Radio 15250af
1100 1200 South Africa, CVC 1 Africa Christian Radio 13590af
1100 1200 Taiwan, Radio Taiwan International 7445as 11715as
1100 1200 UK, BBC World Service 6195as 9605as 9740as 9860af 11760me 11895as

1100	1200		USA, American Forces Network				4319usb
			5446usb	5765usb	7812usb	12133usb	
			12759usb	13362usb			
1100	1200		USA, EWTN/WEWN Irondale, AL				9390as
1100	1200		USA, FBN/WTJC Newport NC				9370na
1100	1200		USA, WHRI Cypress Creek SC				9840va
			9985va				
1100	1200	Sat/Sun	USA, WHRI Cypress Creek SC				17540va
1100	1200		USA, WINB Red Lion PA		9265am		
1100	1200		USA, WRNO New Orleans LA		7505am		
1100	1200		USA, WTWW Lebanon TN		5080va		5755va
1100	1200		USA, WWCR Nashville TN		4840na		5890na
			5935na	15285na			
1100	1200		USA, WWRB Manchester TN		3185va		
1100	1200		USA, WYFR/Family Radio Worldwide				6000ca
			6875am	6890na	7300af		7455am
			11725ca	11830am			
1100	1200		Zambia, CVC Radio Christian Voice				6065af
1100	1200		Zambia, Zambia Broadcasting Corp				6165do
1130	1140	f	Vatican City State, Vatican Radio				15595as
			17765as				
1130	1200		Vietnam, Voice of Vietnam		9840as		12020as
1135	1140		India, All India Radio, Delhi-Kingsway				9595do
			11710do	15185do			
1135	1140		India, All India Radio/Dehli-Khampur				11620do
1135	1140		India, All India Radio/Gorakhpur				7250do

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

1200	1215		Vatican City State, Vatican Radio				9865am
1200	1225		Saudi Arabia, BSKSA/Saudi Radio				15250af
1200	1230		France, Radio France Internationale				21620af
1200	1230		Germany, AWR Europe		15495as		
1200	1230		Japan, Radio Japan NHK World				6120na
			9625pa	9790eu			
1200	1257		China, China Radio International				5955as
			7250eu	9460as	9600as		9645as
			9730as	11760as	11780me		11980as
			12015as	13665eu	13790eu		17490eu
1200	1258		New Zealand, Radio NZ International				13660pa
1200	1300		Anguilla, Worldwide Univ Network				11775am
1200	1300		Australia, ABC NT Alice Springs				2310do
1200	1300		Australia, ABC NT Katherine		2485do		
1200	1300		Australia, ABC NT Tennant Creek				2325do
1200	1300		Australia, Radio Australia		6020pa		6140as
			9475pa	9485pa	9560va		9580va
			9590pa	11945pa			
1200	1300	DRM	Australia, Radio Australia		5995pa		
1200	1300		Bahrain, Radio Bahrain		6010me		
1200	1300	Sat/ SRM	Belgium, TDP Radio		6015eu		
1200	1300	Sat/Sun	Canada, CBC Northern Quebec Service				9625na
1200	1300		Canada, CFRX Toronto ON		6070na		
1200	1300		Canada, CFVP Calgary AB		6030na		
1200	1300		Canada, CKZN St Johns NF		6160na		
1200	1300		Canada, CKZU Vancouver BC		6160na		
1200	1300		Equatorial Guinea, Radio African 2/Malabo				
			15190af				
1200	1300		Equatorial Guinea, Radio East Africa/Malabo				
			15190af				
1200	1300	Sun	Italy, IRRS-Shortwave/NEXUS		9510va		
1200	1300		Japan, Radio Japan NHK World				9695as
1200	1300		Malaysia, RTM/Traxx FM		7295do		
1200	1300		Nigeria, Voice of Nigeria/Ikorodu				9690af
1200	1300		Romania, Radio Romania International				11970eu
			15430eu	15430af	17765af		
1200	1300	DRM	Russia, Voice of Russia		7340as		
1200	1300		Russia, Voice of Russia		7350as		9695as
			11660as				
1200	1300		South Africa, CVC 1 Africa Christian Radio				
			13590af				
1200	1300		South Korea, KBS World Radio				9650na
1200	1300		UK, BBC World Service		5875as		6190af
			6195as	9605as	9740as		9860af
			11760me				
1200	1300		USA, American Forces Network				4319usb
			5446usb	5765usb	7812usb		12133usb
			12759usb	13362usb			
1200	1300		USA, EWTN/WEWN Irondale, AL				15610me
1200	1300		USA, FBN/WTJC Newport NC				9370na
1200	1300		USA, KNLS Anchor Point AK		7355as		9655as
1200	1300		USA, Overcomer Ministries		15320af		
1200	1300		USA, Voice of America		7575va		9640va
			11700va	11750va			
1200	1300		USA, WHRI Cypress Creek SC				9965va
1200	1300	Sat/Sun	USA, WHRI Cypress Creek SC				17540va
1200	1300		USA, WINB Red Lion PA		13570am		
1200	1300		USA, WRNO New Orleans LA		7505am		
1200	1300		USA, WTWW Lebanon TN		9480va		9990va
1200	1300		USA, WWCR Nashville TN		4840af		5935na
			9980na	15825na			
1200	1300		USA, WWRB Manchester TN		3185va		
1200	1300		USA, WYFR/Family Radio Worldwide				6890am
			7455am	11530ca	11970am		17545ca
1200	1300		Zambia, CVC Radio Christian Voice				6065af
1200	1300		Zambia, Zambia Broadcasting Corp				6165do
1215	1300		Egypt, Radio Cairo		17870as		
1215	1300	mtwhf	UK, BBC World Service		9410ca		11860sa
1230	1235		India, All India Radio, Delhi-Kingsway				4860do
			6085do	17860do			
1230	1300	smtwhf	Australia, HCJB Global Voice Australia				15400as
1230	1300		Bangladesh, Bangladesh Betar				7250as
1230	1300		Thailand, Radio Thailand World Service				9720as
1230	1300	Sun	USA, WHRI Cypress Creek SC				7385va
1230	1300		Vietnam, Voice of Vietnam		9840as		12020as
1259	1300		New Zealand, Radio NZ International				5950pa

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

1300	1330		Australia, HCJB Global Voice Australia				15400as
1300	1330		Egypt, Radio Cairo		17870as		
1300	1330		Japan, Radio Japan NHK World				9875as
1300	1357		China, China Radio International				5995as
			7300na	9570na	9655as		9730as
			9765as	9870as	11760me		11885as
			11900eu	11980as	13670as		13790as
			15230as				
1300	1357		North Korea, Voice of Korea		7570eu		9335na
			11710na	12015eu			
1300	1359		Poland, Polskie Radio Warsaw				9460eu
			11860eu				
1300	1400		Anguilla, Worldwide Univ Network				11775am
1300	1400		Australia, ABC NT Alice Springs				2310do
1300	1400		Australia, ABC NT Katherine		2485do		
1300	1400		Australia, Radio Australia		6020pa		9485pa
			9560va	9580va	9590pa		
1300	1400	DRM	Australia, Radio Australia		5995pa		
1300	1400		Bahrain, Radio Bahrain		6010me		
1300	1400	Sun/DRM	Belgium, TDP Radio		6015na		
1300	1400	Sat/Sun	Canada, CBC Northern Quebec Service				9625na
1300	1400		Canada, CFRX Toronto ON		6070na		
1300	1400		Canada, CFVP Calgary AB		6030na		
1300	1400		Canada, CKZN St Johns NF		6160na		
1300	1400		Canada, CKZU Vancouver BC		6160na		
1300	1400		Equatorial Guinea, Radio East Africa/Malabo				
			15190af				
1300	1400		Germany, Overcomer Ministries				15495af
1300	1400		Indonesia, Voice of Indonesia/Jawa Barat				
			9525as	11785as			
1300	1400		Malaysia, RTM/Traxx FM		7295do		
1300	1400		New Zealand, Radio NZ International				5950pa
1300	1400		Nigeria, Voice of Nigeria/Ikorodu				9690af
1300	1400		Palau, T8WH/World Harvest Radio International				
			9930as				
1300	1400		Russia, Voice of Russia		7205as		
1300	1400		South Africa, CVC 1 Africa Christian Radio				
			13590af				
1300	1400		South Korea, KBS World Radio				9570as
1300	1400		UK, BBC World Service		5875as		6190af
			6195as	9410as	9740as		9860af
			11760me	11805as			
1300	1400		USA, American Forces Network				4319usb
			5446usb	5765usb	7812usb		12133usb
			12759usb	13362usb			
1300	1400		USA, EWTN/WEWN Irondale, AL				15610me
1300	1400		USA, FBN/WTJC Newport NC				9370na
1300	1400		USA, Overcomer Ministries		11680af		17765af
1300	1400	Sat/Sun	USA, Voice of America		7575va		9640va
			9760va	11700va			
1300	1400		USA, WHRI Cypress Creek SC				9540va
			9840va	17540va			
1300	1400		USA, WINB Red Lion PA		13570am		
1300	1400		USA, WRNO New Orleans LA		7505am		
1300	1400		USA, WTWW Lebanon TN		9480va		9990va
1300	1400		USA, WWCR Nashville TN		7490af		9980na
			13845na	15825na			
1300	1400		USA, WWRB Manchester TN		3185va		
1300	1400		USA, WYFR/Family Radio Worldwide				5835as
			6075as	7455am	11830as		11520am
			11560am	11855am	11970am		
1300	1400		Zambia, CVC Radio Christian Voice				6065af
1300	1400		Zambia, Zambia Broadcasting Corp				6165do

1330	1400	ts	Guam, AWR/KSDA	11935as	
1330	1400	mta	Guam, AWR/KSDA	15660as	
1330	1400		India, All India Radio/External Service		9690as
			11620as	13710as	
1330	1400		Laos, Lao National Radio	7145as	
1330	1400		Turkey, Voice of Turkey	11735as	12035eu
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as

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

1400	1425	mh	Guam, TWR Asia/KTWR	9975as	
1400	1425		Turkey, Voice of Turkey	11735as	12035eu
1400	1430	Sun	Germany, Pan American Broadcasting		13645as
1400	1430	`	Japan, Radio Japan NHK World		5955as
			9875as	21560af	
1400	1430		Serbia, International Radio Serbia		9505eu
1400	1430		Thailand, Radio Thailand World Service		9725as
1400	1430	Sun	United Arab Emirates, FEBA Radio		12045as
1400	1435	twfas	Guam, TWR Asia/KTWR	9975as	
1400	1457		China, China Radio International		5955as
			7300na	9460na	9700as	9765as
			9795eu	9870as	11665na	13675eu
			13685af	13740as	15230as	17630af
1400	1500		Anguilla, Worldwide Univ Network		11775am
1400	1500		Australia, ABC NT Alice Springs		2310do
1400	1500		Australia, ABC NT Katherine	2485do	
1400	1500		Australia, ABC NT Tennant Creek		2325do
1400	1500		Australia, Radio Australia	5995pa	6080pa
			7240pa	9590pa		
1400	1500		Bahrain, Radio Bahrain	6010me	
1400	1500	DRM	Belgium, TDP Radio/Disco Palace		6015eu
1400	1500	Sat/Sun	Canada, CBC Northern Quebec Service		9625na
1400	1500		Canada, CFRX Toronto ON	6070na	
1400	1500		Canada, CFVP Calgary AB	6030na	
1400	1500		Canada, CKZN St Johns NF	6160na	
1400	1500		Canada, CKZU Vancouver BC	6160na	
1400	1500		Equatorial Guinea, Radio East Africa/Malabo		
			15190af		
1400	1500		Ethiopia, Radio Ethiopia/Home Service		5989do
			7110do	9705do	
1400	1500		Germany, Overcomer Ministries		15495af
1400	1500		India, All India Radio/External Service		9690as
			11620as	13710as	
1400	1500		Italy, IRRS-Shortwave/NEXUS	15710va	
1400	1500		Libya, LJBC Voice of Africa	17725af	21675af
			21695af		
1400	1500		Malaysia, RTM/Traxx FM	7295do	
1400	1500		Netherlands, R Netherlands Worldwide		12080as
			15595va		
1400	1500		New Zealand, Radio NZ International		5950pa
1400	1500		Nigeria, Voice of Nigeria/Ikorodu		9690af
1400	1500		Oman, Radio Sultanate of Oman		15140va
1400	1500		Palau, T8WH/World Harvest Radio International		
			9930as		
1400	1500		Russia, Voice of Russia	7205as	11660as
1400	1500	DRM	Russia, Voice of Russia	7340as	
1400	1500		South Africa, CVC 1 Africa Christian Radio		
			13590af		
1400	1500		UK, BBC World Service	5875as	6190af
			6195as	9410as	9740as	9860as
			9915af	11760as		
1400	1500	DRM	UK, BBC World Service	5845as	13590as
1400	1500		USA, American Forces Network		4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1400	1500		USA, EWTN/WEWN Irondale, AL		15610me
1400	1500		USA, FBN/WTJC Newport NC	9370na	
1400	1500		USA, KJES Vado NM	11715na	
1400	1500		USA, KNLS Anchor Point AK	7355as	
1400	1500		USA, Overcomer Ministries	9460eu	13810me
			17580af		
1400	1500		USA, Voice of America	6080af	15580af
			17650af	17715af	
1400	1500	mtwhf	USA, Voice of America	7575va	9760va
			12150va		
1400	1500		USA, WBCQ Monticello ME	9330am	
1400	1500		USA, WHRI Cypress Creek SC		9840va
			15180va	17540va	
1400	1500		USA, WINB Red Lion PA	13570am	
1400	1500		USA, WJHR International Milton FL		15550usb
1400	1500		USA, WRNO New Orleans LA	7505am	15590al
1400	1500		USA, WTWW Lebanon TN	9480na	9990va
1400	1500		USA, WWCR Nashville TN	7490af	9980na
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385na	
1400	1500		USA, WYFR/Family Radio Worldwide		5835as
			6070as	9485as	11560am	11565am
			11855am	13695am	17760am	
1400	1500		Zambia, CVC Radio Christian Voice		6065af
1400	1500		Zambia, Zambia Broadcasting Corp		6165do
1405	1430	Sat/Sun	Canada, Bible Voice Broadcasting		6225as
1415	1427		Nepal, Radio Nepal	5005as	
1415	1430	Sun	Canada, Bible Voice Broadcasting		13635as
1415	1445		Germany, Pan American Broadcasting		13645as
1425	1455		Swaziland, TWR Swaziland	6025af	
1430	1435		India, All India Radio, Delhi-Kingsway		9835do
1430	1440		India, All India Radio, Delhi-Kingsway		6085do
			9575do		
1430	1445		Bangladesh, Bangladesh Betar/Home Service		
			4750do		
1430	1500		Australia, Radio Australia	9475pa	11825as
1430	1500	Sat	Canada, Bible Voice Broadcasting		13365as
1445	1500		Australia, HCJB Global Voice Australia		15340as

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radio Service 1		5015do
1500	1515	Sun	Canada, Bible Voice Broadcasting		12035as
1500	1530		Australia, HCJB Global Voice Australia		15340as
1500	1530		Guam, AWR/KSDA	12025as	
1500	1530		UK, BBC World Service	9410af	11860af
1500	1530		Vietnam, Voice of Vietnam	7280as	9840as
			12020as		
1500	1550		New Zealand, Radio NZ International		5950pa
1500	1555	Sat/Sun	Swaziland, TWR Swaziland	6025af	
1500	1557		Canada, Radio Canada International		9635as
			11975as		
1500	1557		China, China Radio International		5955as
			6095me	7325as	7405as	9435as
			9525as	9720as	9785eu	9870eu
			13685af	13740as	17630af	
1500	1557		Libya, LJBC Voice of Africa	17725af	21675af
			21695af		
1500	1557		Netherlands, R Netherlands Worldwide		15595as
1500	1557		North Korea, Voice of Korea	7570eu	9335na
			11710na	12015eu		
1500	1600		Anguilla, Worldwide Univ Network		11775am
1500	1600		Australia, ABC NT Alice Springs		2310do
1500	1600		Australia, ABC NT Katherine	2485do	
1500	1600		Australia, Radio Australia	5995pa	6080pa
			7240pa	9475pa	9590pa	11825as
1500	1600		Bahrain, Radio Bahrain	6010me	
1500	1600		Bhutan, Bhutan Broadcasting Service		6035do
1500	1600	Sat/Sun	Canada, CBC Northern Quebec Service		9625na
1500	1600		Canada, CFRX Toronto ON	6070na	
1500	1600		Canada, CFVP Calgary AB	6030na	
1500	1600		Canada, CKZN St Johns NF	6160na	
1500	1600		Canada, CKZU Vancouver BC	6160na	
1500	1600		Equatorial Guinea, Radio East Africa/Malabo		
			15190af		
1500	1600		Germany, Overcomer Ministries		17580af
1500	1600		Italy, IRRS-Shortwave/NEXUS	15710va	
1500	1600		Malaysia, RTM/Traxx FM	7295do	
1500	1600		Nigeria, Voice of Nigeria/Ikorodu		15120va
1500	1600		Russia, Voice of Russia	4975va	7260as
			9660as		
1500	1600	DRM	Russia, Voice of Russia	5905eu	9675eu
1500	1600		South Africa, CVC 1 Africa Christian Radio		
			13590af		
1500	1600		Uganda, Dunamis Shortwave	4750af	
1500	1600		UK, BBC World Service	5875as	5975as
			6190af	6195as	7395as	9485as
			9740as	9860as		
1500	1600	DRM	UK, BBC World Service	5845as	13590as
1500	1600		USA, American Forces Network		4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1500	1600		USA, EWTN/WEWN Irondale, AL		15610me
1500	1600		USA, FBN/WTJC Newport NC	9370na	
1500	1600		USA, KJES Vado NM	11715ca	
1500	1600		USA, Overcomer Ministries	9460eu	13810me
			17580af		
1500	1600		USA, Voice of America	4930af	6080af
			7575va	9930va	11765va	12055va
			12150va	15580af	17715af	17895af
1500	1600		USA, Voice of America/Special English		6140va
			7520va	9760va	9945va	
1500	1600		USA, WBCQ Monticello ME	9330am	
1500	1600	Sat	USA, WBCQ Monticello ME	15420am	
1500	1600		USA, WHRI Cypress Creek SC		9840af
			21630af		

1500	1600	Sun	USA, WHRI Cypress Creek SC			15680va
1500	1600	Sat/Sun	USA, WHRI Cypress Creek SC			15180va
1500	1600		USA, WINB Red Lion PA	13570am		
1500	1600		USA, WJHR International Milton FL			15550usb
1500	1600		USA, WRNO New Orleans LA	7505am		15590al
1500	1600		USA, WTWW Lebanon TN	9480na		9990va
1500	1600		USA, WWCR Nashville TN	7490af		9980na
			13845na	15825na		
1500	1600		USA, WWRB Manchester TN	9385na		
1500	1600		USA, WYFR/Family Radio Worldwide			6280as
			9895af	11565am	11855am	11995as
			12015af	15210sa	15795am	17760am
			21840af			
1500	1600		Zambia, CVC Radio Christian Voice			6065af
1500	1600		Zambia, Zambia Broadcasting Corp			6165do
1504	1600	DRM	Canada, Radio Canada International			9800na
1504	1600		Canada, Radio Canada International			9610na
1515	1545	Sat	Canada, Bible Voice Broadcasting			13670as
1530	1545		India, All India Radio, Delhi-Kingsway			6085do
			9575do	9835do		
1530	1545		India, All India Radio/Aligarh	7255do		9910do
1530	1545		India, All India Radio/External Service			9910as
			7255al	9820al		
1530	1545		India, All India Radio/Panaji, Goa			9820do
1530	1550	smtwhf	Vatican City State, Vatican Radio			11850as
			13765as			
1530	1550	Sat	Vatican City State, Vatican Radio			7585as
1530	1558	Sat	Vatican City State, Vatican Radio			7585am
			11850as	13765as		
1530	1600	mtwhfa	Albania, Radio Tirana	13640na		
1530	1600	h	Canada, Bible Voice Broadcasting			13670as
1530	1600		Germany, AWR Europe	11675as		
1530	1600		Iran, VOIRI/IRIB	9915as	11655as	
1530	1600		Mongolia, Voice of Mongolia	9665as		
1530	1600	Sat	UK, BBC World Service	9410af		11860af
1551	1600		New Zealand, Radio NZ International			7440pa
1551	1600	DRM	New Zealand, Radio NZ International			5950pa

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

1600	1615		Pakistan, PBC/Radio Pakistan	7510va		11575va
1600	1627		Iran, VOIRI/IRIB	9915as	11655as	
1600	1630		Eritrea, Radio Bana	5060	d0	
1600	1630		Guam, AWR/KSDA	9585as		11690as
1600	1630		Vietnam, Voice of Vietnam	7220me		7280eu
			9550me	9730eu		
1600	1650	DRM	New Zealand, Radio NZ International			5950pa
1600	1650		New Zealand, Radio NZ International			7440pa
1600	1657		China, China Radio International			6060as
			6100as	7235af	7255eu	7420eu
			7435eu	9435eu	9525eu	9570eu
			9600af	11650af		
1600	1657		North Korea, Voice of Korea	9990va		11545va
1600	1658		Taiwan, Radio Taiwan International			11550as
			12055as			
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	9475pa	9590pa	9710pa
			11825as			
1600	1700		Bahrain, Radio Bahrain	6010me		
1600	1700	Sat	Canada, CBC Northern Quebec Service			9625na
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St Johns NF	6160na		
1600	1700		Canada, CKZU Vancouver BC	6160na		
1600	1700		Canada, Radio Canada International			9610na
1600	1700		Egypt, Radio Cairo	12170af		
1600	1700		Ethiopia, Radio Ethiopia	7235af		9559af
1600	1700		France, Radio France Internationale			15605af
1600	1700		Germany, Deutsche Welle	5965as		15275as
1600	1700		Italy, IRRS-Shortwave/NEXUS	15710va		
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		Palau, T8WH/World Harvest Radio International			
			9930as			
1600	1700		Russia, Voice of Russia	4975me		6130as
			7305as	9470va		
1600	1700	DRM	Russia, Voice of Russia	7340as		
1600	1700		South Africa, CVC 1 Africa Christian Radio			
			13590af			
1600	1700		South Korea, KBS World Radio			9640as
			9515eu			
1600	1700		Uganda, Dunamis Shortwave	4750af		
1600	1700		UK, BBC World Service	3255af		5975as
			6190af	7355as	9740as	
1600	1700	Sat	UK, BBC World Service	9410af		11860af
1600	1700		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1600	1700		USA, EWTN/WEWN Irondale, AL			15610me
1600	1700		USA, FBN/WTJC Newport NC	9370na		
1600	1700		USA, Voice of America	4930af		6080af
			15580af	17895af		
1600	1700		USA, Voice of America/Special English			9395va
			13600va	15460va		
1600	1700		USA, WBCQ Monticello ME	9330am		
1600	1700	Sat	USA, WBCQ Monticello ME	15420am		
1600	1700		USA, WHRI Cypress Creek SC			9840af
			15180af	21630af		
1600	1700		USA, WINB Red Lion PA	13570am		
1600	1700		USA, WJHR International Milton FL			15550usb
1600	1700		USA, WRNO New Orleans LA	7505am		15590al
1600	1700		USA, WTWW Lebanon TN	9480na		9990va
1600	1700		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385na		
1600	1700		USA, WYFR/Family Radio Worldwide			6085ca
			9795af	11565am	11740af	11830am
			13695am	17540af	17690af	17760am
			18980va			
1600	1700		Zambia, CVC Radio Christian Voice			6065af
1600	1700		Zambia, Zambia Broadcasting Corp			6165do
1604	1700		Canada, Radio Canada International			9610na
1604	1700	DRM	Canada, Radio Canada International			9800na
1615	1700	Sun	UK, BBC World Service	9410af		11860af
1630	1700	Sun	Canada, Bible Voice Broadcasting			9460me
1630	1700		China, Xizang People's Broadcasting Sta/Lhasa			
			4905do	4920do	5240do	6110do
			6130do	7255do	7385do	
1630	1700		Guam, AWR/KSDA	9790as		
1630	1700	mtwhf	UK, BBC World Service	9410af		
1630	1700	mtwhf	USA, Voice of America	9785af		11905af
			13635af			
1640	1650		Turkmenistan, Turkmen Radio Service 2			4930do
1645	1700	mf	Canada, Bible Voice Broadcasting			9460me
1645	1700	twhfa	Canada, Bible Voice Broadcasting			9460me
1651	1700		New Zealand, Radio NZ International			9765pa
1651	1700	DRM	New Zealand, Radio NZ International			9890pa

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

1700	1705	Sat/Sun	Croatia, HRT Voice of Croatia			6165eu
1700	1715	f	Canada, Bible Voice Broadcasting			9460me
1700	1715	mtwhfa	Croatia, HRT Voice of Croatia			6165eu
1700	1720	t	Canada, Bible Voice Broadcasting			9460me
1700	1745	h	Canada, Bible Voice Broadcasting			9460me
1700	1746		UK, BBC World Service	9410af		11860af
1700	1750		New Zealand, Radio NZ International			9765pa
1700	1750	DRM	New Zealand, Radio NZ International			9890pa
1700	1757		China, China Radio International			6090as
			6100as	6140eu	7205eu	7255af
			7335af	7410af	7420as	7425as
			7435eu	9570af		
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
			9475pa	9580pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me		
1700	1800	Sun	Canada, Bible Voice Broadcasting			9460me
1700	1800	Sat	Canada, Bible Voice Broadcasting			9460me
1700	1800	Sat	Canada, CBC Northern Quebec Service			9625na
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St Johns NF	6160na		
1700	1800		Canada, CKZU Vancouver BC	6160na		
1700	1800		Canada, Radio Canada International			9610na
1700	1800	DRM	Canada, Radio Canada International			9800na
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio Africa/Malabo			15190af
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		Palau, T8WH/World Harvest Radio International			
			9930as			
1700	1800		Russia, Voice of Russia	4975va		7240as
			7330as	9470va	9880as	
1700	1800		South Africa, Channel Africa	15235af		
1700	1800		South Africa, CVC 1 Africa Christian Radio			
			4965af	13590af		
1700	1800		Swaziland, TWR Swaziland	3200af		
1700	1800		Taiwan, Radio Taiwan International			15690af

1700	1800		Tajikistan, Voice of Tajik	7245va		
1700	1800		UK, BBC World Service	3255af	5975as	
			6190af	9740as		
1700	1800		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1700	1800		USA, EWTN/WEWN Irondale, AL			15610me
1700	1800		USA, FBN/WTJC Newport NC	9370na		
1700	1800		USA, Voice of America	6080af	13635af	
			15580af	17895af		
1700	1800		USA, WBCQ Monticello ME	9330am		
1700	1800	Sat	USA, WBCQ Monticello ME	15420am		
1700	1800		USA, WHRI Cypress Creek SC			15180af
			21630af			
1700	1800		USA, WHRI Cypress Creek SC			9840af
1700	1800		USA, WINB Red Lion PA	13570am		
1700	1800		USA, WJHR International Milton FL			15550usb
1700	1800		USA, WRNO New Orleans LA	7505am	15590al	
1700	1800		USA, WTWW Lebanon TN	9480na	9990va	
1700	1800		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385na		
1700	1800		USA, WYFR/Family Radio Worldwide			7230af
			7385af	12045af	13695am	15795am
			17555am	18980va	21680af	
1700	1800		Zambia, CVC Radio Christian Voice			4965af
1700	1800		Zambia, Zambia Broadcasting Corp			6165do
1714	1800		Congo Dem. Republic, Radio Kahuzi			6209do
1715	1730		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	7290eu	9645eu
1720	1740	fas	USA, Voice of America	4930af	12080af	
			15775af			
1720	1740	Sat/Sun	USA, Voice of America/Studio 7			4930af
			15775af			
1730	1735		India, All India Radio, Delhi-Kingsway			6085do
			7370do	9575do	9835do	
1730	1800		Clandestine, Sudan Radio Service/SRS			9840af
1730	1800	mtwhf	USA, Voice of America	4930af	12080af	
			15775af			
1730	1800	mtwh	USA, Voice of America/Studio 7			4930af
			12080af	15775af		
1730	1800		Vatican City State, Vatican Radio			9755af
			11625af	13765af		
1745	1800		Bangladesh, Bangladesh Betar			7250as
1745	1800	DRM	India, All India Radio/External Service			9950eu
1745	1800		India, All India Radio/External Service			6280eu
			7400af	7410af	7550eu	9415af
			9445af	11935af	6120al	
1751	1800		New Zealand, Radio NZ International			11725pa
1751	1800	DRM	New Zealand, Radio NZ International			11675pa

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

1800	1804		Canada, Radio Canada International			9610na
1800	1804	DRM	Canada, Radio Canada International			9800na
1800	1810		Tanzania, Radio Tanzania/Zanzibar			11735af
1800	1815		Canada, Bible Voice Broadcasting			9460me
1800	1830	w	Austria, AWR Europe	9515af		
1800	1830	Sat	Canada, Bible Voice Broadcasting			9460me
1800	1830		Congo Dem. Republic, Radio Kahuzi			6209do
1800	1830	DRM	Romania, Radio Romania International			5895eu
1800	1830		South Africa, AWR Africa	3215af	3345af	
1800	1830		UK, BBC World Service	7260as	7355as	
1800	1830		USA, Voice of America	6030af	13635af	
			15580af			
1800	1830	f	USA, Voice of America	4930af	12080af	
			15775af			
1800	1830	Sat/Sun	USA, Voice of America	4930af		
1800	1830		Vietnam, Voice of Vietnam	5955eu		
1800	1850		New Zealand, Radio NZ International			11725pa
1800	1850	DRM	New Zealand, Radio NZ International			11675pa
1800	1857		China, China Radio International			6100eu
			7405eu			
1800	1857		Netherlands, R Netherlands Worldwide			6020af
			11655af			
1800	1857		North Korea, Voice of Korea	7570eu		12015eu
1800	1858		Taiwan, Radio Taiwan International			3965eu
1800	1859		Canada, Radio Canada International			9740va
			11845af	15365af	17790af	
1800	1859		Poland, Polskie Radio Warsaw			9650eu
1800	1859	DRM	Poland, Polskie Radio Warsaw			5895eu
1800	1900		Anguilla, Worldwide Univ Network			11775am
1800	1900		Argentina, RAE	9690eu	15345eu	
1800	1900		Australia, ABC NT Alice Springs			2310do
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia	6080pa	7240pa	
			9475pa	9580pa	9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me		
1800	1900		Bangladesh, Bangladesh Betar			7250as
1800	1900	Sat	Canada, Bible Voice Broadcasting			6110me
1800	1900	Sun	Canada, Bible Voice Broadcasting			6110me
			9460me			
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St Johns NF	6160na		
1800	1900		Canada, CKZU Vancouver BC	6160na		
1800	1900		Equatorial Guinea, Radio Africa/Malabo			15190af
1800	1900	DRM	India, All India Radio/External Service			9950eu
1800	1900		India, All India Radio/External Service			6280eu
			7400af	7410af	9415af	9445af
			11935af	6120al		
1800	1900		Kuwait, Radio Kuwait	15540va		
1800	1900		Liberia, Star Radio	3960do		
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Nigeria, Voice of Nigeria/Ikorodu			15120va
1800	1900		Palau, T8WH/World Harvest Radio International			
			9955as			
1800	1900	DRM	Romania, Radio Romania International			6065eu
			7415eu			
1800	1900		Russia, Voice of Russia	4975va	7240as	
			7305va	7330as	9880af	12060af
1800	1900		South Africa, CVC 1 Africa Christian Radio			
			4965af	13590af		
1800	1900		South Korea, KBS World Radio			7275eu
1800	1900		Swaziland, TWR Swaziland	3200af		
1800	1900		UK, BBC World Service	3255af	5875eu	
			5945as	5955as	6005af	6190af
			7225eu	9615af	11810af	
1800	1900		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1800	1900		USA, EWTN/WEWN Irondale, AL			15610me
1800	1900		USA, FBN/WTJC Newport NC	9370na		
1800	1900		USA, WBCQ Monticello ME	9330am	15420am	
1800	1900		USA, WHRI Cypress Creek SC			9840af
			21630af			
1800	1900		USA, WINB Red Lion PA	13570am		
1800	1900		USA, WJHR International Milton FL			15550usb
1800	1900		USA, WRNO New Orleans LA	7505am	15590al	
1800	1900		USA, WTWW Lebanon TN	9480na	9990va	
1800	1900		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385na		
1800	1900		USA, WYFR/Family Radio Worldwide			6045af
			6915va	7240af	7395af	9895af
			11665af	13695af	15115af	1755am
			17535am			
1800	1900		Yemen, Yemen RTV Corp/Radio Sana			6005me
			9780me			
1800	1900		Zambia, CVC Radio Christian Voice			4965af
1800	1900		Zambia, Zambia Broadcasting Corp			6165do
1830	1900		Bulgaria, Radio Bulgaria	6200eu	7400eu	
1830	1900	DRM	Bulgaria, Radio Bulgaria	9700eu		
1830	1900	mtwhf	Moldova, (Transnistria) Radio PMR			6240na
1830	1900		South Africa, AWR Africa	11830af		
1830	1900		UK, BBC World Service	9410af		
1830	1900		USA, Voice of America	4930af	6080af	
			13635af	15580af		
1830	1900	Sat	USA, WHRI Cypress Creek SC			15180af
1845	1850		Guinea, RTV Guineenne	7125do		
1851	1900		New Zealand, Radio NZ International			11725pa
1851	1900	DRM	New Zealand, Radio NZ International			15720pa

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

1900	1915	Sun	Canada, Bible Voice Broadcasting			9460me
1900	1928		Germany, Deutsche Welle	15275af		
1900	1930		Germany, Deutsche Welle	9735af	13780af	
1900	1930		Vietnam, Voice of Vietnam	7280eu	9730eu	
1900	1945	Sun	Canada, Bible Voice Broadcasting			9470me
1900	1945	DRM	India, All India Radio/External Service			9950eu
1900	1945		India, All India Radio/External Service			6280eu
			7400af	7410af	9415af	9445af
			11935af	6120al		
1900	1950	DRM	New Zealand, Radio NZ International			15720pa
1900	1950		New Zealand, Radio NZ International			11725pa
1900	1957		China, China Radio International			7285af
			7295af	9440af		
1900	1957		Netherlands, R Netherlands Worldwide			7425af
			9895af	11615af	11655af	

1900	1957		North Korea, Voice of Korea	7210af	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	
			9475pa	9500as	9580pa	9710pa
			11880pa			
1900	2000		Bahrain, Radio Bahrain	6010me		
1900	2000	Sat	Canada, Bible Voice Broadcasting		9470me	
1900	2000	Sun	Canada, Bible Voice Broadcasting		6030eu	
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St Johns NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000		Equatorial Guinea, Radio Africa/Malabo		15190af	
1900	2000		Indonesia, Voice of Indonesia/Jawa Barat			
			9525eu	11785eu		
1900	2000	fas	Italy, IRRS-Shortwave/NEXUS	6090va		
1900	2000		Kuwait, Radio Kuwait	15540va		
1900	2000		Liberia, Star Radio	3960do		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Nigeria, Voice of Nigeria/Ikorodu		7255af	
1900	2000		Palau, T8WH/World Harvest Radio International			
			9930as			
1900	2000		Russia, Voice of Russia	4975va	7330eu	
			12060af			
1900	2000		South Africa, CVC 1 Africa Christian Radio			
			4965af	13590af		
1900	2000	mtwhf	Spain, Radio Exterior de Espana		9605af	
			9665eu			
1900	2000		Swaziland, TWR Swaziland	3200af		
1900	2000		Thailand, Radio Thailand World Service		7570eu	
1900	2000		UK, BBC World Service	3255af	5875eu	
			5945as	5955as	6005af	6190af
			7225eu	9410af	9615af	11810af
1900	2000		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1900	2000		USA, EWTN/WEWN Irondale, AL		15610af	
1900	2000		USA, FBN/WTJC Newport NC	9370na		
1900	2000		USA, KJES Vado NM	15385ca		
1900	2000		USA, Voice of America	4930af	4940af	
			6080af	15580af		
1900	2000		USA, Voice of America/Special English		9585va	
			12020va			
1900	2000		USA, WBCQ Monticello ME	9330am	15420am	
1900	2000	mtwhfa	USA, WBCQ Monticello ME	7415am		
1900	2000		USA, WHRI Cypress Creek SC		9840af	
			15180af	17520na		
1900	2000		USA, WINB Red Lion PA	13570am		
1900	2000		USA, WJHR International Milton FL		15550usb	
1900	2000		USA, WRNO New Orleans LA	7505am	15590al	
1900	2000		USA, WTWW Lebanon TN	9480na	9990va	
1900	2000		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385na		
1900	2000		USA, WYFR/Family Radio Worldwide		3230af	
			6020af	6085ca	6915va	7395af
			9705af	9885af	9925af	15115af
			15565va			
1900	2000		Zambia, CVC Radio Christian Voice		4965af	
1900	2000		Zambia, Zambia Broadcasting Corp		6165do	
1905	1910	mtwhfa	Croatia, HRT Voice of Croatia		6165eu	
1905	1920	Sat	Mali, RTV Malienne	5995do		
1905	2000	m	South Africa, SA Radio League		3215af	
1915	1945	Sat	Canada, Bible Voice Broadcasting		6030eu	
1930	2000		Iran, VOIRI/IRIB	6010eu	6115eu	7320eu
			11695af	11860af		
1930	2000		South Africa, RTE Radio Worldwide		6225af	
1930	2000		Turkey, Voice of Turkey	6050eu		
1930	2000	Sat/Sun	USA, WRMI/Radio Prague	9955na		
1945	2000	mtwhfa	Albania, Radio Tirana	7465eu	11635na	
1951	2000		New Zealand, Radio NZ International		11725pa	
1951	2000	DRM	New Zealand, Radio NZ International		17675pa	

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

2000	2005	m	South Africa, SA Radio League		3215af	
2000	2025		Turkey, Voice of Turkey	6050eu		
2000	2027		Iran, VOIRI/IRIB	6010eu	6115eu	7320eu
			11695af	11860af		
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030		Niger, ORTN/La Voix du Sahel		9705do	
2000	2030		South Africa, RTE Radio Worldwide		6225af	
2000	2030	Sat	Swaziland, TWR Swaziland	3200af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	15580af		
2000	2030		Vatican City State, Vatican Radio		7365af	
			9755af	11625af		
2000	2045		Rwanda, Radiodiffusion Rwandaise		6055do	
2000	2050		New Zealand, Radio NZ International		11725pa	
2000	2050	DRM	New Zealand, Radio NZ International		17675pa	
2000	2057		China, China Radio International		5960eu	
			5985af	7285eu	7295af	9440af
			9600eu	11640eu	13630af	
2000	2057		Germany, Deutsche Welle	9735af	13780af	
			15275af			
2000	2057		Netherlands, R Netherlands Worldwide		5935af	
			7425af	11655af		
2000	2059		Germany, Deutsche Welle	9690af		
2000	2100		Anguilla, Worldwide Univ Network		11775am	
2000	2100		Australia, ABC NT Alice Springs		2310do	
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek		2325do	
2000	2100		Australia, Radio Australia	9500as	9700as	
			11650as			
2000	2100	Sat/Sun	Australia, Radio Australia	6080va	7240pa	
			12080pa			
2000	2100		Bahrain, Radio Bahrain	6010me		
2000	2100	DRM	Belgium, TDP Radio/Disco Palace		17555am	
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St Johns NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		Cuba, Radio Havana Cuba	11760am		
2000	2100		Equatorial Guinea, Radio Africa/Malabo		15190af	
2000	2100		Kuwait, Radio Kuwait	15540va		
2000	2100		Liberia, Star Radio	3960do		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		Nigeria, Voice of Nigeria/Ikorodu		7255af	
2000	2100		Palau, T8WH/World Harvest Radio International			
			9930as			
2000	2100		Russia, Voice of Russia	7330eu		
2000	2100		South Africa, CVC 1 Africa Christian Radio			
			4965af	9505af		
2000	2100		Syria, Radio Damascus	9330eu	12085va	
2000	2100		UK, BBC World Service	3255af	6005af	
			6190af	9410af	9615af	11810af
2000	2100		Ukraine, Radio Ukraine International		6030na	
2000	2100		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2000	2100		USA, EWTN/WEWN Irondale, AL		15610af	
2000	2100		USA, FBN/WTJC Newport NC	9370na		
2000	2100	mtwhf	USA, Voice of America	7470va	9490va	
2000	2100		USA, WBCQ Monticello ME	7415am	15420am	
2000	2100		USA, WBCQ Monticello ME	5110am		
2000	2100		USA, WINB Red Lion PA	13570am		
2000	2100		USA, WJHR International Milton FL		15550usb	
2000	2100		USA, WRNO New Orleans LA	7505am	15590al	
2000	2100		USA, WTWW Lebanon TN	9480na	9990va	
2000	2100		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family Radio Worldwide		5745va	
			6915va	9830af	9925af	11615af
			15115af	15195af	15520af	17535am
			17555am	17575sa		
2000	2100		Zambia, CVC Radio Christian Voice		4965af	
2000	2100		Zambia, Zambia Broadcasting Corp		6165do	
2000	21000		USA, WHRI Cypress Creek SC		7540na	
			15180na	15665na		
2030	2045		Thailand, Radio Thailand World Service		9535eu	
2030	2100	mtwhf	Moldova, (Transnistria) Radio PMR		6240eu	
2030	2100		USA, Voice of America	4930af	6080af	
			7560as	15580af		
2030	2100	Sat/Sun	USA, Voice of America	4940af		
2030	2100		USA, Voice of America/Radio Ashna		7560as	
2030	2100		Vietnam, Voice of Vietnam	7220me	7280eu	
			9550me	9730eu		
2045	2100		India, All India Radio/External Service		6280eu	
			7550eu	9445eu	11620pa	11715pa
			9910al	9940al		
2045	2100	DRM	India, All India Radio/External Service		9950eu	
2045	2100	DRM	Vatican City State, Vatican Radio		9800am	
2050	2100		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu		
2051	2100		New Zealand, Radio NZ International		11725pa	
2051	2100	DRM	New Zealand, Radio NZ International		15720pa	

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

2100	2110		Papua New Guinea, Wantok Radio Light			7325do
2100	2120		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu		
2100	2130	mtwhfa	Albania, Radio Tirana	7530eu		9895na
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	9830af		
2100	2130	Sat	Canada, CBC Northern Quebec Service			9625na
2100	2130	DRM	Vatican City State, Vatican Radio			9800am
2100	2150		New Zealand, Radio NZ International			11725pa
2100	2150	DRM	New Zealand, Radio NZ International			15720pa
2100	2157		China, China Radio International			7250af
			11640af	13630af		
2100	2157		China, China Radio International			5960as
			6135as	7205eu	7225as	7250as
			7285as	7405eu	7415eu	9600af
			11640af	13630af		
2100	2157		Germany, Deutsche Welle	12070af		13780af
2100	2157		North Korea, Voice of Korea	7570eu		12015eu
2100	2159		Germany, Deutsche Welle	7280af		9545af
2100	2200		Anguilla, Worldwide Univ Network			11775am
2100	2200		Australia, Radio Australia	9500as		9660pa
			11650as	11695va	12080pa	13630pa
			15515va			
2100	2200		Bahrain, Radio Bahrain	6010me		
2100	2200		Belarus, Radio Station Belarus	6155eu		7360eu
			7390eu			
2100	2200	DRM	Belgium, TDP Radio	17555eu		
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St Johns NF	6160na		
2100	2200		Canada, CKZU Vancouver BC	6160na		
2100	2200		Equatorial Guinea, Radio Africa/Malabo			15190af
2100	2200		India, All India Radio/External Service			6280eu
			7550eu	9445eu	11620pa	11715pa
			9910al	9940al		
2100	2200	DRM	India, All India Radio/External Service			9950eu
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		Micronesia, The Cross Radio/Pohnpei			4755as
2100	2200		Palau, T8WH/World Harvest Radio International			
			9930as			
2100	2200		Russia, Voice of Russia	7290eu		7330eu
2100	2200		South Africa, CVC 1 Africa Christian Radio			
			4965af	9505af		
2100	2200		Syria, Radio Damascus	9330va		12085va
2100	2200		UK, BBC World Service	3255af		3915as
			5875as	5910af	5965as	6190af
			6195as	9410af	9915af	
2100	2200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2100	2200		USA, EWTN/WEWN Irondale, AL			15610af
2100	2200		USA, FBN/WTJC Newport NC	9370na		
2100	2200		USA, Voice of America	6080af		15580af
2100	2200		USA, Voice of America/Radio Ashna			7560as
2100	2200		USA, WBCQ Monticello ME	7415am		9330am
			15420am			
2100	2200	Sat	USA, WBCQ Monticello ME	5110am		
2100	2200		USA, WHRI Cypress Creek SC			7555na
			15180na	15665na		
2100	2200		USA, WINB Red Lion PA	9265am		
2100	2200		USA, WJHR International Milton FL			15550usb
2100	2200		USA, WRNO New Orleans LA	7505am		15590al
2100	2200		USA, WTWW Lebanon TN	9480na		9990va
2100	2200		USA, WWCR Nashville TN	7465na		9350na
			9980na	13845na		
2100	2200		USA, WWRB Manchester TN	9385na		
2100	2200		USA, WYFR/Family Radio Worldwide			5950am
			6915va	7510va	9925af	15195af
			17535am	17555am		
2100	2200		Zambia, CVC Radio Christian Voice			4965af
2100	2200		Zambia, Zambia Broadcasting Corp			6165do
2115	2200		Egypt, Radio Cairo	6270eu		
2130	2157		Romania, Radio Romania International			6030na
			6115na	7310eu	7380eu	
2130	2200		Australia, ABC NT Alice Springs			4835do
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC Northern Quebec Service			9625na
2130	2200	DRM	Romania, Radio Romania International			6030eu
2130	2200		Turkey, Voice of Turkey	9610va		
2151	2200		New Zealand, Radio NZ International			15720pa
2151	2200	DRM	New Zealand, Radio NZ International			17675pa

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

2200	2205		Zambia, Zambia Broadcasting Corp			6165do
2200	2210		Guinea, Radio Familia FM	4900do		
2200	2225		Turkey, Voice of Turkey	9610va		
2200	2230		India, All India Radio/External Service			6280eu
			7550eu	9445eu	11620pa	11715pa
			9910al	9940al		
2200	2230	DRM	India, All India Radio/External Service			9950eu
2200	2230		South Korea, KBS World Radio			3955eu
2200	2245		Egypt, Radio Cairo	6270eu		
2200	2257		China, China Radio International			5915as
2200	2259	DRM	Canada, Radio Canada International			9800na
2200	2300		Anguilla, Worldwide Univ Network			6090am
2200	2300		Australia, ABC NT Alice Springs			4835do
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, Radio Australia	11695pa		12080pa
			13590as	13630pa	15230as	15240pa
			15360pa	15415as	15515va	15560pa
2200	2300		Bahrain, Radio Bahrain	6010me		
2200	2300		Belarus, Radio Station Belarus	6155eu		7360eu
			7390eu			
2200	2300		Bulgaria, Radio Bulgaria	6200eu		7400eu
2200	2300	smtwhf	Canada, CBC Northern Quebec Service			9625na
2200	2300		Canada, CFRX Toronto ON	6070na		
2200	2300		Canada, CFVP Calgary AB	6030na		
2200	2300		Canada, CKZN St Johns NF	6160na		
2200	2300		Canada, CKZU Vancouver BC	6160na		
2200	2300		Equatorial Guinea, Radio Africa/Malabo			15190af
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300		Micronesia, The Cross Radio/Pohnpei			4755as
2200	2300		New Zealand, Radio NZ International			15720pa
2200	2300	DRM	New Zealand, Radio NZ International			17675pa
2200	2300		Palau, T8WH/World Harvest Radio International			
			9930as			
2200	2300		Russia, Voice of Russia	7300eu		
2200	2300	Sat/Sun	Spain, Radio Exterior de Espana			6125eu
2200	2300		Syria, Radio Damascus	9330va		12085va
2200	2300		UK, BBC World Service	3915as		5875as
			5910af	5965as	6135as	6195as
			9740as	9915af		
2200	2300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2200	2300		USA, EWTN/WEWN Irondale, AL			15610af
2200	2300		USA, FBN/WTJC Newport NC	9370na		
2200	2300	smtwh	USA, Voice of America	5835va		7365va
			7425va	7570va	11860va	
2200	2300		USA, Voice of America/Radio Ashna			7560as
2200	2300		USA, WBCQ Monticello ME	9330am		
2200	2300	fasmt	USA, WBCQ Monticello ME	7415am		
2200	2300	Sat	USA, WBCQ Monticello ME	5110am		
2200	2300		USA, WHRI Cypress Creek SC			9615na
			15180na			
2200	2300		USA, WINB Red Lion PA	9265am		
2200	2300		USA, WJHR International Milton FL			15550usb
2200	2300		USA, WTWW Lebanon TN	9480na		9990va
2200	2300		USA, WWCR Nashville TN	7465na		9350na
			9980na	13845na		
2200	2300		USA, WWRB Manchester TN	3215na		
2200	2300		USA, WYFR/Family Radio Worldwide			5950am
			15440am	11740am	17690af	
2200	2300		Zambia, CVC Radio Christian Voice			4965af
2230	2300		Guam, AWR/KSDA	15320as		
2230	2300	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
2230	2300		USA, Voice of America/Special English			5850va
			7230va	9570va		
2245	2300		India, All India Radio/External Service			6055as
			7305as	11645as	13605as	9705al
			9950al			

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

2300	0000		Anguilla, Worldwide Univ Network			6090am
2300	0000		Australia, ABC NT Alice Springs			4835do
2300	0000		Australia, ABC NT Katherine	5025do		
2300	0000		Australia, Radio Australia	9660pa		12080pa
			13590va	13690pa	15230as	15360pa
			15145as	15560pa	17795pa	
2300	0000		Bahrain, Radio Bahrain	6010me		
2300	0000	smtwhf	Canada, CBC Northern Quebec Service			9625na
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		
2300	0000		Canada, CKZN St Johns NF	6160na		
2300	0000		Canada, CKZU Vancouver BC	6160na		
2300	0000		Egypt, Radio Cairo	11590am		

2300	0000		India, All India Radio/External Service			6055as
			7305as	11645as	13605as	9705al
2300	0000		Malaysia, RTM/Traxx FM			7295do
2300	0000		Micronesia, The Cross Radio/Pohnpei			4755as
2300	0000		New Zealand, Radio NZ International			15720pa
2300	0000	DRM	New Zealand, Radio NZ International			17675pa
2300	0000		Romania, Radio Romania International			5915va
			6015eu	7220as	7300as	
2300	0000		Russia, Voice of Russia			7250na 11830as
2300	0000		UK, BBC World Service			3915as 5875as
			6135as	6195as	7385as	9740as
2300	0000		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2300	0000		USA, EWTN/WEWN Irondale, AL			15610af
2300	0000		USA, FBN/WTJC Newport NC			9370na
2300	0000		USA, Voice of America			5830va 7365va
			7480va	7570va	11860va	
2300	0000		USA, Voice of America/Radio Ashna			7560as
2300	0000		USA, WBCQ Monticello ME			9330am
2300	0000	fasmt	USA, WBCQ Monticello ME			7415am
2300	0000	Sat	USA, WBCQ Monticello ME			5110am
2300	0000		USA, WHRI Cypress Creek SC			7315na
2300	0000	smtwhf	USA, WHRI Cypress Creek SC			5920na
2300	0000	Sat	USA, WHRI Cypress Creek SC			7335na
2300	0000		USA, WINB Red Lion PA			9265am
2300	0000		USA, WTWW Lebanon TN			5080va 5755va
2300	0000		USA, WWCR Nashville TN			5070na 7465na
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN			3215na 6890va
2300	0000		USA, WYFR/Family Radio Worldwide			9430ca
			15400ca			
2300	0000		Zambia, CVC Radio Christian Voice			4965af
2300	2330		Australia, Radio Australia			11695pa 15240pa
2300	2330		USA, Voice of America/Special English			6180va
			7460va	11655va	11840va	
2300	2330	DRM	Vatican City State, Vatican Radio			7370am
2300	2345		USA, WYFR/Family Radio Worldwide			11740na
2300	2357		China, China Radio International			5915as
			5990ca	6040na	6145eu	7350as
			7415as	9610pa	11790as	11970na
2300	2357		Turkey, Voice of Turkey			5960va
2315	2330	mtwhf	Croatia, HRT Voice of Croatia			3985eu
			7375sa			
2330	0000		Australia, Radio Australia			17750as
2330	0000		UK, BBC World Service			6170as
2330	0000		USA, Voice of America/Special English			6180va
			7460va	11655va	11840va	13640va
2330	0000		Vietnam, Voice of Vietnam			9840as 12020as

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana ..... **http://rtsh.sil.at/**
Anguilla, Worldwide Univ Network ..... **www.worldwideuniversitynetwork.com/**
Argentina, RAE ..... **www.radionacional.gov.ar**
Australia, ABC NT Alice Springs ..... **www.abc.net.au/radio/**
Australia, ABC NT Katherine ..... **www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek ..... **www.abc.net.au/radio/**
Australia, HCJB Global Voice Australia ..... **www.hcjb.org/**
Australia, Radio Australia ..... **www.abc.net.au/ra/**
Austria, AWR Europe **www.awr2.org/**
Austria, AWR Europe **www.awr2.org/**
Austria, Radio Austria International **http://oe1.orf.at/service/international**
Bahrain, Radio Bahrain ..... **www.radiobahrain.fm/**
Bangladesh, Bangladesh Betar ..... **www.betar.org.bd/**
Bangladesh, Bangladesh Betar/
Home Service ..... **www.betar.org.bd/**
Belarus, Radio Station Belarus ..... **www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio ..... **www.airtime.be/schedule.html**
Belgium, TDP Radio/Disco Palace ..... **www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service ..... **www.bbs.com.bt**
Bulgaria, Radio Bulgaria ..... **www.bnr.bg/**
Bulgaria, Radio Bulgaria/Euranet ..... **www.bnr.bg/**
Canada, Bible Voice Broadcasting ..... **www.biblevoice.org/**
Canada, CBC Northern Quebec Service . **www.cbc.ca/north/**
Canada, CFRX Toronto ON ..... **www.cfrb.com**
Canada, CFVP Calgary AB **www.classiccountryam1060.com**
Canada, CKZN St Johns NF ..... **www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC ..... **www.cbc.ca/bc**
Canada, Radio Canada International ..... **www.rcinet.ca/**
China, China Radio International ..... **www.cri.cn/**
China, Voice of the Strait (News Channel) Fuzhou **www.vos.com.cn**
China, Voice of the Strait/Fuzhou ..... **www.vos.com.cn**
Clandestine, Sudan Radio Service/SRS ..... **www.sudanradio.org**
Congo Dem. Republic, Radio Kahuzi ..... **www.radiokahuzi.com**
Croatia, HRT Voice of Croatia ..... **www.hrt.hr/**
Cuba, Radio Havana Cuba ..... **www.radiohc.cu/**
Egypt, Radio Cairo ..... **www.ertu.org**
Equatorial Guinea, Radio Africa/Malabo. **www.panambc.com**
Equatorial Guinea, R
adio African 2/Malabo ..... **www.panambc.com**
Equatorial Guinea,
Radio East Africa/Malabo ..... **www.panambc.com**
Ethiopia, Radio Ethiopia ..... **www.erta.gov.et**
Ethiopia, Radio Ethiopia/Home Service .... **www.erta.gov.et**
France, Radio France Internationale ..... **http://rfienglish.com**
Germany, AWR Europe **www.awr2.org/**
Germany, Deutsche Welle ..... **www.dw-world.de/**
Germany, European Music Radio ..... **www.emr.org.uk/**
Germany, Overcomer Ministries ..... **www.overcomerministry.org/**
Germany, Pan American Broadcasting ..... **www.radiopanam.com/**
Germany, TWR Europe ..... **www.twr.org**
Greece, Voice of Greece ..... **www.voiceofgreece.gr/**
Guam, AWR/KSDA **www.awr2.org/**
Guam, TWR Asia/KTWR ..... **http://nea.ktwr.net/**
India, All India Radio, Delhi-Kingsway ..... **www.allindiaradio.org/**
India, All India Radio/Aligarh ..... **www.allindiaradio.org/**
India, All India Radio/Dehli-Khampur ..... **www.allindiaradio.org/**
India, All India Radio/External Service ..... **www.allindiaradio.org/**
India, All India Radio/Gorakhpur ..... **www.allindiaradio.org/**
India, All India Radio/Panaji, Goa ..... **www.allindiaradio.org/**
Indonesia, Voice of Indonesia/Jawa Barat **www.voi.co.id**
Iran, VOIRI/IRIB ..... **www.irib.ir/English/**
Italy, IRRS-Shortwave/NEXUS ..... **www.nexus.org**
Japan, Radio Japan NHK World ..... **www.nhk.or.jp/english/**
Kuwait, Radio Kuwait ..... **www.media.gov.kw/**
Laos, Lao National Radio ..... **www.lnr.org.la**
Liberia, Star Radio ..... **www.starradio.org.lr/**
Malaysia, RTM/Traxx FM ..... **www.traxxfm.net/index.php**
Malaysia, RTM/Voice of Malaysia ..... **www.rtm.gov.my**
Mali, RTV Malienne ..... **www.ortm.ml**
Micronesia, The Cross Radio/Pohnpei ..... **www.pmapacific.org/**
Monaco, TWR Europe ..... **www.twr.org/**
Nepal, Radio Nepal ..... **www.radionepal.org/**
Netherlands, R Netherlands Worldwide .... **www.radionetherlands.nl/**
New Zealand, Radio NZ International ..... **www.rnzi.com**
Nigeria, Voice of Nigeria/Ikorodu ..... **www.voiceofnigeria.org**
Oman, Radio Sultanate of Oman ..... **www.oman-tv.gov.om**
Pakistan, PBC/Radio Pakistan ..... **www.radio.gov.pk**
Palau, T8WH/
World Harvest Radio International ..... **www.whr.org/**
Philippines, PBS/ Radyo Pilipinas ..... **www.pbs.gov.ph/**
Poland, Polskie Radio Warsaw ..... **www.polskieradio.pl**
Romania, Radio Romania International .... **www.rri.ro/**
Russia, Voice of Russia ..... **http://english.ruvr.ru/**
Rwanda, Radiodiffusion Rwandaise ..... **www.orinfor.gov.rw/**
Saudi Arabia, BSKSA/Saudi Radio ..... **www.saudiradio.net/**
Serbia, International Radio Serbia ..... **www.glassrbije.org**
South Africa, AWR Africa **www.awr2.org/**
South Africa, Channel Africa ..... **www.channelafrica.org**
South Africa, RTE Radio Worldwide **www.rte.ie/radio1/**
South Africa, SA Radio League ..... **www.sarl.org.za**
South Korea, KBS World Radio ..... **www.worldkbs.co.kr**
Spain, Radio Exterior de Espana ..... **www.ree.rne.es/**
Sri Lanka, SLBC ..... **www.slbc.lk**
Swaziland, TWR Swaziland ..... **www.twrafrica.org**
Syria, Radio Damascus ..... **www.rtv.gov.sy/**
Taiwan, Radio Taiwan International ..... **http://english.rti.org.tw/**
Thailand, Radio Thailand World Service ... **www.hsk9.org/**
Turkey, Voice of Turkey ..... **www.trt-world.com**
Uganda, Dunamis Shortwave ..... **www.biblevoice.org/stations/east-africa**
UK, BBC World Service ..... **www.bbc.co.uk/worldservice/**
Ukraine, Radio Ukraine International ..... **www.nrcu.gov.ua/**
United Arab Emirates, FEBA Radio ..... **www.febaradio.net**
USA, American Forces Network ..... **http://myafn.dodmedia.osd.mil/**
USA, EWTN/WEWN Irondale, AL ..... **www.ewtn.com/**
USA, FBN/WTJC Newport NC ..... **www.fbnradio.com/**
USA, KNLS Anchor Point AK ..... **www.knls.org/**
USA, Overcomer Ministries ..... **www.overcomerministry.org/**
USA, Voice of America ..... **www.voanews.com/**
USA, Voice of America/Radio Ashna ..... **www.voanews.com/**
USA, Voice of America/Special English ..... **www.voanews.com/**
USA, Voice of America/Studio 7 ..... **www.voanews.com/zimbabwe/news**
USA, WBCQ Monticello ME ..... **www.wbcq.com/**
USA, WHRI Cypress Creek SC ..... **www.whr.org/**
USA, WINB Red Lion PA ..... **www.winb.com/**
USA, WRMI/Radio Prague ..... **www.wrmi.net/**
USA, WRMI/Radio Slovakia Intl ..... **www.wrmi.net/**
USA, WRNO New Orleans LA ..... **www.wrnoradio.com**
USA, WTWW Lebanon TN ..... **www.wtww.us/**
USA, WWCR Nashville TN ..... **www.wwcr.com**
USA, WWRB Manchester TN ..... **www.wwrb.org/**
USA, WYFR/Family Radio Worldwide ..... **www.familyradio.com/**
Vatican City State, Vatican Radio ..... **www.vaticanradio.org/**
Vietnam, Voice of Vietnam ..... **www.vov.org.vn**
Zambia, CVC Radio Christian Voice ..... **www.voiceafrica.net**

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Old Favorites Still Active!

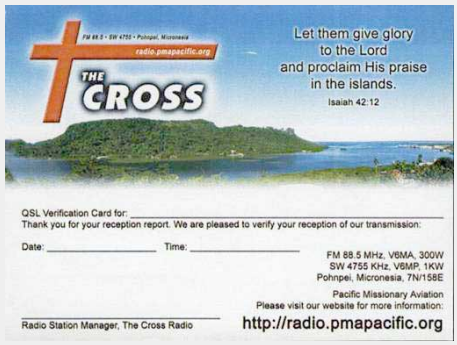
WRMI expands their relay broadcast

On January 31, Radio Prague ended their shortwave transmissions from the Czech Republic. However, an agreement between Radio Prague and WRMI has allowed shortwave transmissions to continue to the Caribbean and Latin America, via Radio Miami International in English and Spanish. Jeff White commented, "Radio Miami is happy to be able to help Radio Prague stay on the air as we did Radio Slovakia International."

Send your program details to *info@wrmi.net* or P.O. Box 526852, Miami, FL 33152 USA. Consult MT's English SW Guide and MT ExPress for the Spanish broadcast schedules. In last month's column, I announced Radio Prague plans to also QSL via the Internet. Tune into their streaming audio at **www.radio.cz.**

The Cross Radio returns to shortwave

Thanks to Galcom engineers, The Cross Radio has returned to the airwaves after extended antenna problems. The Cross Radio is a ministry of Pacific Missionary Aviation, on the island of Pohnpei in the Federated States of Micronesia. Station Manager, Sylvia Kalau advises listeners the station is tentatively operating 2130-0930 UTC, on 4755 kHz. Thanks to Ron Howard for the update on this station.



New clandestine station

In recent weeks, monitors have been reporting a new clandestine station on shortwave. Radio Dardasha 7 is relaying programming from transmitters in Wertachtal and Nauen, Germany, targeted to Africa and the Middle East in Arabic. Consult MT ExPress for broadcast schedules. Send report details to *dardasha7@gmailcom* (or) *alijazeeraalkhadra@gmail.com.* Postal address: Radio Dardasha 7, P.O. Box 991, Larnaca, Cyprus. Website with on-demand audio **www.dardacha7.com**

BRAZIL

Radio Inconfidencia, 15190 kHz. Full data card signed by Marcus Starling, Technical Director. Received in two months from email report to ***directoria@inconfidencia.com.br*** Station address: Av. Raja Gabaglia 1666-Luxemburgo, Belo Horizonte, Minas Gerais, Brasil. (Manuel Méndez, Spain/Cumbre DX) Streaming audio **www.inconfidencia.com.br**

CLANDESTINE

Oromiya Radio, 6030 kHz. Partial data confirmation letter via email from Habtamu Dargie Gudeta, Head of Engineering Department. Received in 12 days for postal report and one IRC to: Radio Oromiya, P.O. Box 2919, Adama, Ethiopia (Roberto Pavanello, Italy/playdx). Email ***habtamu_dargie@yahoo.com*** Streaming/on-demand audio **www.orto.gov.et/**

Radio Free Sarawak, via Dushanbe, Tajikistan, 7590 kHz. Two full data prepared QSL cards verified with site notation, illegible signature. Received in 26 days for a CD mp3 to Switzerland address (Ed Kusalik, Daysland, Alberta, Canada). Full data prepared card. Received in 16 days for English report and one IRC. QSL address: c/o Bruno Manser Fonds, Socinstrasse 37, 4051 Basel, Switzerland (Takahito Akabayashi, Japan/WWDXC Top News/BCDX). Email: ***info@radiofreesarawak.org.*** On-demand audio **www.radiofreesarawak.org.**

DIEGO GARCIA

AFN/American Forces Network, 4319 kHz USB. Full data AFRTS card. Received in 25 days for an English report. Station address: DOD, NMC Det AFRTS-DMC, 23755 Z Street, Bldg 2730, Riverside, CA 92518-2017 (Bill Wilkins, Springfield, MO). Website: **www.myafn.dodmedia.osd.mil/**

FEDERATED STATES OF MICRONESIA

Pohnpei, The Cross Radio, 4755 kHz. Verification statement and attached color station logo card via email. Reception reports may be sent to ***pohnpei@pmapacific.org***. Station address: Pacific Missionary Aviation, The Cross Radio, P.O. Box 517, Pohnpei FM 96941, Federated States of Micronesia (Ron Howard, Asilomar Beach, CA). E-QSL received from Sylvia Kalau, Station Manager, in two days (Jim Evans, Germantown, TN) Website: **www.pmapacific.org/**

GERMANY

Radio Sadaye Zindaga (Afghan One) via Wertachtal, 9445 kHz. Full data e-QSL from Mark Anderson, Pamir Productions. Received in 91 minutes after posting report to Feedback link at **www.afghanradio.org** (or) email to ***Info@AfghanRadio.org*** Streaming audio at the website (Wendel Craighead, Prairie Village, KS).

GUAM

KTWR-Trans World Asia, Agana, Guam 12105 kHz. Full data QSL card signed by M.T. Schroeder, plus souvenirs. Received in 39 days for report posted at website's Feedback link (Fabricio Andrarade Silva/playdx). Website with streaming audio **http://nea.ktwr.net/**

GUATEMALA

Radio Verdad, 4052.5 kHz. Full data verification letter from Dr. Edgar Amilcar Madrid, Station Manager, plus calendar and souvenirs. Received in 40 days for email report to ***radioverdad5@yahoo.com.*** Station address: Apartado Postal 5, Chicquimula, Guatemala, Central America (Manuel Méndez, Lugo, Spain/Cumbre DX). Streaming audio **www.radioverdad.org**

LITHUANIA

Rhein-Main Radio Club via Sitkunai, 11640 kHz. Full data e-QSL photo of birds, radio and headphones card. Received in one month for report to ***mail@rmrc.de*** (Craighead). Last month after press time, I discovered my website typo for this club. There's still time to obtain your 2011 calendar from RMRC at **www.rmrc.de**

MEDIUM WAVE

GBC Radio, 1458 kHz AM. Full data logo QSL card signed by Gerard J. Teuma, Head of Radio. Received in 245 days for an English AM report and $ 5.00US. Station address: Gibraltar Broadcasting Corporation, Broadcasting House, 18 South Barrack Road, Gibraltar (Albert Musick, Kandahar Airfield, Afghanistan). Email: ***info@gbc.gi*** Streaming/on-demand audio, video **www.gbc.gi/**

KKOW, 860 kHz AM. Full data prepared QSL card signed by Jerry Tellietts, Chief Engineer. Received in three days for an AM report. Station address: 1162 East Hwy 126, Pittsburg, KS 66762 (Wilkins). Streaming audio **www.kkowradio.com/**

KZQZ, 1430 kHz AM, ***Hot Talk and Cool Oldies.*** Full data e-QSL from Ray Diamond. Received in just under two hours for an AM e-report. Email ***info@kzqz1430am.com*** (Mauricio Molano, Salamanca, Spain/IRCA). Streaming audio **www.kzqz1430am.com**

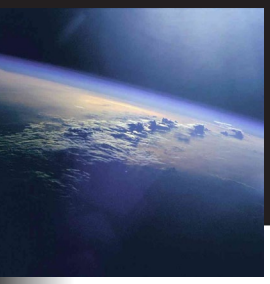
UTILITY

Non-directional beacon 3U, Gatineau, Quebec, Canada, 414 kHz, 25 watts. Full data prepared QSL card verified by D. Bergeron, Manager Technical Operations. Also enclosed an information brochure and companion CD. Received in 18 days for a utility report, SAE and $2.00US (both returned). QSL address: NAV Canada, 1601 Tom Roberts, Ottawa ON Canada K1V 1E5 (Jim Pogue, Memphis, TN).

Non-directional beacon ATS, Artesia, New Mexico, 414 kHz, 25 watts. Full data prepared QSL card verified by Lance Goodrich, Airport Manager. Received in three years, four months (and 12 days after follow-up) for a utility report and an SASE. QSL address: City of Artesia, P.O. Box 1310, 702 Airport Road, Artesia, NM 88211-1310 (Pogue).

Non-direction beacons ZXU, Thames' London, Ontario, Canada, 201 kHz, 7 watts. Beacon XU, 382 kHz, 3.5 watts. Full data prepared QSL cards verified by James Edwards, Team Leader, Technical Operations. Cards received in 21 days for an SASE and $2.00US. QSL address: NAV Canada, Tech Ops, 2530 Blair Blvd., London, ON Canada N5V 3Z9 (Pogue).

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



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.

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

0000	0057		North Korea, Voice of Korea	11735sa	13760sa 15180sa
0000	0059		Canada, Radio Canada International		11990sa 13700sa
0000	0100		Argentina, Radio Nacional	6060do	
0000	0100		Argentina, RAE	6060sa	11710va 15345va
0000	0100		Bolivia, Radio Eco	4409do	
0000	0100		Bolivia, Radio Nacional de Huanuni		5965do
0000	0100		Bolivia, Radio San Jose	5580do	
0000	0100		Bolivia, Radio San Miguel	4700do	
0000	0100		Bolivia, Radio Tacana	4781do	
0000	0100		Bolivia, Radio Virgen de Remedios		4834do
0000	0100		Bolivia, Yatun Ayllu Yura/Radio Yura		4716do
0000	0100		Bulgaria, Radio Bulgaria	6200sa	7300sa
0000	0100		Chile, CVC/ La Voz	9635sa	17680sa
0000	0100		China, China Radio International		5990ca 15190sa
0000	0100		Clandestine, Radio Republica/WRMI		5954ca
0000	0100		Colombia, La Voz de tu Conciencia		6010do
0000	0100		Colombia, La Voz del Guaviare		6035do
0000	0100		Colombia, Marfil Estereo	5910do	
0000	0100		Cuba, Radio Havana Cuba	6120na	6140ca 9770am 11760na 12040sa 15230am
0000	0100		Cuba, Radio Rebelde	5025na	6140ca
0000	0100		Dominican Republic, Radio Amanecer Int'l		6025do
0000	0100		Ecuador, La Voz del Napo	3279do	
0000	0100		Ecuador, Radio El Buen Pastor	4814do	
0000	0100		Ecuador, Radio Oriental	4781do	
0000	0100		Ecuador, Radio Quito	4919do	
0000	0100		Honduras, HRMI/ Radio Misiones Intl		3340do
0000	0100		Honduras, Radio Luz y Vida	3250do	
0000	0100		Mexico, XEOI/Radio Mil	6010do	
0000	0100		Mexico, XERTA/Radio Transcontinental		4800do
0000	0100		Mexico, XEXQ/Radio Universidad		6045do
0000	0100		Netherlands, R Netherlands Worldwide		6165sa
0000	0100		Peru, La Voz de Anta	5323do	
0000	0100		Peru, La Voz de la Selva	4824do	
0000	0100		Peru, La Voz de las Huarinjas	5059do	
0000	0100		Peru, Ondas del Huallaga	3329do	
0000	0100		Peru, Radio Bethel	5921do	
0000	0100		Peru, Radio Bolivar	5460do	
0000	0100		Peru, Radio Cusco	6195do	
0000	0100		Peru, Radio Frecuencia Popular		5485do
0000	0100		Peru, Radio La Reina de la Selva		5486do
0000	0100		Peru, Radio La Voz de Bolivar	5460do	
0000	0100		Peru, Radio Libertad de Junin	5039do	
0000	0100		Peru, Radio Madre de Dios	4950do	
0000	0100		Peru, Radio Maranon	4835do	
0000	0100		Peru, Radio Melodia	5939do	
0000	0100		Peru, Radio Nueva Super Sensacion		6536do
0000	0100		Peru, Radio Ondas del Suroiente		5120do
0000	0100		Peru, Radio Rasuwilca	4805do	
0000	0100		Peru, Radio San Antonio	4940do	
0000	0100		Peru, Radio San Miguel	4930do	
0000	0100		Peru, Radio Santa Monica	4965do	
0000	0100		Peru, Radio Santa Rosa	6047do	
0000	0100		Peru, Radio Tarma	4775do	
0000	0100		Peru, Radio Union	6114do	
0000	0100		Peru, Radio Victoria	6019do	9720do
0000	0100		Peru, Radio Vision	4790do	
0000	0100		Romania, Radio Romania International		7315ca 9525ca 9665sa 11960sa
0000	0100		Spain, Radio Exterior de Espana		6125sa 9535ca 9620sa 9765sa 11680sa
0000	0100	DRM	Spain, Radio Exterior de Espana		9630na
0000	0100		USA, EWTN/WEWN Irondale, AL		5810ca 11870ca
0000	0100		USA, Radio Marti	6030ca	7365ca 9825ca
0000	0100		USA, Voice of America	5890ca	9725sa 9885ca
0000	0100		USA, WYFR/Family Radio Worldwide		5985sa 7395sa 9355sa 9715am 11855am 13615sa
0000	0100		Venezuela, Radio Amazonas	4940do	
0030	0100		Iran, VOIRI/IRIB	6010sa	7240sa
0030	0100		Peru, Radio Genesis		4850do
0045	0100		Egypt, Radio Cairo	6270na	9915ca 9990sa

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

0100	0130		France, Radio France Internationale		5995ca
0100	0130		Vatican City State, Vatican Radio		7305am 9610am
0100	0157		Netherlands, R Netherlands Worldwide		6165sa
0100	0159		Canada, Radio Canada International		6100am
0100	0200		Argentina, Radio Nacional	6060do	
0100	0200		Argentina, RAE	6060sa	11710va 15345va
0100	0200		Bolivia, Radio Eco	4409do	
0100	0200		Bolivia, Radio Nacional de Huanuni		5965do
0100	0200		Bolivia, Radio San Jose	5580do	
0100	0200		Bolivia, Radio San Miguel	4700do	
0100	0200		Bolivia, Radio Tacana	4781do	
0100	0200		Bolivia, Radio Virgen de Remedios		4834do
0100	0200		Bolivia, Yatun Ayllu Yura/Radio Yura		4716do
0100	0200		Chile, CVC/ La Voz	9635sa	
0100	0200		China, China Radio International		9590sa 9710sa
0100	0200		Clandestine, Radio Republica/WRMI		5954ca
0100	0200		Colombia, La Voz de tu Conciencia		6010do
0100	0200		Colombia, La Voz del Guaviare		6035do
0100	0200		Colombia, Marfil Estereo	5910do	
0100	0200		Cuba, Radio Havana Cuba	6120na	6140ca 9770am 11760na 12040sa 15230am
0100	0200		Cuba, Radio Rebelde	5025na	6140ca
0100	0200		Dominican Republic, Radio Amanecer Int'l		6025do
0100	0200		Ecuador, La Voz del Napo	3279do	
0100	0200		Ecuador, Radio El Buen Pastor	4814do	
0100	0200		Ecuador, Radio Oriental	4781do	
0100	0200		Ecuador, Radio Quito	4919do	
0100	0200		Egypt, Radio Cairo	6270na	9915ca 9990sa
0100	0200		Honduras, HRMI/ Radio Misiones Intl		3340do
0100	0200		Honduras, Radio Luz y Vida	3250do	
0100	0200		Iran, VOIRI/IRIB	6010sa	7240sa
0100	0200		Mexico, XEOI/Radio Mil	6010do	
0100	0200		Mexico, XERTA/Radio Transcontinental		4800do
0100	0200		Mexico, XEXQ/Radio Universidad		6045do
0100	0200		Peru, La Voz de Anta	5323do	
0100	0200		Peru, La Voz de la Selva	4824do	
0100	0200		Peru, La Voz de las Huarinjas	5059do	
0100	0200		Peru, Ondas del Huallaga	3329do	
0100	0200		Peru, Radio Bethel	5921do	
0100	0200		Peru, Radio Bolivar	5460do	
0100	0200		Peru, Radio Cusco	6195do	
0100	0200		Peru, Radio Frecuencia Popular		5485do
0100	0200		Peru, Radio Genesis	4850do	
0100	0200		Peru, Radio La Reina de la Selva		5486do
0100	0200		Peru, Radio La Voz de Bolivar	5460do	
0100	0200		Peru, Radio Libertad de Junin	5039do	
0100	0200		Peru, Radio Madre de Dios	4950do	
0100	0200		Peru, Radio Maranon	4835do	
0100	0200		Peru, Radio Melodia	5939do	
0100	0200		Peru, Radio Ondas del Suroiente		5120do
0100	0200		Peru, Radio San Antonio	4940do	
0100	0200		Peru, Radio San Miguel	4930do	
0100	0200		Peru, Radio Santa Monica	4965do	
0100	0200		Peru, Radio Santa Rosa	6047do	
0100	0200		Peru, Radio Tarma	4775do	
0100	0200		Peru, Radio Union	6114do	
0100	0200		Peru, Radio Victoria	6019do	9720do

0100 0200 Peru, Radio Vision 4790do
0100 0200 Russia, Voice of Russia 6065sa 7210sa 9865sa 9875sa 9965sa
0100 0200 South Korea, KBS World Radio 11810sa
0100 0200 Spain, Radio Exterior de Espana 6055na 6125sa 9535ca 9620sa 9765sa 11680sa
0100 0200 DRM Spain, Radio Exterior de Espana 9630na
0100 0200 USA, EWTN/WEWN Irondale, AL 5810ca 11870ca
0100 0200 USA, Radio Marti 6030ca 7365ca 9825ca
0100 0200 USA, WYFR/Family Radio Worldwide 5950am 5985sa 6890va 7570sa 9355sa 9525am 9985sa 11885sa
0100 0200 Venezuela, Radio Amazonas 4940do
0145 0200 Vatican City State, Vatican Radio 7305am 9610am

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

0200 0227 Iran, VOIRI/IRIB 6010sa 7240sa
0200 0230 Argentina, RAE 6060sa 15345va
0200 0230 Bolivia, Radio San Jose 5580do
0200 0230 South Korea, KBS World Radio 9560na
0200 0255 Turkey, Voice of Turkey 9410va 9650va
0200 0257 North Korea, Voice of Korea 11735sa 13760sa 15180sa
0200 0259 Canada, Radio Canada International 9800am
0200 0300 Argentina, Radio Nacional 6060do
0200 0300 Argentina, RAE 11710va 15345va
0200 0300 Bolivia, Radio Eco 4409do
0200 0300 Bolivia, Radio San Miguel 4700do
0200 0300 Bolivia, Radio Tacana 4781do
0200 0300 Bolivia, Radio Virgen de Remedios 4834do
0200 0300 Bulgaria, Radio Bulgaria 6200sa 7300sa
0200 0300 China, China Radio International 9590sa 9710sa
0200 0300 Clandestine, Radio Republica/WRMI 5954ca
0200 0300 Colombia, La Voz de tu Conciencia 6010do
0200 0300 Colombia, La Voz del Guaviare 6035do
0200 0300 Colombia, Marfil Estereo 5910do
0200 0300 Cuba, Radio Havana Cuba 5040na 6120ca 6140am 9770sa 11760am 12010sa 12040sa 15230sa
0200 0300 Cuba, Radio Rebelde 5025na 6140ca
0200 0300 Dominican Republic, Radio Amanecer Int'l 6025do
0200 0300 Ecuador, La Voz del Napo 3279do
0200 0300 Ecuador, Radio El Buen Pastor 4814do
0200 0300 Ecuador, Radio Oriental 4781do
0200 0300 Ecuador, Radio Quito 4919do
0200 0300 Honduras, HRMI/ Radio Misiones Intl 3340do
0200 0300 Honduras, Radio Luz y Vida 3250do
0200 0300 Honduras, Radio Luz y Vida 3250do
0200 0300 Mexico, XEOI/Radio Mil 6010do
0200 0300 Mexico, XERTA/Radio Transcontinental 4800do
0200 0300 Mexico, XEXQ/Radio Universidad 6045do
0200 0300 Netherlands, R Netherlands Worldwide 6165ca
0200 0300 Peru, La Voz de la Selva 4824do
0200 0300 Peru, Ondas del Huallaga 3329do
0200 0300 Peru, Radio Bethel 5921do
0200 0300 Peru, Radio Bolivar 5460do
0200 0300 Peru, Radio Cusco 6195do
0200 0300 Peru, Radio Frecuencia Popular 5485do
0200 0300 Peru, Radio Genesis 4850do
0200 0300 Peru, Radio La Reina de la Selva 5486do
0200 0300 Peru, Radio La Voz de Bolivar 5460do
0200 0300 Peru, Radio Maranon 4835do
0200 0300 Peru, Radio Melodia 5939do
0200 0300 Peru, Radio Ondas del Suroiente 5120do
0200 0300 Peru, Radio San Miguel 4930do
0200 0300 Peru, Radio Santa Monica 4965do
0200 0300 Peru, Radio Santa Rosa 6047do
0200 0300 Peru, Radio Tarma 4775do
0200 0300 Peru, Radio Union 6114do
0200 0300 Peru, Radio Victoria 6019do 9720do
0200 0300 Peru, Radio Vision 4790do
0200 0300 Russia, Voice of Russia 7210sa 9475sa 9865sa 9875sa 9965sa
0200 0300 Spain, Radio Exterior de Espana 3350ca 6055na 6125na 9535ca 9620sa 9765sa
0200 0300 mtwhf Spain, Radio Exterior de Espana 9675na
0200 0300 Taiwan, Radio Taiwan International 7570sa 11995sa
0200 0300 USA, EWTN/WEWN Irondale, AL 5810ca 11870ca
0200 0300 USA, Radio Marti 6030ca 7365ca 9825ca
0200 0300 USA, WYFR/Family Radio Worldwide 9355ca 9930am 9985sa 11825sa
0200 0300 Venezuela, Radio Amazonas 4940do
0230 0300 Iran, VOIRI/IRIB 6010sa

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

0300 0327 Iran, VOIRI/IRIB 6010sa
0300 0330 Bolivia, Radio Eco 4409do
0300 0330 Peru, Radio La Voz de Bolivar 5460do
0300 0330 USA, WRMI/Radio Prague 9955ca
0300 0330 Vietnam, Voice of Vietnam/Overseas Service 6175am
0300 0355 Ecuador, Radio El Buen Pastor 4814do
0300 0357 Netherlands, R Netherlands Worldwide 6165ca
0300 0400 Argentina, Radio Nacional 6060do
0300 0400 China, China Radio International 9665sa
0300 0400 Clandestine, Radio Republica/WRMI 5954ca
0300 0400 Colombia, La Voz de tu Conciencia 6010do
0300 0400 Colombia, La Voz del Guaviare 6035do
0300 0400 Colombia, Marfil Estereo 5910do
0300 0400 Cuba, Radio Havana Cuba 5040na 6120ca 6140am 9770sa 11760am 12010sa 12040sa 15230sa
0300 0400 Cuba, Radio Rebelde 5025na 6140ca
0300 0400 Ecuador, La Voz del Napo 3279do
0300 0400 Ecuador, Radio Quito 4919do
0300 0400 Honduras, HRMI/ Radio Misiones Intl 3340do
0300 0400 Honduras, Radio Luz y Vida 3250do
0300 0400 Mexico, XEOI/Radio Mil 6010do
0300 0400 Mexico, XERTA/Radio Transcontinental 4800do
0300 0400 Mexico, XEXQ/Radio Universidad 6045do
0300 0400 Peru, Ondas del Huallaga 3329do
0300 0400 Peru, Radio Frecuencia Popular 5485do
0300 0400 Peru, Radio Genesis 4850do
0300 0400 Peru, Radio Melodia 5939do
0300 0400 Peru, Radio Santa Monica 4965do
0300 0400 Peru, Radio Santa Rosa 6047do
0300 0400 Peru, Radio Tarma 4775do
0300 0400 Peru, Radio Union 6114do
0300 0400 Peru, Radio Victoria 6019do 9720do
0300 0400 Peru, Radio Vision 4790do
0300 0400 Romania, Radio Romania International 7325ca 9635sa 9765ca 11825sa
0300 0400 Russia, Voice of Russia 6065sa 7210sa 7335ca 9475sa 9965ca
0300 0400 Spain, Radio Exterior de Espana 3350ca 6055na 6125sa 9535ca 9620sa 9765sa
0300 0400 USA, EWTN/WEWN Irondale, AL 5810ca 11870ca
0300 0400 USA, Radio Marti 6030ca 7365ca 7405ca
0300 0400 USA, WYFR/Family Radio Worldwide 5985ca 6890va 7570ca 9355sa 9525am 9680am
0304 0400 Canada, Radio Canada International 9755na
0320 0400 Vatican City State, Vatican Radio 6040am 7305am
0330 0400 USA, WRMI/Radio Slovakia Intl 9955ca

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

0400 0404 Canada, Radio Canada International 9755na
0400 0420 Vatican City State, Vatican Radio 6185va 7335va
0400 0430 Japan, Radio Japan NHK World 6195sa
0400 0430 Vietnam, Voice of Vietnam/Overseas Service 6175am
0400 0445 USA, WYFR/Family Radio Worldwide 9355sa
0400 0500 Clandestine, Radio Republica/WRMI 5954ca
0400 0500 Colombia, La Voz de tu Conciencia 6010do
0400 0500 Colombia, La Voz del Guaviare 6035do
0400 0500 Colombia, Marfil Estereo 5910do
0400 0500 Cuba, Radio Havana Cuba 5040na 6120ca 6140am 9770sa 11760am 12010sa 12040sa 15230sa
0400 0500 Cuba, Radio Rebelde 5025na 6140ca
0400 0500 Ecuador, La Voz del Napo 3279do
0400 0500 Ecuador, Radio Quito 4919do
0400 0500 Honduras, HRMI/ Radio Misiones Intl 3340do
0400 0500 Mexico, XEOI/Radio Mil 6010do
0400 0500 Mexico, XERTA/Radio Transcontinental 4800do
0400 0500 Mexico, XEXQ/Radio Universidad 6045do
0400 0500 Peru, Ondas del Huallaga 3329do
0400 0500 Peru, Radio Frecuencia Popular 5485do
0400 0500 Peru, Radio Genesis 4850do

0400	0500		Peru, Radio Melodia	5939do		
0400	0500		Peru, Radio Santa Rosa	6047do		
0400	0500		Peru, Radio Union 6114do			
0400	0500		Peru, Radio Victoria	6019do	9720do	
0400	0500		Peru, Radio Vision 4790do			
0400	0500		Russia, Voice of Russia	7210sa	7335ca	
			9475sa	9965ca		
0400	0500		Spain, Radio Exterior de Espana		3350ca	
			5965sa	6055na	6125sa	9535ca
0400	0500	mtwhf	Spain, Radio Exterior de Espana		9675na	
0400	0500		Taiwan, Radio Taiwan International		6890ca	
0400	0500		USA, EWTN/WEWN Irondale, AL		5810ca	
			11870ca			
0400	0500		USA, Radio Marti	6030ca	7365ca	7405ca
0400	0500		USA, WYFR/Family Radio Worldwide		5985ca	
			7730ca	9930am	9985sa	

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

0500	0530		Japan, Radio Japan NHK World		6195ca	
0500	0600		Clandestine, Radio Republica/WRMI		5954ca	
0500	0600		Colombia, La Voz de tu Conciencia		6010do	
0500	0600		Colombia, La Voz del Guaviare		6035do	
0500	0600		Colombia, Marfil Estereo	5910do		
0500	0600		Cuba, Radio Havana Cuba	5040na	6120ca	
			12010sa	12040sa	15230am	
0500	0600		Cuba, Radio Rebelde	5025na	6140ca	
0500	0600		Ecuador, La Voz del Napo	3279do		
0500	0600		Ecuador, Radio Quito	4919do		
0500	0600		Honduras, HRMI/ Radio Misiones Intl		3340do	
0500	0600		Mexico, XEOI/Radio Mil	6010do		
0500	0600		Mexico, XERTA/Radio Transcontinental		4800do	
0500	0600		Peru, Ondas del Huallaga	3329do		
0500	0600		Peru, Radio Frecuencia Popular		5485do	
0500	0600		Peru, Radio Genesis	4850do		
0500	0600		Peru, Radio Melodia	5939do		
0500	0600		Peru, Radio Santa Rosa	6047do		
0500	0600		Peru, Radio Union 6114do			
0500	0600		Peru, Radio Victoria	6019do	9720do	
0500	0600		Peru, Radio Vision 4790do			
0500	0600		Russia, Voice of Russia	7210sa	7335ca	
			9475sa			
0500	0600		Spain, Radio Exterior de Espana		3350ca	
			5965sa	6055na	9675na	11895as
0500	0600	mtwhf	Spain, Radio Exterior de Espana		12035eu	
0500	0600	DRM	Spain, Radio Exterior de Espana		9780eu	
0500	0600		USA, EWTN/WEWN Irondale, AL		7555ca	
			11870ca			
0500	0600		USA, Radio Marti	6030ca	7365ca	7405ca
0500	0600		USA, WYFR/Family Radio Worldwide		5745am	
			6000ca	9335eu	9495am	9715am
0504	0600		USA, WYFR/Family Radio Worldwide		9495va	
0530	0600		Iran, VOIRI/IRIB	13710va	15400va	

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

0600	0627		Iran, VOIRI/IRIB	13710va	15400va	
0600	0700		China, China Radio International		15135eu	
0600	0700		Clandestine, Radio Republica/WRMI		5954ca	
0600	0700		Colombia, La Voz de tu Conciencia		6010do	
0600	0700		Colombia, La Voz del Guaviare		6035do	
0600	0700		Colombia, Marfil Estereo	5910do		
0600	0700		Cuba, Radio Rebelde	5025na		
0600	0700		Ecuador, La Voz del Napo	3279do		
0600	0700		Ecuador, Radio Quito	4919do		
0600	0700		Honduras, HRMI/ Radio Misiones Intl		3340do	
0600	0700		Mexico, XEOI/Radio Mil	6010do		
0600	0700		Mexico, XERTA/Radio Transcontinental		4800do	
0600	0700		Peru, Ondas del Huallaga	3329do		
0600	0700		Peru, Radio Frecuencia Popular		5485do	
0600	0700		Peru, Radio Genesis	4850do		
0600	0700		Peru, Radio Melodia	5939do		
0600	0700		Peru, Radio Santa Rosa	6047do		
0600	0700		Peru, Radio Union 6114do			
0600	0700		Peru, Radio Victoria	6019do	9720do	
0600	0700		Peru, Radio Vision 4790do			
0600	0700		South Korea, KBS World Radio		6045eu	
0600	0700		Spain, Radio Exterior de Espana		5965sa	
			11895me	12035eu		
0600	0700	DRM	Spain, Radio Exterior de Espana		9780eu	
0600	0700		Taiwan, Radio Taiwan International		6875na	
0600	0700		USA, EWTN/WEWN Irondale, AL		7555ca	
			11870ca			
0600	0700		USA, Radio Marti	6030ca	7405ca	
0600	0700		USA, WYFR/Family Radio Worldwide		5950am	
			9495va	9715am		
0630	0700		USA, WRMI/Radio Prague	9955ca		

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

0700	0730		Bulgaria, Radio Bulgaria	6200eu	7300eu	
0700	0800		China, China Radio International		15135eu	
0700	0800		Clandestine, Radio Republica/WRMI		5954ca	
0700	0800		Colombia, La Voz de tu Conciencia		6010do	
0700	0800		Colombia, Marfil Estereo	5910do		
0700	0800		Cuba, Radio Rebelde	5025na		
0700	0800		Ecuador, La Voz del Napo	3279do		
0700	0800		Ecuador, Radio Quito	4919do		
0700	0800		Honduras, HRMI/ Radio Misiones Intl		3340do	
0700	0800		Mexico, XEOI/Radio Mil	6010do		
0700	0800		Mexico, XERTA/Radio Transcontinental		4800do	
0700	0800		Peru, Ondas del Huallaga	3329do		
0700	0800		Peru, Radio Frecuencia Popular		5485do	
0700	0800		Peru, Radio Genesis	4850do		
0700	0800		Peru, Radio Melodia	5939do		
0700	0800		Peru, Radio Santa Rosa	6047do		
0700	0800		Peru, Radio Union 6114do			
0700	0800		Peru, Radio Victoria	6019do	9720do	
0700	0800		Peru, Radio Vision 4790do			
0700	0800		Spain, Radio Exterior de Espana		5965sa	
			12035eu			
0700	0800	DRM	Spain, Radio Exterior de Espana		9780eu	
0700	0800		USA, EWTN/WEWN Irondale, AL		7555ca	
			11870ca			
0700	0800		USA, Radio Marti	5980ca	6030ca	
0700	0800		USA, WYFR/Family Radio Worldwide		6000ca	
			7520eu	9680am	9715am	

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

0800	0900		Clandestine, Radio Republica/WRMI		5954ca	
0800	0900		Colombia, La Voz de tu Conciencia		6010do	
0800	0900		Colombia, Marfil Estereo	5910do		
0800	0900		Cuba, Radio Rebelde	5025na		
0800	0900		Ecuador, La Voz del Napo	3279do		
0800	0900		Ecuador, Radio Quito	4919do		
0800	0900		Honduras, HRMI/ Radio Misiones Intl		3340do	
0800	0900		Mexico, XEOI/Radio Mil	6010do		
0800	0900		Mexico, XERTA/Radio Transcontinental		4800do	
0800	0900		Peru, Ondas del Huallaga	3329do		
0800	0900		Peru, Radio Frecuencia Popular		5485do	
0800	0900		Peru, Radio Genesis	4850do		
0800	0900		Peru, Radio Melodia	5939do		
0800	0900		Peru, Radio Santa Rosa	6047do		
0800	0900		Peru, Radio Union 6114do			
0800	0900		Peru, Radio Victoria	6019do	9720do	
0800	0900		Peru, Radio Vision 4790do			
0800	0900		Spain, Radio Exterior de Espana		12035eu	
			13720eu			
0800	0900	DRM	Spain, Radio Exterior de Espana		9780eu	
0800	0900		USA, EWTN/WEWN Irondale, AL		7555ca	
			11870ca			
0800	0900		USA, Radio Marti	5980ca	6030ca	
0800	0900		USA, WYFR/Family Radio Worldwide		5745ca	
			6000ca	9495va	9555ca	9715am
			11740ca			

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

0900	0945		USA, WYFR/Family Radio Worldwide		9495va	
0900	1000		Argentina, RAE	6060sa		
0900	1000		Bolivia, Radio Santa Ana	4451do		
0900	1000		Clandestine, Radio Republica/WRMI		5954ca	
0900	1000		Colombia, La Voz de tu Conciencia		6010do	
0900	1000		Colombia, Marfil Estereo	5910do		
0900	1000		Cuba, Radio Nacional de Venezuela		11690ca	
			12010sa	13680ca	13750na	17750sa
0900	1000		Cuba, Radio Rebelde	5025na		
0900	1000		Dominican Republic, Radio Amanecer Int'l			
			6025do			

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On Base Air Show Coverage

By now, those of you who are interested in monitoring air shows should have the March *Monitoring Times* issue in hand as part of your air show monitoring kit. Starting with this month's *Milcom* column, I will extend our annual coverage as follows: If the Blue Angels or the Thunderbirds performs at a military base during the month, I will present a basic frequency profile for that base. That will give you the tools to track pretty much anything that happens before, during and after the event via your scanner.

My only request is if you use our list, please send us some feedback. Did you hear any frequencies on our list? Did you pick up some that weren't on our list? We want to know! You can send your feedback to us to the email address in the masthead.

All frequencies are in MHz and mode is AM unless otherwise indicated.

Charleston AFB/International, South Carolina KCHS

April 9-10 Charleston Air Expo 2011, US Air Force Thunderbirds

437AW (Squadrons 14AS 15AS 16AS 17AS) C-17A Aircraft
Callsigns: Liftr, Moose, Palm, Reach
Basco Used during parachute drop missions
Impac Wing callsign
Thug Possible drop zone mission callsign
Volt Formation of two or more aircraft
315AW (Squadrons 300AS 317AS 701AS) C-17A Aircraft
Callsign: Grits
437AW/315AW Air-to-Air: 225.575 289.175 314.450
Approach Control: 119.300 120.700 135.800 257.100 284.000 306.925 317.450 381.600 (120.700 306.925 317.450 151°-330°) (135.800 257.100 331°-150°)
ATIS: 124.750
Clearance Delivery: 127.325 291.650
Consolidate Command Post 134.100 349.400 (Have quick timing available 255.500)
Callsign: Palmetto Ops
Departure Control: 120.700 135.800 306.925 379.925 (120.700 306.925 151°-330°) (135.800 379.925 331°-150°)
Flight Service Station 122.200 122.500 255.400 113.500T 122.100R
Callsign: Anderson Radio
Ground Control: 121.900 348.600
Pilot-to-Dispatcher (PTD): 372.200
PMSV Metro 233.950
Survival Rescue Training 236.000 251.900
Tower 126.000 239.000
UNICOM 122.950

Civil Engineering (Red Horse) 32.850 34.210 (NBFM)
Maintenance Equipment Checks 173.5125/165.0875 (NBFM)
Miscellaneous Simplex 413.300 (NBFM)
US Air Force P25 Trunk Radio System 406.3625 406.5625 406.7625 406.9625 407.1625 407.3625 407.5625 407.7625 407.9625 408.3625 409.1625 (NBFM)
US Navy Enterprise ELMR Southeast Regional P25 Trunk Radio System 380.0750 380.2750 380.4250 380.5750 380.7250 380.8375 380.9375 381.0125 381.0875 381.1750 381.2375 381.3125 386.1000 (NBFM)

Seymour Johnson AFB, North Carolina KGSB

April 16-17 Wings Over Wayne Air Show 2011, US Air Force Thunderbirds

4 FW Command Post 311.000 321.000 381.300 (Callsign Raymond 25)
4 FW Interplane Air-to-Air 143.150 377.850
334FS Flight Following 260.100
916th Command Post 311.000 321.000 (Callsign Lighthouse Control)
ACC Supervisor of Flying 376.100 (Callsign Lion SOF)
Aerial Refueling 141.300
Approach Control 119.700 123.700 256.800 263.150 273.600 277.400 290.900 379.125 (119.700 273.600 111° -257°) (123.700 290.900 258° -110°) 135.500 272.750 (Other times Washington ARTCC)
ATIS 317.625
Clearance Delivery 128.025 270.800
Departure Control 119.700 123.700 273.600 290.900 326.200 338.600 (123.700 290.900 N) (119.700 273.600 S) 135.500 272.750 (Other times Washington ARTCC)
Ground Control 128.025 275.800
Have Quick 225.150
Precision Approach Radar (PAR) 121.750 251.075 388.200 391.900
Pilot to Dispatcher (PTD) 138.100 372.200
PMSV Metro 323.925
Single Frequency Approach 277.400
Squadron/Wing Common 283.250
Tower 126.250 370.875
Training Air-to-Ground 336.875 349.100

Civil Engineering (Red Horse) 32.350 49.750 (NBFM)
US Air Force P25 Trunk Radio System 406.3625 406.7625 407.1625 407.3625 407.7625 407.9625 408.1625 408.7625 408.9625 409.1625 409.3625 409.9625 (NBFM)

Beale AFB, California KBAB

April 30-May 1 2011 Beale Air Show and Open House, US Air Force Thunderbirds

940th Command Post 256.025 (Callsign Tahoe Control)
ATIS 273.500
Base Operations 140.875
Ground Control 121.600 257.750
Ground Controlled Approach (GCA) 385.600
NorCal Approach/Departure Control 125.400 259.100
Pilot to Dispatcher (PTD) 140.875 372.200
PMSV Metro 239.800
Supervisor of Flying (SOF) 139.600 240.225
Tower 119.400 276.150 284.750
Wing Command Post 321.000 311.000

HF Command Post (USB) 8079.0 11267.0 kHz
Maintenance Equipment Checks 173.4875/163.4875 (NBFM)
US Air Force P25 Trunk Radio System 406.7625 406.9625 407.1625 407.9625 408.1625 408.7625 409.3625 409.7625 410.1625 410.3625

NAS Corpus Christi, Texas KNGP

April 9-10 NAS Corpus Christi Air Show, US Navy Blue Angels

Aircraft Maintenance 306.600
Approach Control 120.900 124.650 125.400 307.900 348.725 (120.900 348.725 Rwy 4, 13L/R, 17; 125.400 307.900 Rwy 22, 31L/R, 35)
Army Operations 49.700 139.200 386.600 (Callsign Xray-Charlie AA5XC)
Army Repeaters 138.0375 139.0375 139.1875 139.3375 139.4875 139.9375 140.9375 406.9625
Army Simplex 138.300 139.375
ATIS 114.000 127.900 290.900
Base Operations 346.659 7965.0 kHz SSB
Coast Guard Air (NOY8) 237.900 326.150 345.000 379.050 (Callsign Corpus Air)
Departure Control 125.400 307.900
Ground Controlled Approach (GCA) 270.800 284.600 299.600 363.200
Navy Air-to-Air 140.300 140.325 337.800 350.800 360.500 384.200
Navy Corpus Clearance Delivery 314.300
Navy Corpus Ground Control 118.700 257.850
Navy Corpus Tower 125.525 134.850 340.200 360.200 (North Tower 134.850 340.200) (South Tower 125.525 360.200)
Pilot-to-Dispatcher (PTD) 346.650
PMSV Metro 343.500
Ramp Control 354.800
Search and Rescue 123.100
Squadron Commons 265.800 342.750 349.800 355.400 379.800
T-44 Maintenance 138.775
VT-28 Squadron Common 358.800
Warning Area W-228A 317.550

Aircraft Maintenance 140.825 (NBFM)
Contractor Maintenance 140.450 150.400 (NBFM)
Military Police 139.575 (Repeater output) 142.850 (NBFM)

US Navy ELMR South Regional P25 Trunk Radio System
386.150 386.600 388.125 388.275 388.425 388.575 (NBFM)

JRB/NAS Forth Worth Texas KNFW
April 16-17 Fort Worth Air Show, US Navy Blue Angels

Air Force Reserve Command Post 252.100
Air Force Reserve Operations 34.210 36.810 49.750 49.850 138.625 138.950 140.200 141.425 142.600 142.700 143.750 148.675 245.425 249.425 261.050 274.025 274.825 298.100 305.775 357.100 374.150
Air National Guard Operations 225.800 226.900
ATIS 273.575
Base Operations/Maintenance 291.775 376.800
Clearance Delivery 121.675
Lockheed Martin Radio 284.100 292.500
Navy Fort Worth Arrival 119.125 128.775 132.225 236.775 239.050 270.800 276.400 290.250 291.775 298.925 317.575 323.125 338.325 353.650 371.875
Navy Fort Worth Ground Control 126.400 254.325 279.575 284.725 316.150
Navy Fort Worth Tower 120.950 269.325 284.725
PMSV Metro 342.550
Regional Approach/Departure Control 125.800 257.950
Single Frequency Approach ATIS 273.575
Squadron Common 234.375 291.850
VR-46 Squadron Common 355.400
VR-59 Squadron Common 306.775 342.600

Aircraft Maintenance Net 140.575 143.675 148.500
POL Fuel Farm 138.300 148.3125
Maintenance Equipment Checks 173.4125/165.0875 173.5125/163.4875 (NBFM)
Security Force 140.475 148.550 (NBFM)
US Air Force P25 Trunk Radio System
406.5625 407.3625 407.9625 408.5625 408.9625 409.4375 409.9625 410.3625 410.7625 (NBFM)

MCAS Beaufort, South Carolina KNBC
April 30-May 1 MCAS Beaufort Air Show 2011, US Navy Blue Angels

2nd Marine Air Wing Common 310.200
Approach/Departure Control 123.700 125.125 292.125 328.425 (123.700 328.425 3000′ and below) (125.125 292.125 Above 3000′.) Other times 120.850 322.500 Jacksonville ARTCC
ATIS 256.150
Base Operations 281.800
Command Post 251.400
Departure Control 328.425
Ground Control/Clearance Delivery 128.150 348.625
Ground Controlled Approach (GCA) 132.325 132.850 298.875 317.775 323.275 338.350 372.000 379.275
MAG-31 Wing Common 267.400
Marine Air Operations 290.100 302.350 320.650 342.575 343.200 343.500 354.325 378.400
Navy Air-to-Air 277.200
Pilot-to-Dispatcher (PTD) 281.800
PMSV Metro 264.500
Search and Rescue 282.800
Squadron Common 304.200 339.500
Tower 119.050 342.875 363.150
VFA-86 Squadron Common 308.925 354.400 363.825
VMFA-115 Squadron Common/Tactical 361.800
VMFA-122 Squadron Common/Tactical 253.100 269.700 283.400
VMFA-224 Squadron Common/Tactical 250.300 258.900 305.800
VMFA-251 Squadron Common/Tactical 313.800
VMFA-312 Squadron Common/Tactical 228.200 299.275
VMFA-332 Squadron Common/Tactical 262.700 326.700 349.225

Aircraft Maintenance 148.500 (NBFM)
Crash and Rescue 140.100 (NBFM)
Fire Dispatch 140.625 (NBFM)
Ramp/Visiting Aircraft 149.2125 (NBFM)
US Marine Corps Enterprise MCI East Regional P25 Trunk Radio System
380.0750 380.2750 385.3500 385.6250 386.0625 386.1375 386.2125 386.2875 386.5125 386.6625 386.7250 386.9625 (NBFM)

The air show schedules mentioned in this article are current as of press time, but they are subject to change without notice, and are weather permitting for everyone's safety. You can get the latest and breaking information on our Internet blog – the *Milcom Monitoring Post* at **http://mt-milcom.blogspot.com**.

❖ Civil Air Patrol Reorganizing HF ALE

According to an interim change letter (ICL) issued earlier this year by the US Air Force Civil Air Patrol commander on the public CAP website, the USAF affiliate will soon be making major changes to their HF ALE national network.

According to the letter, the CAP's 21st Century HF/ALE system will not use traditional scheduled voice nets for operational missions. Rather, it will be composed of a system of decentralized point-to-point, peer-to-peer stations strategically located to provide connectivity required for tactical and command and control communications. The system will be organized into a National Command Net and eight Region Command Nets.

The ICL describes the current national ALE net operation as follows:

"The National Command Net is already in operation. It is composed of a designated message center station in each region along with at least one alternate, the National Operations Center (NOC), the National Technology Center (NTC), and one station in each OCONUS wing. The NOC and the NTC serve as the net control stations. Only designated stations may routinely operate on this net with the exception of situations during operational missions when the region ALE net is not available or inadequate."

Two of the points made in the ICL about the change to regional ALE nets include:

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

"HF stations should not routinely operate on ALE nets assigned to other regions, or the national net, unless required for operational missions or pre-coordinated testing. Organized tests and exercises between wings of different regions should be fully coordinated with the appropriate region and wing directors of communications."

Recently, I monitored a wide variety of Civil Air Patrol HF ALE frequencies using the PC-ALE software program The bulk of the activity originated from the National Command Level HF-ALE net mentioned above. Frequencies for the national net that I monitored included: 2011.0 3204.0 4477.0 5006.0 6806.0 7602.0 8012.0 9047.0 10162.0 11402.0 12081.0 13415.0 14357.0 15602.0 17412.0 19814.0 25354.0 kHz.

I did uncover what appears to be the first of the CAP Regional ALE nets from the CAP Middle East region (MER). Stations seen included: 034MERCAP 043MERCAP and 0204SCCAP. The frequencies for the potential MER ALE net include 4585.0 5447.0 6773.0 7665.0 and 7665.0 kHz, all USB.

So, in the near future if you notice changes in the CAP HF ALE operation, you now have a pretty good idea of what they are doing.

❖ Kentucky CAP Callsigns

If you monitor the Civil Air Patrol, here is a breakdown of the callsigns used by the Kentucky Wing of the CAP. The basic wing callsign used by this wing is *Kentucky CAP ####*. The wing callsigns are assigned in blocks of one-hundred call signs to each squadron as follows:

Squad	Callsign	Range
001	Wing Headquarters	0 – 99
007	London Composite	100 – 199
011	Paducah Composite	200 – 299
039	Louisville Composite	300 – 399
050	Boone County Composite	400 – 499
057	Bowling Green Composite	500 – 599
058	Centenary Composite	600 – 699
063	Frankfort Composite	700 – 799
073	Campbell County Composite	800 – 899
077	Golden Armor Composite	900 – 999
082	Jim Brewer Composite	1000 – 1099
122	Danville Senior	1100 – 1199
123	Kentucky Air National Guard Composite	1200 – 1299
131	Bardstown Composite	1300 – 1399
214	Bowman Senior	1400 – 1499
216	Fort Campbell Composite	1500 – 1599
217	Western Kentucky Composite	1600 – 1699
218	Fulton County Composite	1700 – 1799

Each squadron has reserved call signs in their block corresponding to the wing command structure and call signs. For Example "KY CAP 4" is the Wing Director of Communications. In the Fulton County Composite "KY CAP 1704" is assigned to the Squadron Communications Officer. The callsigns 0, 100, 200, 300, etc are assigned to the Wing and Squadron respectively for use with assigned equipment.

If you follow the CAP HF ALE side of things, the ALE address 0148KYCAP is located in Lexington, Kentucky.

BROADCAST BANDSCAN

THE WORLD OF DOMESTIC BROADCASTING

Doug Smith, W9WI
dougsmith@monitoringtimes.com
http://americanbandscan.blogspot.com

We pause for station identification...

Waiting for a station to identify has to be the most frustrating part of broadcast DXing. Murphy's Law seems to require your DX targets to fade out just as they announce their call letters. "This is W(buzzzzz), AM 980 in (buzzzzz), now back to The Music of Your Life." Wouldn't the DX Life be a lot better if stations were identifying continuously, 24 hours a day?

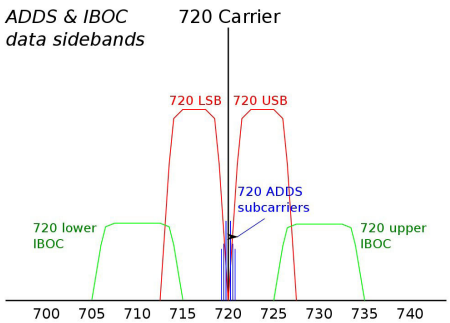
Many FM stations *do* identify continuously, using a data system called "RDS". RDS is a means of transmitting a limited amount of data over an *analog* FM broadcast. Information commonly broadcast includes call letters, the type of music broadcast (you can search for all country stations, for example), and the artist and song names of the song currently on the air. RDS only works on FM; AM stations have been left out.

Now, Ibiquity, the "HD Radio" people, has released an "AM Digital Data Service System Study Report." This report proposes a data system for AM radio similar to the RDS system available on FM.

The AM Digital Data Service (ADDS) proposes to allow the broadcast of:

- Station Name (call letters)
- Station Message (a text message of up to 158 bytes, about the same size as a cellphone text message)
- "ID3 tags" for the musical selection on the air (Those familiar with "CD-ripping" software or MP3 files will be familiar with this.)
- Commercial (including price, web address for buying the product online, description of the product, and a picture)

I know, I know. You just heard "Ibiquity" and "AM" and you're thinking "here we go again, more adjacent channel interference." Well, unlike HD Radio, the AM Digital Data Service will *not* cause adjacent channel interference. HD Radio operates in the space between stations: in practice, it operates on top of the stations on adjacent frequencies. (Thus, the hissing noise that makes some AM frequencies unDXable at night.) ADDS, on the other hand, operates within the station's current channel.



The spectrum plot shows how ADDS won't spill into adjacent AM channels.

ADDS proposes to go in a blank space at the *center* of the AM channel, between the station's two "sidebands." The ADDS data is separated from adjacent-channel stations by the ADDS station's own audio. Interference to adjacent stations simply will not happen.

I am not so sure the ADDS stations won't interfere with themselves, however. ADDS involves three data signals. One, at 181.5Hz either side of center channel, will be only 26dB below the carrier. On a 50,000-watt station, this means the main data signal will be transmitted at 250 watts. That's enough to be clearly heard within the station's coverage area. It is possible phasing techniques will be used to minimize this interference – though there are a number of variables that may make this ineffective.

❖ FCC Proposes Changes to TIS

Travelers' Information Stations – "TISs" – are low-powered AM stations offering information about road construction or congestion. They may also provide non-commercial information about tourist attractions (state parks, etc.). A station at the Nashville Airport broadcasts information about airport parking and pickup/dropoff of passengers. A collection of stations along Nashville's expressways provide drivers with information about construction, Amber Alerts, weather issues (snow & ice), and blockages.

FM-RDS provides a continuous station ID.

It appears some practices common among TISs are not particularly legal. I'm sure many of you have logged TISs rebroadcasting the local NOAA Weather Radio. One in the Houston, Texas area has been pretty widely heard, and it's hardly the only one. A recent FCC release notes that TIS WQGR42 in California was recently issued a Notice of Violation for relaying its local NOAA station. It seems the Commission doesn't feel routine weather broadcasts qualify as "Travelers' Information." Also apparently not permitted is the common practice of simulcasting the same program on multiple TISs.

A Notice of Proposed Rulemaking (NPRM) has been issued, at the request of several TIS operators. The primary question in the NPRM is "what type of programming should TISs be allowed to broadcast?" Some proposals:

- Relays of NOAA Weather Radio
- Amber Alerts
- Alternative emergency numbers when 911 is inoperative
- Homeland Security terror alert levels
- Public health information
- Civil defense information
- Information about 511 information services
- Or simply, the broadcast of any information of a non-commercial nature

The NPRM also asks whether it should be permissible to simulcast the same program on multiple stations. More generically, it's proposed to rename the service to the "Local Government Radio Service."

❖ LPFM Restrictions Relaxed

The *Local Community Radio Act of 2010* has been passed by Congress and signed by President Obama. The Act repeals a 2001 law prohibiting the FCC from allowing Low-Power FM stations (LPFMs) from using frequencies separated by 0.6 MHz from nearby "full-power" stations. Its enactment should make many new LPFM stations possible.

When the LPFM service was created, the FCC initially proposed to allow low-power stations on frequencies separated by 0.4 or 0.6 MHz from local "full-power" stations. After considerable lobbying by the National Association of Broadcasters, the FCC agreed not to allow 0.4 MHz separation, but they refused to change their mind on 0.6MHz. More lobbying resulted in Congress forcing the issue – enacting a law requiring the FCC to place 0.6 MHz separation off limits. As you might guess, this restriction greatly limited the number of possible LPFM stations.

The 2001 law created a rather inconsistent situation. You could install a 100-watt FM transmitter at a given site and get a license to operate

it on a given frequency, as long as you agreed to relay the broadcasts of some other station. If you wished to use the same transmitter, at the same site, and on the same frequency to originate local programs – you couldn't get a license for that.

An interesting (though not particularly unusual) clause in the 2010 Act requires LPFM stations to provide additional interference protection to "full-power" stations under certain circumstances. "Certain circumstances" means "...significantly populated States with more than 3,000,000 population and a population density greater than 1,000 people per one square mile land area..." You may not be surprised to learn only one state meets these criteria. (New Jersey)

The FCC will have to modify its rules and open a filing window before any new LPFMs can take advantage of this law. I suspect they will first accommodate existing LPFMs who've been bumped from their frequencies by full-power stations, or who are using frequencies where they're susceptible to interference from full-power operations.

❖ Proposal to Refarm TV Spectrum

With the conversion to digital, 102MHz of UHF TV spectrum (TV channels 52-69) was reallocated from television to land-mobile services. With the rapid growth of smartphones, that 102MHz doesn't seem to be enough: land-mobile is back for more.

The FCC is now looking at opening *all* UHF TV channels to land-mobile use, on a co-equal basis to TV. TV stations that currently exist will be protected from land-mobile interference, but new TV stations will be required to protect land-mobile operations. The Commission is looking at other steps to open more UHF channels for land-mobile. One option is to allow two or more stations to share channels. Another is to encourage more stations to use VHF.

Stations could volunteer to share their channel with another station. These volunteers would also receive a cut of the auction revenue. As you know, with digital TV, "subchannels" are possible; more than one program can be transmitted over a single station. From a technical standpoint, there is no reason you couldn't have two different companies broadcasting simultaneously over the same transmitter.

The FCC believes two HD stations could broadcast simultaneously over the same channel. (Some viewers and many stations would disagree. It's definitely *possible* but picture quality would suffer.) More than two standard-definition programs can share a channel.

Many TV stations have had problems using VHF frequencies. Big-box stores have been selling too many cheap "digital" antennas that are simply not capable of performing on VHF. The relatively low powers assigned to VHF digital stations haven't helped.

Many of these stations have moved to UHF frequencies. (WHDH Boston and WLS Chicago are two prominent examples.) These moves of course preclude the FCC from assigning these UHF frequencies to land-mobile. The VHF frequencies the stations are abandoning are not of interest to the land-mobile operators. (VHF antennas are too big.)

In order to discourage VHF-to-UHF moves, the FCC is trying to find solutions for improving the performance of indoor VHF antennas. Tests confirmed what most of us have suspected: popular indoor antennas are simply not designed to receive VHF signals properly. 70% of antennas tested performed more poorly than a simple dipole on VHF channels 7-13. Some were as much as 25dB poorer. On UHF, no antenna was worse than 6dB below the dipole; many were as much as 20dB *better*.

Neither the outside engineering firm nor the FCC's own laboratory even bothered testing these antennas on low-band VHF channels 2-6. The manuals for many of the antennas admitted they would not work on these channels.

The Commission proposes to require antennas comply with ANSI/CEA Standard 2032-A, "Indoor TV Receiving Antenna Performance Standard." This standard requires that the antenna be no more than 12dB worse than a dipole on channels 2-6, no more than 8dB worse on any other frequency.

I suppose the obvious answer to VHF's issues is a power increase. The FCC considered authorizing as much as a tenfold increase. Engineers, however, told them it would make little difference. The problem with VHF is noise, not weak signals. The Commission is likely to offer a power increase anyway.

Engineers did say stricter limits on spurious radiation from devices not designed to emit radio signals would greatly improve VHF reception on indoor antennas. However, the FCC is not willing to do so. They feel such a requirement would increase the retail price of consumer electronic devices, something they're not willing to do.

In my humble opinion, few network-affiliated stations will be interested in channel sharing. A few small independent stations may be interested, and in cases where a "duopoly" exists (two co-owned stations in the same market), they may consider merging and selling one of their channels back to the government. The VHF improvement proposals won't sway anybody – VHF DTV stations will continue to try to move to UHF. However, since the FCC can prevent these moves, it's quite possible we'll see them come to an end.

❖ 'Til Next Month

Despite very low powers, some Travelers' Information Stations have been DXed at considerable distances. Have you heard a TIS from outside your local area? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to *dougsmith@monitoringtimes.com.* Good DX!

URLS IN THIS MONTH'S COLUMN

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

www.fcc.gov/Daily_Releases/Daily_Business/2010/db1230/FCC-10-203A1.txt FCC proposal to modify Travelers' Information Service rules.

www.nabfastroad.org/AMDigitalDataSSSRpt.pdf Ibiquity report on AM Digital Data Service.

ftp://ftp.rds.org.uk/pub/acrobat/rbds1998.pdf The RBDS standard for data transmission on FM stations.

http://thomas.loc.gov/cgi-bin/query/D?c111:3:./temp/~c111V1XynN:: Text of the *Local Community Radio Act of 2010***.**

www.prometheusradio.org/ LPFM advocates comment on the *Local Community Radio Act***.**

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-196A1.doc F C C proposal to share UHF between TV and land-mobile.

STATION REPORT:

NEW:

Permits granted for new stations:

Bethel Heights, Arkansas 1340 1,000/1,000 ND (near Fayetteville)

CHANGES:

Frequency & location changes requested:

Wainwright, Alberta 1080 CKKY from 830; 10,000/9,000

Jeffersontown, Kentucky 1200 WGRK from 1540 Greensburg; 3,000 watts daytime-only.

Frequency & location changes granted:

Ten Sleep, Wyoming 1140 KZMQ from Greybull, a move of 37 miles northwest.

Stations deleted:

Daleville, Alabama 1560 WCMA

Prince Rupert, B.C. 560 CHTK going to FM

McComb, Miss. 1250 WHNY

Callsign changes:

Visalia, California	1400	KRZR from KEZL
Fort Walton Beach, Fla.	1400	WFDM from WZFN
Jacksonville, Florida	600	WBOB from WBWL
Leesburg, Florida	1410	WQBQ from WRHB
Dry Branch, Georgia	1670	WPLA from WFSM
Rossville, Georgia	980	WDYN from WUUS
Toccoa, Georgia	1420	WVNG from WLET
Honolulu, Hawaii	1500	KHKA from KUMU
Middleton, Idaho	1400	KXIV (new station)
Wendell, Idaho	1340	KXSL (new station)
Mesquite, Nevada	1250	KACE (new station)
Isleta, New Mexico	1510	KMYN from KABR
Niles, Ohio	1540	WYCL from WRTK
Midwest City, Okla.	1340	KGHM from KEBC
Alexandria, Virginia	730	WTNT from WXTR
Huntington, W. Va.	1200	WNBL from WRWB

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

BOATS, PLANES, AND TRAINS

Ron Walsh VE3GO
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The Benefits of Radio Monitoring

While listening to my HF radio gear, I can't help but reflect on the benefits the radio hobby has given me over the last 50 plus years. Not only have I heard some exciting radio traffic, but I have obtained a great deal of knowledge and information. Although I am not a technical expert, I have learned a great deal about electronics, antennas, propagation, etc. My involvement with radio regulations has allowed me to become an examiner for marine or amateur radio licenses. I still enjoy listening for a rare station or trying to work a faraway station on the amateur bands.

By far the greatest enjoyment from the hobby comes from the people you meet. An interest in radio is a common ground whenever you cross paths with people you would never have met otherwise. Mentioning my interest in radio or that I write a column for *MT* has often started a conversation with fascinating people and allowed me to visit places I might never otherwise have been able to visit – for example, getting to talk to a veteran who copied Japanese coded messages in the Pacific, and a memorable opportunity to visit ZBR Bermuda Radio.

While visiting New York City, I walked from Times Square to the harbor of New York. There I visited the marine museum exhibits aboard the aircraft carrier *Intrepid*. The guide I met on the flight deck (Roy Frederickson ex-K1FUE) was a non-active amateur radio operator, and he directed me to the area of the bridge where the radio equipment was. I found it interesting to look at the antenna set-up on this ship – something a private citizen can only dream about.

Alongside the *Intrepid* there is a submarine open to the public. This is an early missile launching boat and did not see much service. Because of this, the ship is quite intact and in great condition. Again, the guide was an ex-amateur and I had a brief chat with him. The radio room was quite well equipped, and I noticed some Collins gear I would have given anything to have owned when I was younger.

My marine background and radio interest led to two other interesting conversations of late. I interviewed Ken McConnell, the last lighthouse keeper at Main Duck Islands, west of Kingston. Besides getting some great historical information and exciting stories, I was able to discuss the radio equipment used at the light. It brought back memories of 2 MHz AM radio and VBH Kingston radio. I remember their regular weather reports from eastern Lake Ontario.

Ken mentioned the sequenced radio beacon on 306 kHz which he had accurately timed, as it was sequenced with several others on Lake Ontario. Like Loran, these are now all gone.

I recounted my story of listening to a conversation on the 415 MHz link when Queen Elizabeth and Prince Phillip decided to have a picnic on the island, while cruising on the royal yacht *Britannia*!

While having breakfast at a local restaurant, I met Ken Batsford, ex-VE2FV. Ken sailed on corvettes during the Battle of the Atlantic. We had quite a discussion about the radio equipment aboard, particularly the Marconi CSR-5 receiver and matching transmitter. I look forward to talking with him again.

❖ Marconi Marcom IV

I am always happy when someone contacts me about a previous column, especially if I have provided information useful to a fellow radio enthusiast. Jim Hastings, W2RFM, wrote about the Marconi Marcom IV AM marine transceiver I mentioned in the April 2010 issue. He has a similar radio and has it working. He was asking if I had any information about the radio.

Antenna array on the USS Intrepid.

Unfortunately, I am in the same state he is: the manual for this radio is missing. He contacted an ex-Marconi employee and I have contacted a retired service technician here in Kingston. Neither of us has been able to get any manuals, etc. for this radio. I again ask readers, particularly those interested in vintage marine radio equipment, to contact me through the magazine with any material or sources you may have. Like Jim, I have been able to get the radio working through the efforts of a friend, Dave, VE3HFX. However, both Jim and I would appreciate any technical data or possible source of information on the Marconi AM Marine radios.

❖ Working Amateur Marine Stations

I am fortunate that while working on the Canadian *Empress* or local tour boats I can talk on VHF to some of the vessels and stations on the Seaway. I must admit that I am always searching for contacts with amateur marine stations. Again, this is a good reason to get your amateur radio license.

You will be surprised what marine stations are heard on the amateur bands. This fall I had a contact with W7BU, which is the Light Ship *Columbia* – a permanent exhibit at the Columbia River Maritime Museum. The station, operated by the Sunset Empire Amateur Radio Club, can often be heard on 20 meters. More information can be obtained at the website for the museum, **www.crmm.org**. When the Amateur radio lighthouse Society has their annual weekend on the air, many rare lighthouses can be heard and a QSL card obtained.

Of course, the Maritime Mobile Service Net on 14.300 MHz USB is a great source of contacts. I have had the privilege of talking to Dave, KE5AAO/mm, aboard the Gulf Service in Angola West Africa on more than one occasion.

There are many museum ships which are on the air! One station that I have heard but not yet worked is HMCS *Onandaga*. This is a retired Oberon class Canadian Navy submarine that is moored at Rimouski, Quebec. Her radio call was CGNQ, and the amateur station set up in the ship's radio room is VE2GNQ. You can get information about the amateur station by looking up VE2GNQ at **www.qrz.com**. The station is operated by members of the St. Lawrence Amateur Radio Club. For information on the submarine visit the website **www.shmp.qc.ca/index.php?lang=en**

Along with this station there is another retired Canadian submarine which will become a museum ship in the near future. HMCS *Ojibwa*, which is another Oberon class submarine, retired in 1998, has been obtained by the Elgin Military Museum of St. Thomas, Ontario. The vessel will be moored in Port Burwell, Ontario, on Lake Erie, and will have an amateur radio station installed aboard. Her call sign was CZFQ and VA3ZFQ has been obtained for her amateur station. A local amateur in the Port Burwell area is also needed to sponsor the station. They are also looking for any old naval radio equipment

that can be displayed on the vessel.

If you are interested in helping restore the vessel or have any donations, go to the website **http://elginmilitarymuseum.ca?Project-Ojibwa**. To help or join the HMCS Ojibwa Amateur Radio Club, send an email to *VA3ZFQ@rac.ca*. The vessel will be towed from Halifax, Nova Scotia, to Port Burwell in the near future. You can bet that I will be monitoring the radio so I can get a photograph of the ship on her final journey up the St. Lawrence River. I also want to get on the air from this station. It would make a great future column.

Any marine enthusiast can get valuable information by monitoring the marine radio channels. I have just read where three more new vessels will be built overseas for the Great Lakes trade. I keep abreast of their progress and also watch to see which older ships will be heading for scrap. I can get some ideas of their travel times from the Internet, but actual times are best obtained from the marine radio.

In any busy waterway or harbor, you can monitor the traffic and see what ships are in that system. VHF channels 10, 11, 12 13 and 14 are the most commonly used traffic control channels. I have listened to traffic in New York, Boston, Halifax, Quebec City, Vancouver Victoria, and even St. Thomas USVI using some of the above channels. Even traffic for the small port of Rimouski Quebec can be heard on 156.425 MHz.

❖ The Beginning Listener

If you are just starting to monitor the marine bands, I offer the following suggestions. First of all, you will need a VHF marine radio or scanner to monitor the VHF marine frequencies. Remember, you cannot *transmit* on the marine radio if you do not have a license and are not aboard a vessel.

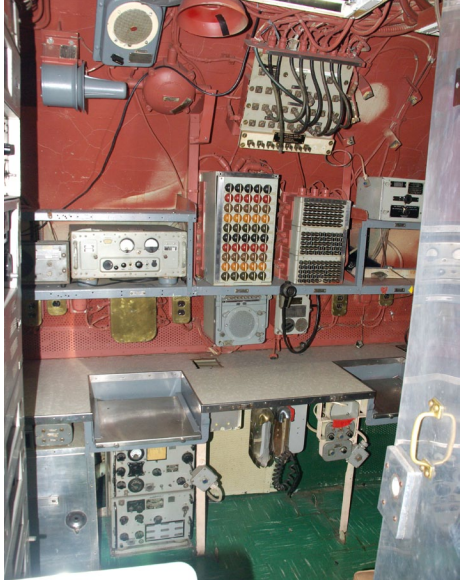
The most interesting channel is channel 16, as this is the marine calling and emergency channel. As Digital Selective Calling (DSC) becomes more prevalent, channel 70 will become more interesting. Although you will not hear the ship to ship calls, any mayday calls will activate your receiver, and then you will listen on channel 16 for the traffic.

As mentioned above, channels 10, 11, 12, 13, and 14 are the most common traffic control channels. Channel 13 is also reserved for communication between commercial vessels. Listen there and you will hear if any other channels are used as the ships move throughout the system. Channel 9 is used for pleasure craft to contact each other in US waters. A Google search can usually provide marine radio frequencies for any major harbor or waterway.

Don't forget to monitor the 450 to 460 MHz commercial band for internal communications aboard ship. This can be very interesting.

Emergency situations involving the Coast Guard can also be monitored. The United States Coast Guard mainly uses channel 22A. However, channels 21A, 23A and 81A can also be used. The Canadian Coast Guard mainly uses channel 82A, but has been heard on channel 65A.

Scanning the marine VHF band when in a port will also give you some channels for private vessel operators. Government publications



Radio room area on the Submarine Growler.

like the Canadian Coast Guard's *Radio Aids to Marine Navigation* give you the frequencies and broadcast times for Canadian Coast Stations. Both VHF and HF frequencies are provided. The new issue comes out in April of each year. There is an edition for the East Coast and Great Lakes as well as one for the West Coast of Canada. You can see an electronic edition at **www.ccg-gcc.gc.ca**.

For U.S. Coast Guard frequencies, check out **www.navcen.uscg.gov/** Also, a very accurate source of frequencies to monitor is the Utility World Loggings section in *Monitoring Times*. Since that column runs every month, you can accumulate quite a list of active frequencies.

Monitoring on Shortwave

For the beginning HF marine listener, there are several shortwave frequencies that are easy to monitor. All frequencies listed here are upper sideband (USB). 2182 kHz is the emergency frequency and calling frequency. It is easy to hear the Canadian and American Coast Guard stations here. Although there is not nearly as much traffic as in years gone by, you can still hear quite a few stations. The USCG uses 2670 kHz for its broadcasts, warnings, etc. Canadian East Coast Stations use 2598 and 2749 kHz, while the West Coast stations use 2054 kHz. Of course, my favorite catch is ZBR Bermuda on 2582 kHz.

The weather broadcasts are can be quite interesting during the winter and hurricane seasons. All are announced on 2182 kHz first. 6501 kHz is also useful for USCG computer voice weather broadcasts. Another distress frequency is 4125 kHz. I have noted this frequency shown on radios in programs about Alaska. Try monitoring this frequency and please let me know what you hear.

SAR (Search and Rescue) traffic can be heard easily on three frequencies. The Canadian Forces SAR teams use 5717 kHz. The United States Coast Guard aircraft and land stations can be heard on 5696 or 8923 kHz.

Equipment

Any good single sideband (SSB) receiver and a long wire antenna will provide excellent results. I use a Kenwood R-5000 here, along with the general coverage receivers in my amateur transceivers. I have had good results using my R-8 vertical antenna. Remember to keep your transmission lines as short as possible to avoid as much signal loss as you can.

When I travel to a marine active area, I take my marine handheld, my portable short wave receiver and my portable scanner. If I am driving, my amateur VHF mobile radio also has wide VHF coverage that I use for monitoring. Be sure to take your scanner if you go on a cruise. You will be surprised what you hear.

One very useful aspect of marine radios is that they have all the weather frequencies built in. Most of them have a button marked WX to activate this feature. They actually have ten frequencies. Weather channels 1 to 7 and 10 are for NOAA/Environment Canada weather radio transmitters. Weather Channels 8 and 9 are the continuous Marine Broadcasts from Canadian coast stations. Many of these frequencies are used to give the marine weather in coastal areas. Do not confuse weather channels 1 to 10 with marine channels 1 to 10.

I hope this helps get you started on monitoring marine activities in your area or when you travel this summer. In future columns, I will discuss the range of marine HF frequencies and some digital modes for you to try monitoring.

Please send your reports, information, and questions about marine radio to *ronwalsh@monitoringtimes.com* for sharing in the column. We'd also welcome your boat-related photography – I know I'm not alone in this passion! *73 de Ron, VE3GO*

GLOBALNET

Exploring the World of Internet Radio and Television

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The Digital Voice of the People

Along with you, I watched with amazement in February as the people of Egypt took freedom into their hands and revolted against the ruling government. This was the first great revolution of the modern digital age, and being the Internet geek that I am, I was interested to see what role the Internet would play in getting the message of the revolution out to the people.

You have probably heard the saying "everyone Tweets," and that phrase rang true during the Egyptian revolution. It was no surprise to me that Egypt's government pulled the plug on the Internet in the country, hoping to silence or diminish the effectiveness of the organizing forces in the revolution.

What they didn't plan on, though, was the resiliency of the people to adapt, and the willingness of others to step in to ensure freedom's voice was heard.

One way that citizens were able to circumvent the Internet block was by using older dial-up technology to access the Internet. Many of the numbers they were dialing to access the Internet were for services located outside of Egypt. Some of these were set up for the express purpose of giving revolting Egyptians an alternative method of communicating during the blackout.

Another way the block was avoided was by a service set up by Twitter and Google called Speak2Tweet. Users could call a number and leave a Twitter message that was translated from their spoken word, or they could hear messages from other users. Measures such as these made it possible to organize mass demonstrations and get the message of the revolution out to the public.

Another way that the Internet played a factor in this – and in subsequent protests that popped up in the wake of the Egyptian revolution – was access to Internet radio. Stations in Jordan and Yemen, as well as Egyptian radio stations once the block on Internet was lifted, were broadcasting programming over the Internet, including phone calls from citizens discussing their views and organizing protests. Thanks to the worldwide accessibility of the Internet, people around the world were able to hear these messages. This is one of the first times we have been able to see the unfiltered and instant voice of a people in revolt span the globe.

In addition to radio and social media, streaming video from the region was providing a bird's eye view to enthralled viewers around the world. One such streaming video source, Al Jazeera, had an English television broadcast link that was providing video from inside Egypt, even after their own reporters had been kicked out of the country. I initiated a search for streaming video content from Egypt and other countries with protests, using the streaming service TVU, and it popped up video streams with news and information from within several countries.

During the revolution, I posted links to streaming video and streaming audio sources from Egypt and other hotspots on the GlobalNet blog. As additional revolutions appear to be popping up across the Middle East and northern Africa, I will continue to post more links as they become available. As always, if you run across a streaming source, I invite you to share it by sending me an email with a link!

The Great Mobile Push

I have previously addressed the effort being made to enhance the availability of Internet Radio and other Web-enabled apps in mobile and in-car applications. Some recent developments confirm the push, but indicate a slight change in the method by which it will be achieved.

Pandora is already appearing in vehicles made by Ford and Toyota, and recently the user-driven music service even went public with their IPO. Toyota's Entune in-car, Web-based system will give drivers the ability to listen to music, make dinner reservations, and more.

The current issue that some users will face is that currently, the Internet is accessed in these systems by a Bluetooth connection to the user's smartphone. This means that the user must have cellular network access in order to be able to use the in-car services.

That could prove costly, as cell providers such as AT&T have already begun to put a restriction on data usage. The network stopped offering unlimited data plans within the past year. The most generous data plan has a 2GB per month limit, beyond which the user is charged $10 for each additional 1GB of data usage.

The change in billing structure may spread even wider: there is growing sentiment among both cellular and home service providers to make customers pay for their service based upon usage. Canada has already approved metered-billing for ISPs there. Users of Bell Canada (including those ISPs that get their Internet through Bell Canada) will be charged a per-gigabyte usage fee. For those users who access the Internet primarily for email and casual surfing, this change should be negligible. However, for those who use the Internet for streaming content (including audio and video), online gaming, and other high bandwidth usage, the costs could add up quickly.

This is happening at the same time that there are efforts being made by the Obama Administration to expand the wireless Internet access in the United States to 98 percent of all Americans within five years. The extra wireless spectrum is expected to come from "more efficient" government management of the spectrum as well as "voluntary incentive auctions" in which broadcasters and license holders give back portions of their spectrum allotment back to the government for wireless Internet use.

Should the government be successful in expanding wireless internet access, the burden should be lessened on bandwidth for home and cell phone ISPs, thereby making data use restrictions unnecessary. But, for those of us looking to expand our wireless coverage for Internet Radio use, this remains something to watch.

Another aspect that might help alleviate the data-use burden might come from new technology. Cellular providers have been dropping hints in recent months about patents and other clues that some form of satellite radio may be coming to mobile phones. For example, rumors are floating around the Web that a satellite radio chipset will be coming to Apple's iPhone in a future edition. This would enable a service such as Sirius/XM to put their satellite radio service directly to a user's iPhone.

A new patent filed by Verizon indicates this may be more than just an idle thought. The patent attacks a glaring hole that traditional cellular coverage faces when using mobile entertainment apps: drop zones, those dreaded, "dead" areas where cellular coverage seems to vanish in thin air. The patent seems to point to satellites as a means for overcoming these dead zones when it comes to radio and other bandwidth-hogging entertainment options: *"The system and method therefore provides for the delivery of customizable on-demand content to a consumer's mobile device with the stable and wide-ranging connectivity of satellite radio."*

Think of the larger-picture implications that a move like this could make! We already have satellite phones, but a combination satellite/wireless hybrid, that uses satellite coverage for data transmission as well as filling in the holes in drop zones…? A device like that could revolutionize the mobile data and entertainment industry completely. That same technology could then even be implemented into vehicle dashboards,

providing Internet access to drivers, no matter where they are.

One thing is for certain: the overall message from consumers has been that they want information and entertainment to be portable enough to take it with them, no matter where they are. If the dollar signs are there, companies will find a way to make this happen. It is just a matter of time.

So, one day you may be listening from California to a radio station in Turkey through a satellite data connection provided by a device that you hold in the palm of your hand, that also is your phone, music player, Internet browser, personal organizer, and more.

The future is bright, and it is portable!

❖ Reciva Remote App

My first experience with WiFi radio came in the form of a Reciva-enabled WiFi radio. I like the interface, but in order to change radio stations, you really need to be at the radio, due to the small size of most Reciva-enabled WiFi radio display screens.

Sure, you could use the included remote that comes with many of these devices, but unless you have the eyes of Superman, you still have to be close enough to the radio to read the menu display.

That is, until now. Reciva has released an app for iOS devices that enables you to control a Reciva-enabled WiFi radio in much the same way you would from the radio itself.

Actually, it is even easier. This new remote control actually feels a lot like the RadioTime interface, which I have always found to be a little easier to navigate, especially if you are searching by station location.

To use the remote application, your Reciva-enabled radio has to be on a certain firmware (V257-a-865-a-348) , and even then, some units don't support the remote app (it doesn't seem to work with my Sangean WFR-1, even with the latest firmware). It also says that you need to have "wireless standby" enabled on your radio for it to work. Well, if you want to use the app to power the radio on or off, this is true. However, I have been testing the app with the C. Crane WiFi radio without wireless standby enabled, and it works fine once you turn the unit on initially.

The app-based remote control isn't a first for Reciva; Grace Digital Radio also released their own remote control app for their Reciva-enabled radios. Their Reciva app works on most other Reciva-enabled radios not made by Grace.

Using the app is relatively easy. After launching the app, it will try to find any Reciva-enabled radios you have available. Once connected, you are able to program presets, navigate stations, and essentially perform any menu activity that you would normally be able to do on the radio itself.

One function I would have liked to have seen included is a search icon. I did find a search box on the menu under "stations," which is a huge improvement over searching through the radio's interface. However, a specific icon to search for stations would have been a nice touch.

Another useful feature would be the ability to record audio from the radio onto your iOS device. Since the stream isn't technically being routed through the iOS device, it may not be technically feasible, but it would be nice to have.

Other than that, the remote app doesn't leave you wanting for features. Everything is there in the app that you would find on the radio.

All-in-all, if you have a Reciva-enabled WiFi radio that is connected to your wireless network, and you have an iOS-enabled device, the app is worth a look. Do some research to make sure your WiFI radio is supported before making the $5.99 purchase. The Reciva Remote App is downloadable in the iTunes App Store, but doesn't appear to be available yet in the Android store.

❖ Blog and Podcast Update

In order to best focus my energy on this column, as well as provide up-to-date information on the blog, I find I am going to have to shelve the GlobalNetCast. It was taking a considerable amount of time to put together, and with a full-time job outside of my GlobalNet efforts, it just wasn't the most productive use of my limited time.

Someday I may be able to resume the podcast and make it even better. But in the interest of providing the best and most informative content I can, I would rather sacrifice the podcast than the blog.

I want to thank each of you that has been visiting the blog, as well as the Facebook fan page. The hit counter is starting to spin a little quicker, and the feedback I am getting from all of you has been helpful and supportive!

As always, you can email me at *loyd@globalnetmt.com* or *loydvanhorn@monitoringtimes.com* if you have any feedback, questions or contributions for the blog or column.

GLOBALNET LINKS

Your next car radio will be downloadable - **http://money.cnn.com/2011/01/27/autos/download_car_apps/**

Will Internet radio kill the FM radio star? - **www.foxnews.com/scitech/2011/01/19/internet-radio-fm-pandora-streaming/**

Usage-based billing a threat to Internet Radio - **www.radiosurvivor.com/2011/01/31/usage-based-billing-a-threat-to-internet-radio/**

Obama unveils wireless Internet expansion plan - **www.nytimes.com/2011/02/11/us/politics/11obama.html?_r=1**

Verizon patent hints at satellites in the future of smartphones - **http://seekingalpha.com/article/252529-verizon-patent-proves-internet-radio-is-no-threat-to-sirius-xm**

Egyptians find a way to maintain Internet presence despite blackout - **www.emergency-email.org/newsemergency/anmviewer.asp?a=880&z=1&ref=fem**

Reciva remote app in the App Store - **http://itunes.apple.com/us/app/reciva-remote/id382727519?mt=8#**

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.com

Spring Chores

The month of April – at least here in North America – typically heralds a "change-over" in longwave conditions. There's still plenty of DX to be heard, but natural static (QRN) will soon be on the rise, and we'll have to cope with digging out signals that were crystal clear just a month or two ago. While conditions may become more challenging, April is also a good time for planning outdoor antenna projects and for making repairs following the ravages of winter.

The tasks of re-securing cables, fixing connections, or trimming branches are best performed now, rather than in the middle of winter. While I have witnessed snow in Western New York as early as late September and as late as mid-May, most years we can count on at least some good-weather days once April arrives. Let's hope that's the case this year!

The following are some points to check after the long winter to be sure you're ready for a new season of longwave monitoring…

Cable Entrance Points

The point at which your antenna feedline, ground, and control cables enter your home is an especially vulnerable area. No matter how good a grade of sealant you used, it is subject to drying out and/or pulling away from wall surfaces. Give special attention to this area, and re-seal it as necessary.

It's also a good idea to arrange outdoor cables with a "drip loop" in them so that rainwater running down the wires encounters an "uphill" portion of several inches just before entering the wall. In this way, rainwater will run off the lowest point of the loop instead of rushing against your outside wall where, chances are, it will eventually find its way inside.

Ground Connections

It won't be long before lightning storms will be on the minds of many of us. While nothing can protect against a direct strike of lightning, a good ground is an essential first step in protecting your equipment, and making your installation safer.

Inspect all ground clamps to make sure they are clean and tight, and ensure that all ground wires are connected to a single ground point – preferably with no splices. As with most cabling, ground wires should be as short and direct as possible.

An excellent booklet on the subject of grounding is *The Grounds for Lightning and EMP Protection* which was published several years ago by PolyPhaser Corporation and is still sometimes available at online used booksellers and auction sites.

Antenna Feedline Connections

Outdoor connections are among the most vulnerable links in an antenna system. The wind, snow, rain, and ice all take their toll, in addition to baking sun. Take a close look at all of your antennas to see if the coax or feedline attachment point is in good shape and weather tight.

Don't want to leave the ground to do your checks? Binoculars can be a useful inspection tool.

Anchor Points & Support Ropes

Several years ago, I came to believe that the annual re-hanging of wire antennas was a normal and expected activity. That was before I started using black Dacron rope and a halyard/pulley arrangement at the end of my wire antennas. What a difference this little bit of extra effort can make! The Dacron rope is highly resistant to sun damage, and the pulley/weight arrangement allows an antenna to sway gently in the wind, with the counterweight rising or falling as necessary to keep a constant tension.

For a pulley, you can use one of the types made for outdoor clotheslines or marine use, and your counterweight can be fashioned from a plastic jug filled with sand. I've had a dipole antenna up for seven years with this stress-relieving arrangement, and I recommend it highly. Check your favorite radio supply house and hardware store for the items you need to build or repair an outdoor antenna. Universal Radio has an excellent selection of supplies at **www.universal-radio.com/catalog/antsup.html**.

Tidying the Shack

OK, I know this is supposed to be about outside work, but every now and then, it becomes necessary to "clean house" in the radio room itself. This point was driven home to me recently when I prepared to get on the air with my trusty Heathkit DX-100 transmitter for an AM net. I don't fire up the old rig very often, but when I do, I usually just apply power, touch up the antenna tuner for the band I'm on, and away I go.

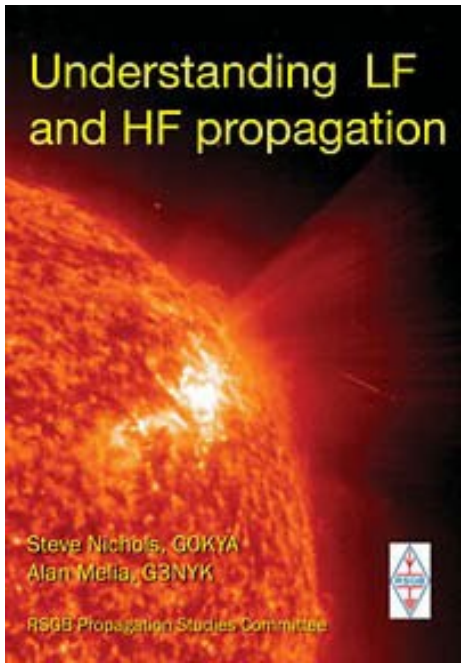
This day was different. The wattmeter wasn't showing any power, and the usual relays were not activating. After a bit of troubleshooting (and missing the check-in period for the net), I discovered that several coaxes in my shack had been switched around to accommodate a temporary set-up weeks earlier. I had forgotten exactly what was changed, and as I looked at the maze of wires, I decided it was time to "start over" with my shack wiring. As *Lead the Field* author Earl Nightingale would say, this was a case of "constructive discontent" and it prompted me into action.

I removed all rigs from the table, cleaned the surface to get rid of the considerable dust build-up, and then proceeded to reinstall each rig, neatly re-wiring, re-dressing, and labeling all of my cable runs as I went along. What a liberating experience this was! Everything works fine now, and if a problem does develop, I'll be in a better position to resolve it. I plan to follow up with a basic drawing of all cabling, which I'll file away with my station records for future reference.

I even established an "AUX" position on my antenna switch, which is wired to a spare area on my table where I can set up a "theme" station for temporary use (Antique, military surplus, QRP, homebrew rig, etc.) and then rotate it out for something different when I'm ready for a change. Getting things in order *inside* goes a long way toward improving your on-air experience, whether chasing longwave beacons or working HF DX!

❖ Learn LF Propagation – Free

An electronic book is available for immediate download called *Understanding LF and*



This useful eBook is available for download right now

AP/378 kHz, Mayne_Island, BC

HF Propagation by Steve Nichols, G0KYA and Alan Melia, G3NYK of the Radio Society of Great Britain's (RSGB) Propagation Studies Committee. The book is based on a series of articles that Steve and Alan wrote on LF and HF propagation for the RSGB's *RadCom* magazine in 2008-09. It includes three features specifically focused on LF. You can download your free copy of this book at **http://tinyurl.com/LW-Propag**.

❖ Mailbag and Loggings

Brian Chapel, VE7AUL, writes: "I enjoy your column and have made extensive use of the *BeaconFinder II* directory that you publish. In the November issue of *MT* you asked for reports of INE-521. It is one of my regulars here in Victoria, BC. My log indicates that it was one of the first ones I heard when I got serious about longwave in 2007, but I know I occasionally heard it at the bottom of the MW band on an old car radio well before that. Most of my listening is now done with a Wellbrook ALA-1530 receiving loop. In 2007 it was probably feeding my Icom R75 equipped with 2 CW filters.

"Before reading your article I did not know that the number of complete IDs is a 'fingerprint' for each beacon, so I have not been logging that characteristic. Checking INE this evening I got 8 IDs every 64 seconds or 7.5 IDs per minute. From my QTH the distance is 686 km. For a 400 Watt beacon that's not exactly a fabulous catch. I'm sure some of your other readers have done better with this one.

"Thanks for the information on AOP in the January issue. Unfortunately, I never caught that one, possibly because of YYF in Penticton, BC. So far I have heard 228 NDBs, 27 DGPS stations, 7 NAVTEX stations, 1 ham, and 1 broadcaster on longwave."

Great to hear from you, Brian. Indeed the "fingerprint" technique I described in the November issue is a useful tool for positively identifying a beacon. Each beacon sends its ID a prescribed number of times per minute, and you can only determine this by listening to the transmission and recording the number of *complete* IDs in a 60 second period.

A few years ago, I had a reader submit some utterly amazing DX loggings made by antique (ancient, really) longwave receivers. At first, I just accepted the validity of these logs, as I tend to be a trusting person. However, I soon got a tip-off from another DXer that this individual had tried to pass off similar loggings to him and he felt all were hoaxes.

Well, to invoke the saying of Ronald Reagan, I decided to "trust, but verify" the loggings. I asked the submitter to provide audio recordings of them, but he never did, and I have not heard from him since. Looking back, I could have just requested the ID timing, which would have been nearly as good as the audio recordings, but I didn't think of it at the time.

John Leonardelli, VE3IPS (ON) furnished the loggings for this issue. He uses a WiNRADIO G31DDC Excalibur receiver with a ***pa0rdt-Mini-Whip***, Burhans active whip, Burhans active loop (like the one we described here last year). The unique thing about John's loggings is that they show distance and bearing information from his location. This is very useful information for anyone trying to understand the impact of a particular logging.

Incidentally, I will be reviewing the ***pa0rdt-Mini-Whip*** antenna in an upcoming issue of *MT*. I received a sample from the maker of this antenna, but it was placed on the back shelf while I completed the loop antenna project during much of 2010. Watch for more on this compact active antenna.

TABLE 1. NDB LOGGINGS FROM ON

Freq	ID	State/Prov.	City/Dist/Bearing
201	ZXU	ON	London/55 mi/269°
207	FD	ON	Brantford/22 mi/284°
216	CLB	NC	Wilmington/624 mi/169°
221	HM	ON	Hamilton/8 mi/358°
245	YZE	ON	Gore Bay/240 mi/328°
248	KZ	ON	Buttonville/73 mi/27°
257	TZ	ON	Gibraltar Point/52 mi/36°
263	YGK	ON	Kingston/192 mi/61°
266	ZHM	ON	Hamilton/14 mi/46°
272	YQA	ON	Muskoka/145 mi/14°
332	YFM	QC	La Grande 4/794 mi/19°
335	ZKF	ON	Kitchener/37 mi/337°
341	ZLP	ON	Toronto/ 45 mi/17°
351	YKQ	QC	Waskaganish/589 mi/5°
362	SB	ON	Sudbury/256 mi/350°
366	YMW	QC	Maniwaki/297 mi/41°
368	ZYZ	ON	Toronto/48 mi/28°
375	7B	ON	St. Thomas/58 mi/255°
379	YPQ	ON	Peterborough/114 mi/42°
382	XU	ON	London/62 mi/276°
385	3M	AB	Drayton Valley Industrial/1739 mi/306°
385	ZDH	ON	Rexdale/ 55 mi/23°
391	OO	ON	Oshawa/84 mi/41°
397	ZHA	ON	Ancaster/14 mi/354°
403	ZTO	ON	Woodhill/53 mi/16°
404	YSL	NB	St. Leonard/658 mi/60°
407	ZHU	QC	Hauts-Bois/374 mi/59°
408	SN	ON	St. Catharines/39 mi/75°

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
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Realigning a Superhet

This month I have to interrupt our Philco restoration project because of a brush with Mother Nature. In the aftermath of our big February blizzard here in the Midwest, I ended up with a broken wrist. I didn't notice that what appeared to be an innocent damp spot at the top of our front steps was really a sheet of black ice, and down I went!

For the first few days I wasn't able to type, but then the doc gave me a fabric brace that allowed the use of my fingers. No cast necessary, luckily, but I was still in no shape to continue the restoration work on the Philco. So, I'm substituting this realignment article which doesn't require any bench work. I should be back with the Philco next month.

Although we have performed realignments on almost all project radios handled in this column, these have usually been done according to the manufacturer's instructions for the specific model without further comment. But there's a lot to be learned about radio alignment from a generic point of view, which would include details taken for granted in the necessarily brief service notes – which are written for the experienced repair technician.

I'm not sure if we have already run a column on generic alignment in *MT*. But if we have, it was some time back and is worth repeating now. This column will focus on the alignment of broadcast band AM superheterodynes – which are the most common receivers you'll be running into in your restoration adventures.

❖ What is Realignment?

Realignment is essentially the tweaking of all of the tuned circuits in a receiver for maximum response at their appropriate frequencies. This is done by adjusting small capacitors – or sometimes inductors – known as trimmers. The physical location of these adjustment points is always shown in the manufacturer's service notes – though they will be obvious in the simpler broadcast band sets.

Before we talk about making any adjustments, let's look at the tuned circuits in a typical AM receiver (Figure 1) and see how they function. The radio signals enter the set through the antenna, and the station of interest is selected by tuned circuits TC1 in the r.f. amplifier stage and TC2 in the mixer stage. Often there is no r.f. amplifier and TC1 is eliminated. The local oscillator, tuned by TC3, produces an internal radio signal that is combined, in the mixer, with the signal coming in from the antenna (or r.f. amplifier if present).

What happens in the mixer is at the heart of the action of a superheterodyne receiver. In the mixer, the incoming signal is combined with the internal signal from the oscillator to form two new signals that are the sum and difference of the two original signals. The sum signal is not used, but the difference signal, called the intermediate frequency, is amplified in the intermediate frequency amplifier stage, tuned by TC4, TC5, TC6 and TC7 – which are located in the two i.f. transformer cans.

TC1 (if present), TC2, and TC3 are a ganged variable capacitor of such design that the difference signal, commonly 455 kHz but sometimes lower in earlier sets, remains constant across the entire tuning range of the radio.

There are two advantages in amplifying with a constant intermediate frequency signal. First, amplification is much more efficient at lower frequencies – and the intermediate frequency *is* significantly lower than the frequency of the incoming signal. Second, amplifying at a single constant frequency is much more efficient than amplification at varying frequencies.

❖ Required Instruments

Superheterodyne alignment requires just two basic instruments: a signal generator to produce test signals and some sort of meter or other indicator to show the strength of the audio produced by the radio in response to the test signals. Of course the signal generator must be able to provide the accurate test frequencies required to adjust all the tuned circuits in the radio, ranging from less than two hundred kHz for the i.f. channel in some of the older sets to 30 MHz or more for the oscillator and r.f. stages of a shortwave receiver.

The signal produced by the generator must be capable of being audio modulated (usually at 400 kHz) so that its strength can be easily measured on an indicating device. It also must have circuitry for control of the amplitude of the test signal over a wide range.

For reasons to be discussed, the test signal amplitude must be kept as low as possible while still registering on the indicating device. But, when bringing a long-neglected tuned circuit back into adjustment, the observed signal strength can easily increase many-fold and will have to be attenuated. To handle such a large control range, many generators have a multiposition switch for coarse amplitude control as well as a potentiometer that provides fine control at any switch position.

Depending on how it is connected to the radio, the signal strength indicator can be one of the a.c. scales of a multimeter or vacuum tube voltmeter or one of the d.c. scales of a vacuum tube voltmeter.

❖ Connecting the Indicator

Looking at Figure 2, a partial schematic of the little Majestic receiver we recently restored, the a.c. meter could be connected directly across the voice coil of the loudspeaker or it might be connected, on the other side of the output transformer, from the plate of the 50L6 output tube to ground. In the latter case, there must be a series capacitor in the circuit (perhaps a .01 or .05 uF) to keep the d.c. from the plate circuit out of the meter.

Alternatively, one could use the d.c. scale of a vacuum tube voltmeter (vtvm) to measure the voltage across the radio's automatic volume control (avc) line. Virtually all superheterodynes have avc. Its purpose is to smooth out the audio response of the radio to avoid, say, blasting by a strong station as one tunes it in with the volume still set for a much weaker station.

The way avc works is that a rectified negative voltage from the audio signal – in this case taken from plates 4 and 5 of the 12SQ7 (still looking at Figure 2) – is fed back through the 3.3 Meg coupling resistor R3 to the grids of the r.f. tubes. Only one of them, the 12SK7 i.f. amplifier tube, is shown here.

The stronger the signal, the stronger the

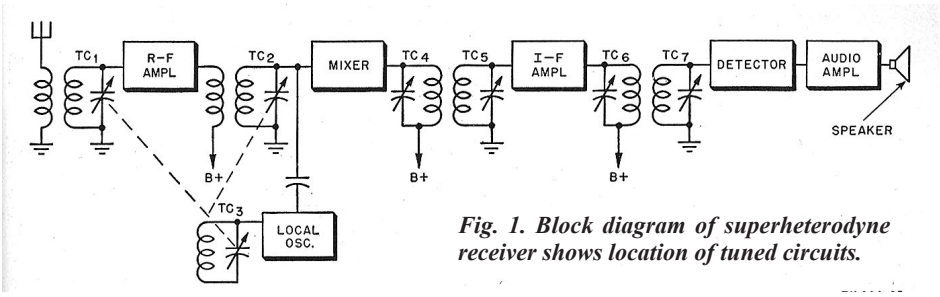

Fig. 1. Block diagram of superheterodyne receiver shows location of tuned circuits.

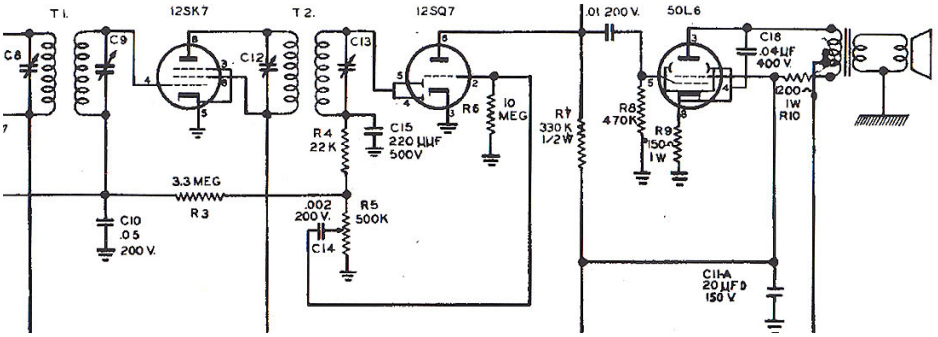

Fig. 2. Partial schematic of our recently-restored Majestic receiver shows locations where indicating meters might be connected (see text).

negative voltage on the grids, and, therefore, the lower the amplification of the tubes. As you can see, this would have the effect of smoothing out the volume differences between stronger and weaker stations as the listener tunes across a band of frequencies.

Since the negative voltage on the grid of, say, the i.f. amplifier tube is higher for strong stations and lower for weaker ones, a measurement of this voltage is an excellent indicator of signal strength. A meter of high sensitivity is required to make this measurement. Most often used is a vacuum tube voltmeter, which has the required very high input impedance. A modern digital voltmeter would also do the job, but it's much easier to watch the movement of a needle as an adjustment is maximized than to interpret the jittering numbers on a digital display.

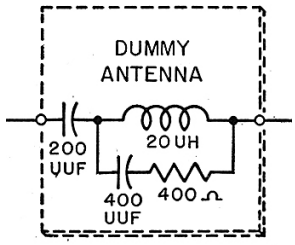

Fig. 3. Schematic of a standard dummy antenna,

Because of the action of the avc, any test signal injected into the radio must be set to the minimum that will register on the indicating meter. Should the signal be strong enough to actuate the avc, then the response to the adjustment of any trimmer will be smoothed out and a proper peak will not be observed. As the adjustment of the trimmers increases the audio response of the receiver, the attenuation controls should be operated to reduce the audio to the original minimum.

If the signal strength indicator is a meter connected to the speaker or the final audio tube, the volume needed to register properly on the meter might be uncomfortably loud even if the signal strength isn't high enough to engage the avc. This can be quite distracting and annoying. For that reason, it is usually preferable to measure the negative voltage on the avc line. This is the method we'll assume for the rest of our discussion.

The control grid of an i.f. tube is a convenient spot to connect the vtvm. And since this circuit point precedes the audio stages, the volume can be set at a minimum without interfering with the measurements.

❖ I.F. Alignment

Since the job of the early stages of a receiver is to produce, for amplification by the i.f. stages, a signal of exactly the specified i.f. frequency, the i.f. stages are the first to be adjusted when undertaking an alignment. Then the earlier stages are adjusted to produce a signal of the exact frequency to pass properly through the i.f. stages.

The service notes for the radio will specify the circuit point at which the signal generator is to be connected for i.f. alignment. Typically the hot lead of the signal generator is to be connected to the signal grid of the mixer through a small (about .001) capacitor and the ground lead to the radio chassis. And it should be mentioned that if the radio is an a.c.- d.c. set like the little Majestic we are using as an example, it should be powered up only through an isolation transformer to avoid a possible serious shock hazard from contact with the chassis or other metal parts.

With the signal generator and vtvm connected to the radio and power applied to all instruments, tune the signal generator to the i.f. frequency, set it for audio modulation, and wait perhaps 20 minutes for the temperatures to stabilize. The i.f. frequency, which is typically 455 kHz, will be found in the radio's service notes.

After warm-up, increase the signal generator amplitude until a comfortable reading is obtained on one of the lower voltage scales of the vtvm. Then adjust the i.f. trimmers (C8, C9, C12 and C13 in Figure 2), which are accessed through holes in the top of the i.f. transformers, for maximum signal strength. Adjust in the order specified in the service notes and continually reduce the signal amplitude to the original low vtvm reading as your adjustments maximize the output.

❖ Oscillator and R.F. Alignment

After the i.f. alignment is completed, the oscillator alignment is next, followed by the r.f. alignment. The method for introducing the test signal into the receiver for these tests depends on whether the set has a loop antenna or antenna and ground posts. If it's a loop antenna, the service notes will often specify that a wire loop of two or three turns, about 12 inches in diameter, be placed parallel with the loop on the radio and perhaps a foot away. The hot and ground leads of the signal generator are connected across the ends of the wire loop. This arrangement feeds the test signal into the radio by induction.

If there is no built-in antenna and the radio has antenna and ground posts, the service notes may specify that the signal generator be connected to the posts through a standard "dummy antenna." A schematic of a dummy antenna is shown as Figure 3. It is simply a little network that makes the generator look, electrically, like an outdoor wire antenna. Otherwise, the notes may simply ask that a simple capacitor or resistor be placed in series with the generator hot lead.

Tune both the signal generator and the receiver to the test frequency specified in the service notes. It will be at the high end of the band – perhaps 1500 kHz. Increase the output of the signal generator until you just see a minimum comfortable reading on the vtvm. Now adjust the oscillator trimmer (refer to service notes for location) for maximum output. Then locate the r.f. trimmer or trimmers and adjust them for maximum output also.

If the set has an oscillator padder, set the signal generator for the specified adjustment frequency; it will be at the low end of the band – say 600 kHz. Tune the receiver to the spot (in the vicinity of 600 kHz) that gives maximum output. Don't be concerned if it is not the exact frequency of the signal generator. Now adjust the padder for maximum output. Repeat the procedure, alternately adjusting the tuning dial and the padder.

This process, called "rocking," locates the point where the combined effects of the padder and tuning dial adjustments yield the maximum output. Once it's done, go back and check the high-end adjustment (at 1500 kHz in this example), because it may have changed a bit.

This completes our once over lightly look at AM broadcast receiver alignment. With this in hand, you will be in a better position to make the good use of the manufacturer's service notes for the alignment of your own project receiver. See you next month when, hopefully, we'll be returning to our Philco restoration project.

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Up In The Air

Height above Ground vs Antenna Performance

Of all the enjoyment I derive from writing this column, nothing matches the delight of getting "fan mail." My readers send me pictures of their antennas, tell me how my two cents' worth has inspired them to try stealth or other unconventional antennas of their own, quiz me on the fine points of constructing the antennas I've described, and pass along questions they have about antenna operation, which in all humbleness I try to answer the best I can. My readers are a bright and perceptive bunch, too – they come up with really good queries about antenna construction, performance, and theory.

Recently I received such a question via E-mail in regard to my November column, where I described a couple of dipole designs made from ladder line. (See "Stepping Up in the World," November 2010.) My correspondent had an excellent question about the "shortened folded dipole" and its performance on 80 meters. She noticed that although the very short antenna *loaded up* well on 3.5 MHz, its *range* was very limited – and that yours truly didn't seem surprised by that. In essence, her question was this: If the dipole loaded up on 80, why didn't it have good *DX* performance?

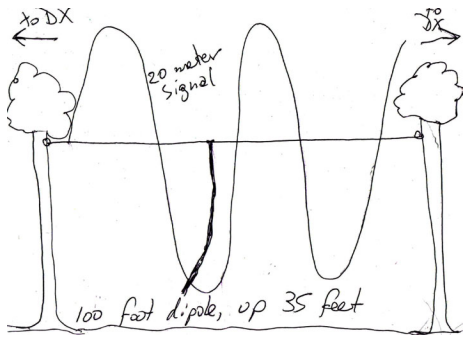
In the process of answering Judy's well-framed question, I realized that this is one area of theory I haven't gotten around to talking about – how the performance of various antennas is affected by their *height above ground.* So, this time around, we'll take a look at this essential aspect of antenna science.

❖ What Constitutes an Obstruction?

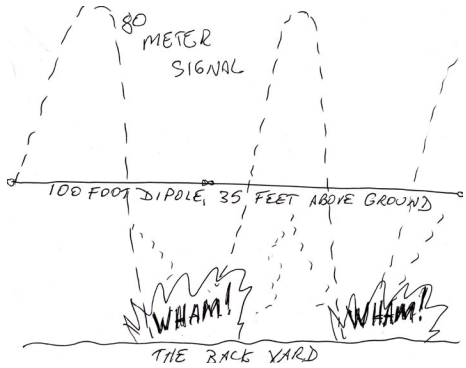
As I look back over 40-plus years of hamming and SWLing, I notice a persistent refrain in antenna advice: get the thing "in the clear" as much as possible – that is, above and/or away from buildings, trees, etc. I don't know about anyone else, but I think that in my case this produced a mindset that depicted antenna performance being drastically degraded by nearby trees and buildings, as though these objects were absorbing the radio energy before it could leap to the sky! Of course, there is *some* truth to this view – nothing is as grounded as a tree, and a house is not only grounded but full of metal, too.

But, on the other hand, radio waves do pass rather effortlessly through the roof and walls of a house, as anyone "stealthing" with an attic dipole knows. And trees, after all, are the primary supports on which most of us erect our dipole, loop, or longwire outdoors. No, these items cannot be honestly faulted as major obstructions to the antenna-to-sky transition.

One major impediment does exist in this scenario, though – the ineluctable laws of physics. "In the clear" is one thing, but *height above ground relative to wavelength* is EVERYTHING.



Look at the first drawing. Here we have a 100 foot long dipole that is 35 feet above ground and is being operated on 20 meters. 35 feet is more than a half-wavelength at 20 meters – so the entire wave is above ground level, departing the antenna unimpeded and bound for Kazakhstan or Antarctica, hopefully.



In the second drawing, we see the same dipole 35 feet above ground, now being operated on 80 meters. But, a half wavelength at 80 meters is 135 feet, so the wave "crashes" into the ground. Instead of leaving the antenna in a nice orderly manner like the 20 meter signal, the 80 meter signal bounces off Mother Earth and straight up into the air. (Older operators call this process "cloud burning.")

I realize this is a gross oversimplification, but it demonstrates a basic point: You cannot work around the basic limitation that a given frequency has a given wavelength – and the lower the frequency is, the longer the wavelength will be. The Earth is a cold, cruel, unforgiving reflector of radio waves that crash directly into it from nearby.

❖ Getting a Better Angle

Maybe the following visualization will help. When you make a bank shot on a pool table that is *across* the table – from one side to the other – the cue ball bounces off the far rail at an *acute* (less than 90 degrees) angle, and comes back to the shooter's side, not far from where the shot was made. But when you make a bank shot along the *length* of the table, the cue ball bounces off the far rail at an *obtuse* (greater than 90 degrees) angle, and the ball travels even farther down the length of the table.

The far rail is the ionosphere, the cue ball is the signal, the shooter is the dipole. The short, across-the-table shot is from a dipole low to the ground, while the long shot is from a dipole high enough above ground that the signal doesn't reflect off the ground, but instead heads for the horizon and bounces off the ionosphere on a much longer trajectory. Having the dipole high enough to avoid ground reflection, then, becomes the whole basis of this idea.

Now, this short path from a low dipole is not necessarily a bad thing. I've pointed out before that, for a net operator, for example, this set-up may be ideal; local and regional coverage – largely omnidirectional in nature – is produced, while operators in Luxembourg and Kampuchea aren't bombarded with your net's operation. The real issue comes up when the 80 meter operator actually *wants* to work Luxembourg and Kampuchea. For that purpose the dipole 35 feet above ground will definitely not get the job done. To do that, we'll need to look at other antenna arrangements, as we'll see.

All of this, of course, is a theoretical basis for understanding this process. Experience has shown that a horizontal antenna that is at least a *quarter* wavelength above ground provides fairly good performance. My 102 foot dipole is up 35 feet, just over a quarter wavelength on 40 meters, yet my log is full of CW QSOs on 40 meters all over the Western hemisphere and all over Europe.

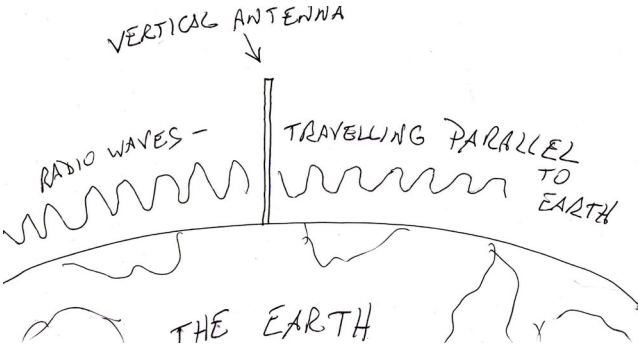
Also, to give heart to all you SWLs, the lower antenna does manage to perform better on receive than it does on transmit; it's common for hams to *hear* DX on a low dipole or longwire, but not be heard by the DX when they *transmit* with the low antenna. That's because received signals tend to arrive at your antenna by a variety of routes, while a transmitted signal from your antenna only has one good shot at making the "leap." The main thing to keep in mind is to

erect the horizontal antenna as high in the air as you can, remembering that as you go higher in frequency it becomes ever easier to get a half wavelength above ground.

❖ Horizontal vs Vertical Antennas

Now, if I haven't thoroughly confused everyone with this dissertation on height above ground for horizontal antennas, let's talk about some ways to get around the problem entirely.

The most straightforward solution is to use a vertical antenna. Verticals aren't troubled by height-above-ground issues at all: in fact, they commonly sit right at ground level, sometimes even being solidly grounded, as when a tower is shunt-fed as a vertical. Yet a vertical effortlessly flings the signal right at the horizon – that low angle that we want for DX. How does an antenna sitting on the ground manage this, when a dipole many feet above ground cannot if the wavelength is too long?



The third drawing shows the reason. Since the vertical is *perpendicular* to the Earth, the wave it emits is parallel to it. Travelling along parallel to, instead of *running into,* the planet, the wave neatly avoids all that pool-table nonsense and heads straight for the horizon – and, hopefully, Ivory Coast and Laos.

The only real drawback to the beauty of the vertical (everything's a tradeoff, you know) is that a very efficient ground system is necessary to make the antenna perform well. A vertical is, in one sense, "half of a dipole" and needs the effective, low-impedance ground to "push against." Making this efficient ground system is a lot of work; you'll need a large number of radials, ideally, which means lots of trenching with a lawn edger (and being careful not to endanger lawn mowers), multiple ground rods, solid connections to copper cold-water pipes, etc. It's difficult to overbuild a ground system. Unfortunately, it's the only way to reap the benefits of using a vertical.

I've mentioned before that the ladder line-fed dipole can be turned into a vertical of sorts by tying the tuner end of the ladder line together and feeding it as a single wire from the WIRE (or RANDOM) output of the tuner. Folks variously call this a "tee vertical," or "Marconi." The feedline itself becomes a vertical, and the dipole wires form a sort of "capacitance hat" or "loading hat" that helps load the antenna up at low frequencies.

I use this approach on 160 and 80 meters with my 102 foot dipole up 35 feet, with very satisfactory results. (Basically my tuner is seeing a 35 foot vertical with loading wires attached at the top.) Be aware, though, that you will still need the very best ground system you can come up with to get the best results. And also keep in mind that any vertical antenna system will tend to be noisier – sometimes a lot noisier – on receive than the horizontal dipole. Again with the tradeoffs, folks!

❖ Best of Both Worlds

Want the quietness of a dipole on receive, with the low-angle radiation of the vertical? Figure out a way to put up a *vertical dipole.* There's a few of them out there. The hardest part is routing the now-horizontal feedline away from the center of the now-vertical dipole for some distance before routing it to the rig. And make sure the bottom of the dipole – the end of the bottom half – is at least 10 feet off the ground. There can be some pretty spectacular voltage peaks at the ends of a dipole. You wouldn't want to fry pets or neighborhood kids. (Well, I guess it depends on how the kids in your neighborhood are...)

I hope this month's discussion has given you some good ideas about antenna heights and how to deal with them. Next month we'll dig ever deeper into the universe of antenna notions. Until then, happy operating!

GRE PSR-800 Review

By Bob Grove, W8JHD

General Research of Electronics (GRE America) has evolved from its former subordinate position as a radio accessories manufacturer and producer of private-labeled scanners for Radio Shack to a major contender in their own right. Previous scanners like the PSR-100, 200, 300, 400, 500, and 600 have enjoyed wide acceptance.

The recent introduction of Uniden's HP-1 HomePatrol™ has set a new standard in scanner architecture with its enormous, internal, nationwide database, as well as its easy, intuitive, automatic loading of local frequencies just by entering a zip code or geographical location.

In our February issue we took a look at GRE's introductory, hand-held PSR-700 which, like Uniden's cutting-edge HP-1 HomePatrol, comes with factory-loaded, U.S.-wide frequencies downloaded from Radioreference.com, the same private source utilized by Uniden. As with the Uniden, frequencies can be autoloaded simply by selecting the geographical location without the traditional, manual loading of discrete frequencies, channel by channel.

But there are some profound differences between the PSR-800 and its competitors which provide more features than any other scanner ever made. However, be aware that a sizeable amount of time will be spent learning how to use this scanner.

❖ PSR-800 Specifications

The new PSR-800 "EZ Scan-SD Digital" looks identical to its hand-held predecessor, the 700. Its solid aluminum front and back panels provide durability along with light weight (7-1/2 oz.); it fits an adult hand comfortably, measuring 2-5/8"W x 1-1/16"D, and it's only 5-1/4" tall.

The PSR-800 is designed to operate from any reasonably-current Windows platform: 2000, XP, Vista or 7.

The frequency range is 25-54, 108-174, 216-512, 764-782, 791-797, 806-960 (less cellular), and 1240-1300 MHz. This provides all the communications bands in the VHF/UHF spectrum except for commercial broadcasting. The down-conversion is provided by triple-conversion architecture.

Selectivity specifications are impressive: AM bandwidth for -6 and -50 dB attenuation is at 4 and 6 kHz; FM bandwidth for the same sideband attenuation is at 7 and 13 kHz. This is tight, providing excellent adjacent-channel interference rejection.

Sensitivity is certainly on par with the competitors: depending on the mode chosen, 0.2-0.5 microvolts, with the singular exception of the high end of the military aircraft band (300-400 MHz), 0.8 microvolts.

While the scan/search rate is nowhere near the 100-200 channels per second of most Uniden scanners, it is a healthy 70-80 steps per second, still fast when compared to early scanning radios, and likely to capture transmissions quickly, especially if not too many memory channels have been activated. Programmable delay is a nominal 2 seconds.

Although the internal speaker measures only 1-1/4" wide, it produces high-volume, relatively-undistorted audio with its half-watt audio power. With the mix of normal FM and narrow-band FM now utilized on the air, audio levels often vary on conventional scanners; the 800 offers automatic gain control (AGC) to average the levels for uniform loudness.

Up to 30 continuous hours of off-air recording can be internally stored on the SD card and played back for review of message contents.

Power is supplied by four AA cells (not provided), alkaline or rechargeable NiMH. A mini switch in the battery compartment allows the selection of either chemistry. The NiMH cells can be overnight-recharged from any USB source such as a computer, or from a low-cost AC/USB power supply which can additionally operate the radio.

(Photo by Judy Grove)

Since the minimum current drain of the radio when squelched is about 170 mA, the average play time for fully-charged batteries is guesstimated to be about eight hours; this varies, of course, with the type of battery selected. A battery icon displays the charge state so that the user can elect to charge the unit when the solid black, full-charge indication becomes increasingly clear.

The earphone jack on the top panel allows for private listening with a user-supplied headset or earphone, and it also doubles as an unfiltered, unsquelched, IF discriminator output, useful for signal analysis and decoding when used with third-party software/hardware like Unitrunker (**http://wiki.radioreference.com/index.php/UniTrunker**), Trunk88 (**www.trunk88.com/index.php?title=Main_Page**), and Treport (**www.thebriarpatch.org/treport/**).

❖ PSR-800 Operation

The simplified control panel utilizes the familiar "joystick navigation" layout which is endemic on digital devices like video games, cameras, MP3 players, and more. Up and down arrows allow volume adjustment as well as scrolling functions; left and right arrows permit selection options on the menu.

The main key is the MENU key; pressing it allows access to all the adjustable parameters and selectable features and functions. These are scrolled and separated into sub routines. Full alphanumerics of upper and lower case text, numbers, and punctuations are accessible.

The PSR-800 utilizes a 2 GB SD-card loaded with 50 states plus Canada, allowing for the storage of at least ten million records. To select the listening frequencies in any area, the user scrolls to "Browse Library," then selects U.S. or Canada, next the state. Once there, the user selects among topics such as agencies, public safety, railroads, federal, trunking systems, and others that may be available. The list is further refined by city.

Dozens of listening combinations may be individually or collectively chosen, such as local licensees, neighboring cities or states, and various types of services, so that suddenly-occurring events like tornadoes, hurricanes, earthquakes, forest fires, major crimes, air disasters, and other frequency-changing requirements can have immediate access by selection of the specific scanlist.

Scanlists are what we traditionally know as memory banks, and they can be scanned individually or in any combination; thus, in the event of disasters as outlined above, a user might wish to select local law enforcement on one list, area-wide on another, forestry service during fire season, medical services following a natural disaster, and so on.

A service search feature provides for the selection of eight different, high-interest listening targets looking for activity on their allocated channels: Marine, CB, FRS/GMRS/MURS, public safety, aircraft, amateur, and railroad.

The PSR-800 will track all conventional and trunked radio systems, and will decode P25 digital voice transmissions as well. This is an important asset, as the government has specified P25 as the digital system of preference for intercommunication among various agencies, and increasing numbers of metropolitan public safety systems are integrating this mode.

While P25 does have encryption levels that can be opted by the user, the vast majority of the communications are conducted in the basic digital mode which is not considered a privacy configuration, so it is lawful to be accessible to scanners.

New data can be downloaded off the Internet by computer interface with the USB cable (provided). All data can be modified, amended, and deleted on screen with the computer, including the manual entry of new frequencies and associated data.

A bargraph-style signal strength meter displays relative levels of received transmissions. While such bargraphs don't really provide absolute signal intensity values, their relative readings can provide information regarding relative distances of signals, and how well an antenna is working, as well as whether it is in the clear and positioned properly.

The spectrum sweeper function will capture any unknown nearby signal in its frequency range in less than one second and will monitor its contents while displaying its frequency. This is very handy for sleuthing for unregistered or unlicensed transmitters and listening devices.

The 800 decodes and displays CTCSS, DCS, and NAC encoding, and follows all major trunking systems like Motorola Types I/II/hybrid, EDACS, and LTR. With the database ability of talk group IDs, there's no having to tinker with all that manual loading formerly encountered in other scanners; it does it all automatically.

In the event of detecting a digitally-encrypted signal which cannot be decoded, the user may select to hear the noise, a tone, or silence.

NOAA National Weather Service broadcasts can be immediately brought up with their own key, and a SAME weather alert mode can be selected for your area. If desired, an automatic interrupt can be selected so that if your local weather broadcast sends the alert tone, you will hear the emergency message regardless of other signals currently being received.

A multi-color, super-bright LED can be programmed to visually flash the service color chosen by the user, such as blue for police, red for fire, yellow for EMS, green for forestry/conservation agencies, and white for business. The colors can be strobed, solid, or even alternated like a Christmas tree for more imaginative users!

A USB data cable really opens up the flexibility of the 800. Plugged into your computer, you can see all of the channels you've selected in a chart, and you can selectively amend the files. You can make it a routine to download the latest database library or upgrade to the latest CPU firmware with a simple press of the mouse key.

❖ A Lot of Reading

Perhaps the single negative aspect of a scanner with such enormous capability is the daunting task of absorbing the instruction manual to understand all the options available and what all the abbreviations on the LCD screen mean. Initial turn-on is easy, but complete control is not intuitive. Prepare for a substantial learning curve.

The operational manual is provided on a CD, which also includes the utility management software programs for reconfiguring the radio's settings, as well as updating the firmware and database.

Included with the 800 are a USB data cable, compact 4" rubber whip, 2 GB SD memory card, CD-ROM disk, and a removable, rotatable belt clip.

❖ Let's Take a Listen

From turn-on until reception there is about a 12 second delay for data loading. The brightly-backlit LCD screen shows the progress during this time. The display is large with multiple alphanumeric text lines and adjustable brightness and contrast for easy viewing under any conditions. Although changes and additions to the factory text is readily done, since there are no direct-entry keys the scrolling technique of selection letters, numbers, and punctuations can be tiresome. Such text changes can be made either directly to the scanner or on the screen of a USB-attached computer.

The data display can be called up in two different formats: a simple presentation simply identifies the station currently being received, while a fully-informational presentation is far more informative, revealing frequency, squelch tone, mode, battery charge condition, simplex or repeater, and many other characteristics.

For seasoned scanner and computer users (especially gamers!) the arrow-key operation is intuitive, as are the first few levels of MENU selections. However, there are quite a few acronyms and abbreviations that require familiarity. Fortunately, the computer readout provides a glossary and other reference explanations. They aren't all there, however, and downloading the latest software version from time to time is highly recommended.

With our review model fully loaded and ready, we found it very sensitive. Of course, sensitivity in this case is dependent upon the antenna, and this one is small. Thankfully, GRE opted for the traditional BNC connector. This makes it easier to substitute antennas.

If extended range of coverage is desired, there are bigger whips available like the Condor (**www.grove-ent.com/ANT14B.html**) and Diamond RH77CA (**www.grove-ent.com/rh77ca.html**). And if someone wants to perfect the impedance match on any particular frequency in the high VHF/UHF range, there's always a telescoping antenna (**www.grove-ent.com/ANT6.html**).

If used with a rooftop antenna in an RF-dense environment, or if strong-signal overload becomes a problem by producing images or desensitizing weak-signal reception, there is an attenuation option that is key-selected.

Speed of scanning was adequate even though roughly half as fast as the recent Uniden hand-helds. Audio delivered a strong punch with admirable voice-frequency contouring.

The backlit display is excellent: large, strongly-contrasted characters against a white background are easy to read, and both the backlight illumination and the character contrast can be adjusted to suit the user's environment. Even the key legends are bright and sharp.

Because backlighting drains battery power, multiple options for on/off are provided, such as on times triggered by the reception of a signal and first turn-on of the radio. Programming the illumination of the function keys is also addressable.

The spectrum sweeper is fast, and by selecting the type of sweep you want to do, it can be even faster. It will look for unknown signals through its entire spectrum in about two seconds, and will look through smaller chunks of spectrum like all allocatable public safety channels in less than a second. If you want only specific swaths of spectrum, it's even faster.

Scrolling through the menu options – and there are a lot of them – is inconsistent. Sometimes you can back up with the arrows, sometimes you can't. Sometimes you can use the up/down arrows, sometimes you can't. This is very frustrating to conventional scanner owners, but may be a familiar routine for many users of multi-function, hand-held, digital-devices in the iPod age.

Finally, there is one glitch that can really throw you, but it's solvable. If you decide it's time for a firmware update, follow the directions *explicitly*. If the power switch is accidentally turned on, the scanner locks up and stays on. Even removing the batteries doesn't help. It's dead as a doornail, totally unresponsive to any commands including power off.

However, simply follow the template directions under "Updates," then "Check for CPU Firmware Update." The reload will restore everything back to normal.

❖ The Bottom Line

The overall performance of the new GRE PSR-800 is truly remarkable. After a short period of use, selecting its myriad custom functions, and knowing that new data libraries as well as firmware improvements are downloadable, it leaves the owner wondering if there really is anything left to be added to scanning receivers.

The new GRE PSR-800 is available from Grove Enterprises for $449.95 (1-800-438-8155 or **www.grove-ent.com/product535.html**) plus shipping.

Brian Wood, W0DZ
www.dzkit.com

Write Your Own Logging Program

There are many programs out there to let you log SWL or QSO information. Some are useful in contests; most are great for general logging. Some can even key your rig. But suppose you want something a little simpler?

Suppose you want to digitize your logging, but don't want or need all the frills. You might still want to search your logbook for information about a station you've heard or worked. You might even want to get information about that station so that you can print a mailing label for a QSL card, or format the data for submission to *Logbook of the World* or eQSL or for submission to a contest committee in Cabrillo format. Or, you might want to see how many stations you worked during the summer of 2010. Or perhaps you want to know how many VP, VK and ZL stations you heard between the hours of 5PM and 8PM. If you put your SWL or QSO data into a database (your digitized logbook), you can "ask" that database questions, or "queries."

In this column, I will examine one such database, called MySQL, or My Structural Query Language. ("My" is not the word "my", but is the name of the daughter of the developer of MySQL, Michael Widenius, and "SQL" is usually pronounced like the word "sequel"). It is a very powerful database that you can download and use for free, although you can also pay for higher performance versions. As with any language, there is a lot to learn, but you can also get your feet wet pretty quickly with just a little basic information.

It is impractical to give you more than a cursory look in the limited space I have here. Some web links are provided below that can give you plenty of reading material if you want to delve into it in detail.

SQL consists of several important pieces:

- The SQL "engine." This is the software that allows multiple computers to access the database.
- A "Front End." This is the data entry and retrieval software.
- A Graphical User Interface.

MySQL Installation

Let's get started. First, you must install the SQL engine. To download the program go to **www.mysql.com/downloads/mysql/**

Since SQL can connect to multiple databases and can manage connections from multiple computers simultaneously, there's a little bit of administrative set-up to be done, like naming your connection. I called mine "DZ," since my call is W0DZ. But this step is pretty straightforward.

"SQLYog" Front End Installation

Once the SQL engine is installed, you need some software that lets you access the database in a friendly way. One such front end is called SQLYog. You can download it at: **http://code.google.com/p/sqlyog/downloads/list**

When you install and run this free community edition, the first screen you will encounter is shown in Figure 1 (below).

The resulting SQLYog screen is shown in Figure 2 (next page).

In this example, I named the database "logbook" and created a table called "qso_info". That table has the columns that you would typically find in a logbook: Start Date/Time, End Date/Time, Tx Frequency, Rx Frequency, Call, Band, Mode, Received Signal Report, Sent Signal Report, Output Power, Name, etc.

Many databases are broken into multiple Tables, each containing a portion of the desired data. When one piece of data relates to another, it can be useful to group them together. (That's why SQL is called a "Relational Database".) It's not always desirable to put everything in one table, especially if one item can be linked to two or more other pieces of data. In the case of a manufacturing operation, for example, you might want to have a list of parts that go on a circuit board in one table, and the description of the part and manufacturer's part number and cost of the part in another table. This would be useful if several manufacturers' parts could all go in one spot on a circuit board.

But in the case of a logging database, everything you would want to store for a contact is a one-of-a-kind entry. You might work a station multiple times on different bands, but you don't really need to put the call into a different table for every band. You might, however, want to create a table for allowed values of, say, Band or Mode. This would allow you to create a drop-down list containing only allowable values, so you don't accidentally enter, say, 21M when you meant 20M for the band entry. Since you will eventually be using the Query function to ask the database to do something useful, like find

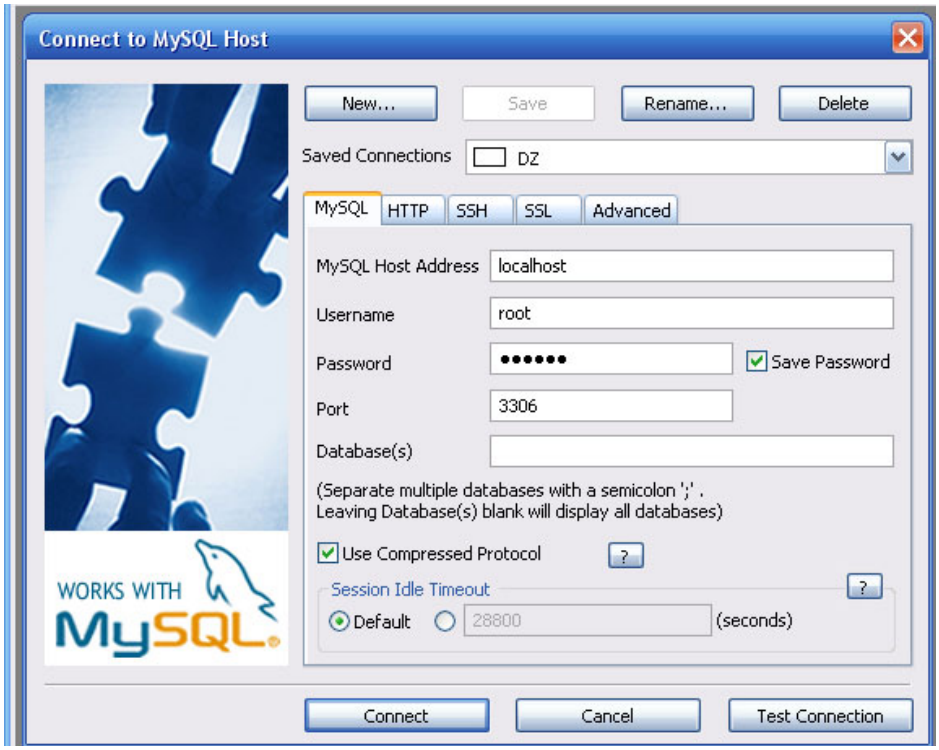


Figure 1. Startup SQLYog screen. Using all default values, you can then connect to the server

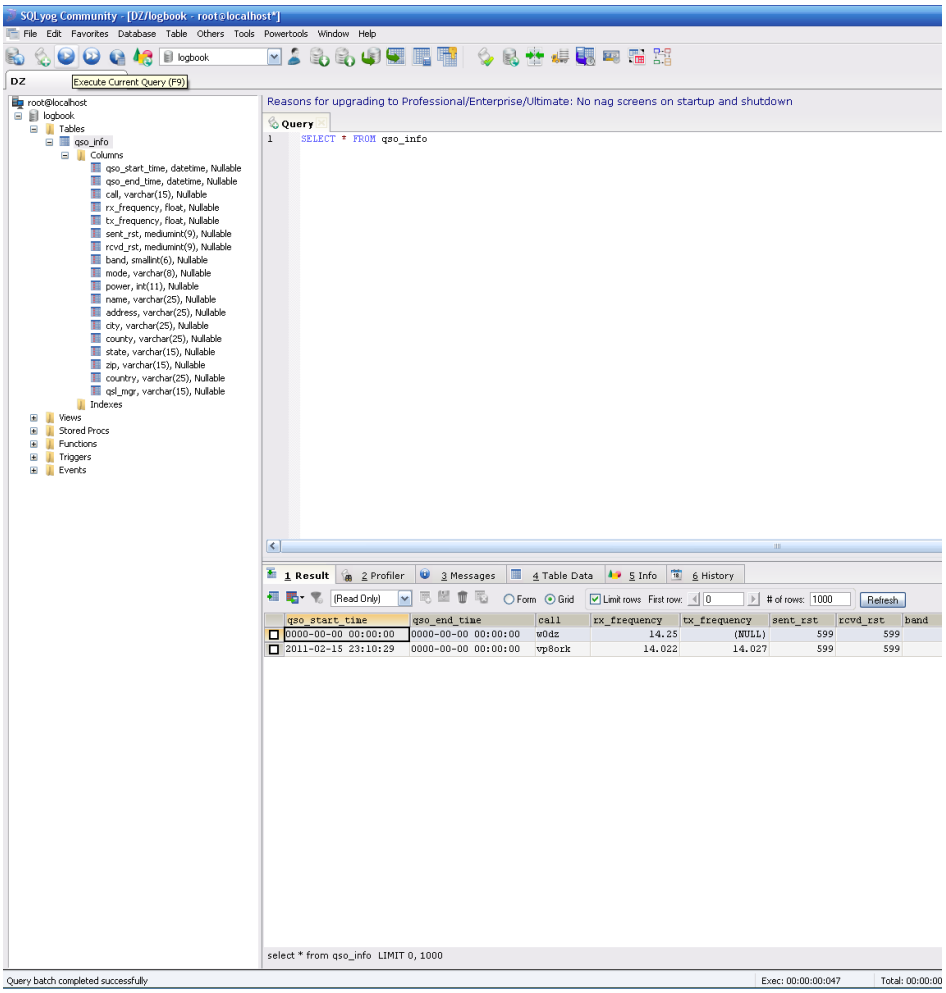


Figure 2. SQLYog screen showing an example logbook database

all 20M contacts, you will want the field to be as precise as possible.

Each entry was made by right-clicking on the word "Tables" and selecting "Create Table" (which I named qso_info). Once the table was created, I right-clicked on the word "Columns" and selected "Manage Columns," which let me define all the names shown above. As each column was created, the data entry form required me to select a "datatype." For the date/time columns, I chose a "datetime" type, which automatically puts the date and time in the database. Others were either textual ("varchar") or float (real decimal numbers), or integers. I was also able to put default values in, such as 599 for signal reports.

Note that in the ARRL *Logbook*, there is not a place to enter both Tx and Rx frequency. This makes it awkward to handle split frequency operation. So I thought it might be nice to allow for it. You don't have to enter it if you don't want to, though. And, although Band information would then be redundant, there may be times when you just want to enter the Band and not necessarily the exact frequency. This would be especially true during a contest.

You might actually want a fair amount of data that a paper log just doesn't give you room to enter, such as Name, Address, City, State, Zip, Country, QSL Manager, etc. With a computerized system, you can have that information. You don't have to actually store it; you can just put a link to, say, the QRZ database of amateur call signs, which does contain address information. In fact, you could set up the database to automatically create a link, so that all you have to do is click the call letters and have your favorite web browser pop up the qrz.com data so that you can create a mailing label or even hand write a QSL card. That involves the use of "Triggers", which we won't get into in this column. But it can be done.

❖ Doing Queries

After you have created the table, you need to get it to show up in the bottom window so you can put data into it. The easiest way to do this is to execute a query, telling it to show the data. The query statement takes the form SELECT <item> FROM <table> WHERE <function>. To get the data to show up, just enter SELECT * FROM qso_info, which tells it to get everything (*) from the qso_info table. Once entered, you must Execute the Query. This is done by pressing the "Play" button (or F9, as shown by the informational box titled "Execute Current Query".)

Once the table headings are visible, change the selected mode in the drop-down box that says "Read Only" to the other entry, which in this example will be logbook. qso_info. Now you can click in the various fields and enter information. I entered a couple of calls as an example.

Pretty simple, right? Well, this is of course only the tip of the iceberg. MySQL has many math functions, triggers, and complicated queries that can be executed to get at the data. For example, you could enter a query like this: SELECT * FROM qso_info WHERE county = "larimer" and the results window will show only the stations worked in Larimer county.

There are graphical user interfaces available for MySQL that can make the data entry and query process a little more intuitive.

ADDITIONAL RESOURCES

Home page of MySQL:
http://dev.mysql.com

MySQL Workbench:
http://dev.mysql.com/downloads/workbench/

Light reading:
http://rapidapplicationdevelopment.blogspot.com/2007/06/entity-relationship-diagram-example.html
http://www2.cs.uregina.ca/~bernatja/crows-foot.html
http://en.wikipedia.org/wiki/Entity-relationship_model

Cheap DIY Solar Power for your Radio

By Ben Jandrell
(All graphics courtesy the author)

Here's a good use for the small solar panels found on a huge number of garden LED lights which can be bought new or salvaged and coupled to a portable radio that runs off two or three AA cells. Most of us have an old radio lying around, so I based the $5 price on the cost of purchasing/ acquiring a solar powered garden LED light. I suspect there are plenty of scrap ones lying around, not working because of slightly corroded battery terminals in damp environments – the solar panel will probably be perfect.

Having built this myself, I have left my radio on now for 4 weeks (12 hours a day) while I work, and it has never let me down, even at a reasonably high volume level. You could either leave the solar radio out on a sunny window sill as I do, or leave it in the sun outdoors every so often to recharge the radio's battery. This is a very quick project that can be made in about 2 hours and helps save the planet (just a little bit).

Here's what you will need:

1. A portable AM/FM/SW radio (2AA or 3AA battery type).
2. One 4 or 4.5v 80 mA solar panel, pried off a solar light.
3. A BAT43 Schottky diode or Silicone IN4001 (more voltage loss).
4. A soldering iron, solder, and red and black cable in 6 inch lengths.
5. Two or three NiMh rechargeable batteries (NiCad will work but not as well), minimum capacity 800 mAh per battery.

Optional: Heat shrink tubing and adhesive foam strip.

This project is even "greener" if you can use a broken solar patio light headed for the landfill.

❖ Removing Solar Panel from Garden Light

Choose a solar panel that has eight solar strips that run the entire width of the panel – some cheaper panels only have four strips or are cut down. You will need the full eight strips to provide the 4.5v 80 mA output.

Remove the clear plastic lens and metal rim from the garden light.

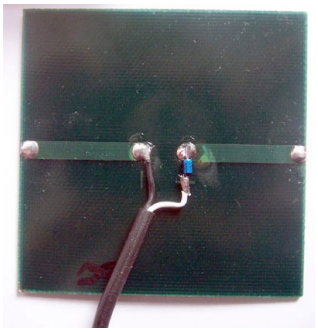
DIY solar power: Typical portable radio that runs on two or three AA batteries; double-sided adhesive tape; diode; solar patio light; soldering iron and solder. It'll help if you have a small volt-ohm meter.

Solar Panel Removal: Using a screwdriver, carefully pry the panel away from the light body (it's usually stuck on with some type of glue so be careful). Cut the connector wire and remove the panel completely.

(It's usually a pressure fit and easy to get off). Using a screwdriver, carefully pry the panel away from the light's body. (It is usually stuck on with some type of glue, so be careful). Cut the connector wire and remove the panel completely.

❖ Connecting the Radio

You can either hard wire the solar panel directly to the radio or outfit it with a power plug. Some radios have a power input socket for mains adapter, but it could be difficult to find just the right plug. My Sony had an odd sized plug. This option makes connecting the panel easier by simply connecting a suitable plug to the solar panel using a blocking diode. Check that the polarity is correct and that's it!



Installing Blocking Diode.

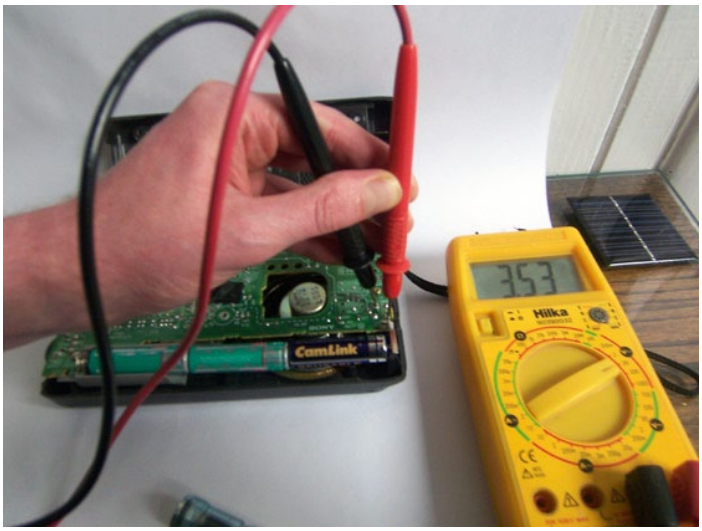
I decided to hard wire my solar panel; here is how I approached it.

1. Remove the rear panel of radio and with the batteries in place, use a multimeter to identify the positive and negative connections (where the batteries would connect). Make sure the multimeter doesn't indicate a negative value, which would indicate that you have the positive and negative probes the wrong way around.
2. Solder the 6" lengths of red wire (to positive) and black wire (to neutral).
3. Drill a small hole in the side of the radio to allow the two wires to exit the back of the radios panel when reassembled.

❖ Solar Panel and Blocking Diode

You will have to solder a BAT43 or IN4100 blocking diode to the positive terminal on the solar panel. The BAT43 Schottky type diode is better, because it has a lower voltage loss (about 0.3v), which is particularly important if you are charging three batteries as I am.

The diode prevents any reverse current flowing from the battery



Use a multimeter to identify the positive and negative connections where the batteries would connect.

when there is low light.

Make sure the white or black band around the diode faces away from the solar panel. You can check if you have connected the diode the correct way around by using a multimeter set to mA's or volts and seeing if there is any output in bright light from the panel; if not, the diode needs to be connected the other way around.

❖ Final Assembly

Using a piece of double sided foam adhesive tape, you can position the solar panel centrally onto the radio. Fortunately, my Sony radio had a support stand that was ideal on which to mount the panel. If your radio doesn't have such a stand, you could fix it to the top of the radio.

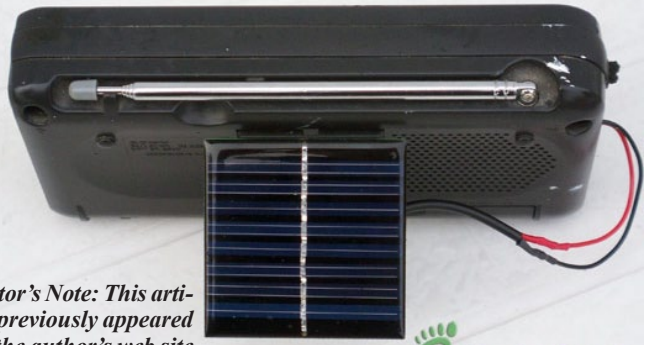
Solder the positive and negative wires from the radio to the solar panel, and use heat shrink tubing or insulation tape to cover any bare joints.

I used to work at my computer all day listening to my stand-alone stereo system that used over 40 watts of mains power just to listen to the radio. Now, my solar set-up lasts forever and uses no energy.

For more DIY power projects, visit Ben Jendrell's imaginative alternate energy web site **www.gotwind.org** that includes a forum where other builders discuss their current projects. Among Ben's power projects are: building a 12 volt 100 watt wind generator, a five and 100 watt pedal-powered generator, and other great ideas easily adapted to your radio related power needs.

Side view shows power wires going into the radio cover.

Top view showing installed solar panel stuck onto the radio's folding support.



Editor's Note: This article previously appeared on the author's web site at www.gotwind.org

What's NEW

Tell them you saw it in Monitoring Times

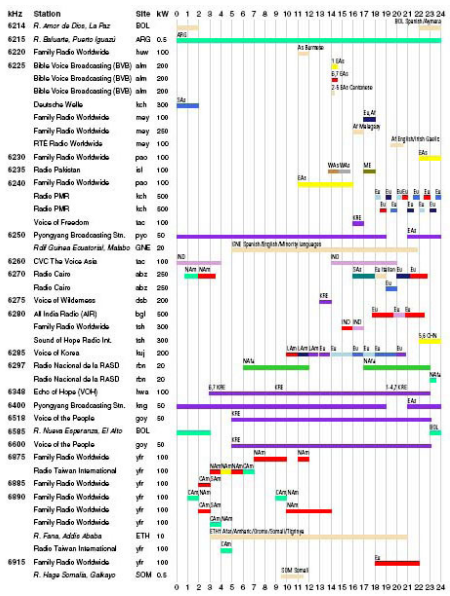
Larry Van Horn, New Products Editor

WRTH Bargraph CD Now Available

World Radio TV Handbook is billed as the most accurate and complete guide to the world of radio on longwave, shortwave and FM, that's available in any form. Now the *WRTH* has jumped from their traditional print media publication into the electronic age with a new publication on CD-ROM. This CD, new for the B10 season, takes part of this information, international broadcasts on LW, shortwave (including domestic), and medium wave, and displays it as a graphic color bar graphs. It is supplied as an Adobe PDF document.

Text columns show the frequency of the broadcast in kHz and the names of the station transmitting or the broadcaster that is responsible. Listings of international stations differ from the domestic stations at a glance, as domestic broadcasters are shown in italics. Additional listings are the transmitter code for international broadcasts and the country code for domestic transmissions, plus the power of the transmitter in kW.

Each entry also has a color bar. These color bars show the duration of each broadcast in UTC time on the 24-hour clock. The color of the bar shows the language of the broadcast. Eighteen languages are identified by different colored bars, with the color and language shown at the bottom of the page. Other languages, or combination of languages, are shown above a buff-colored bar. Information above the bar also gives the target area or country to which the broadcast is aimed, an indication of the broadcast days, and symbols showing if the broadcast is inactive, irregular, a variable frequency, or used as a DRM transmission.



You can use these pages to identify a broadcast you have heard on a specific frequency, or you can scan the color bars to find broadcast in your chosen language at a particular UTC time. By using the find function of the Adobe Acrobat program, users can search the PDF document for frequencies, stations, or sites.

The disk also includes a list of abbreviations used in the bar graph along with decode tables for international transmitter sites and countries or geographical areas. These are also supplied as PDFs.

Full ordering details are available at **www.wrth.com.**

Hitler's Radio War

A new book titled *Hitler's Radio War*, by Roger Tidy, is a study of the external service of the wartime German radio and the "personalities" who polluted the airwaves on behalf of their Nazi masters.

Topics discussed included Lord Haw-Haw, Axis Sally, Mary of Arnhem and the Nazis' overt and clandestine broadcasts to Britain, the United States, Latin America, the Middle East, Russia, India and South Africa.

There is also a chapter on Charlie and his Orchestra, a specially created Nazi jazz combo that broadcast "hot" jazz and swing with modified propaganda lyrics to Allied audiences.

This illustrated book, which also contains a number of transcripts of Nazi broadcasts, is published by Robert Hale, London, and is available from all good book stores and internet book sellers (ISBN-13: 978-0-7090-9149-3). The book is also available direct from the publishers at **www.halebooks.com** and from High Street bookstores.

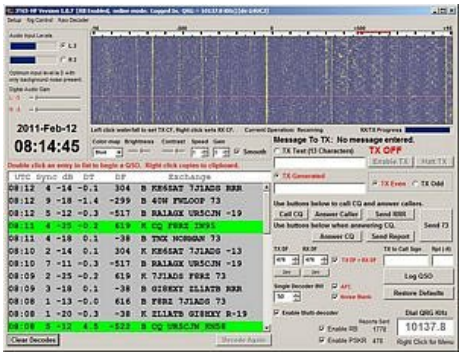
New JT65A Ham Software

If you are a licensed ham interested in working the weak signal digital mode JT65A, there is a new software package available as a free download from the Internet known as JT65-HF.

The JT-65 modes have been around for awhile. They were developed for use by Joe Taylor, K1JT, for amateur radio operators attempting marginal communications paths such as moon bounce and meteor scatter. One of these K1JT modes, JT65A – a variant for HF use – has been gaining popularity.

More recently, a program developed by Joe Large W4CQZ, is proving more user-friendly than the original package. JT65-HF is an excellent program for extreme weak-signal communications and is very resistant to noise and interference. Communication is possible at signal levels lower than 26 dB below that needed for SSB communication, as well as below that needed for CW, PSK31, or other digital modes.

If this interests you, download the program at **http://sourceforge.net/projects/jt65-hf/**, or do a Google search on "JT65-HF Downloads" and follow the links. It's reasonably easy to set up, and if you read the available documentation, you can easily pick up the operating basics.



To put it through its paces, set it up to monitor 14.076 MHz (USB dial frequency), when there isn't a pesky PSK contest on, and see what turns up. The signals will sound like someone badly whistling a tune! According to the instructions, you'll need your PC synched to UTC within a second or so – the closer the better. The author recommends running *Dimension 4* software to make this happen.

I am running this software as I write, and the variety of DX which is popping up on my screen, even with my own modest antenna farm, is very impressive. In two days on the air using JT65A I have already worked 15 countries (including Zambia) and 25 states using a G5RV antenna and 5 to 15 watts of power. Note that one feature of this mode is that it produces either perfect copy or none at all.

This mode uses highly structured communications which some people find very limiting. The QSO is limited to the bare minimum required to be "legal." However, despite the caveats about the requirement for accurate timing and stripped-down communication, I find this mode to be great fun. I hope to see you soon on JT65A.

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

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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

The Lighter Side of Radio

Bob Grove received a number of congratulatory emails following our January anniversary issue. Fritz Anderson added, "I am reading your story in the current issue, and I have to say you are among the most entertaining writers about radio I've ever read."

Bob thanks everyone for their commendations and says, "It was fun to write that article and once again relive the glory days of radio!"

Iceland vs Greenland

"Forrest Bishop from Cincinnati wrote to point out an error in the *Communications* column from February 2011 in which I note that Iceland Radio is leaving the air but have the Greenland Radio logo by the announcement.

"Well, he's right! Iceland may leave one day, but let's not rush it! It's *Greenland's* Kalaallit Nunaata Radioa (KNR), Greenlandic Broadcast Corporation that left the air on February 11, closing their 3815 kHz service in addition to all medium wave stations carrying KNR. According to a report from the HCDX mailing list, KNR is only available via low power FM. Thanks for keeping me straight, Forrest."

Ken KS4ZR

Grundig 750 Critique

Len Halvorsen questioned Ken Reitz's pick of the Grundig 750 as a recommended SW portable in the *2011 Buyers Guide* supplement to the November issue of *MT*. His letter was accidentally overlooked, but the comments are still timely:

"Thought you might like to hear my thoughts on the Grundig 750 Portable Short-Wave Receiver. I purchased one (from one of your advertisers) when they first became available, but I was less than happy with it. Far less.

"The unit I received had a very sloppy (wobbly) tuning knob. When trying to do small-increment fine tuning, the frequency readout would change by one kc, but the received frequency itself did not move. Another small increment of tuning would cause the received frequency to jump 2 kc. Sometimes it would go through this process for 3 or 4 kc. When I tried to do a little fine tuning with the BFO (on CW & SSB), I found the BFO Tuning Control to be non-functional.

"Needless to say, I kept the radio only long enough to remove my new batteries, re-pack it, and return it to the distributor. I ended up kicking-in the difference in price and bought an Icom R-75 instead. That turned out to be a much better – and enjoyable – investment.

"In retrospect, I'd have to say that the '750 is no $300.00 radio (even if everything worked properly). I don't think I'd pay more than half that amount, functioning properly. I might go $175.00 if that wobbly tuning control problem was corrected.

"I guess you spent more time with the thing than I did and discovered some saving graces. I certainly agree with you that there is a serious lack of choices in this class of receiver.

"I hope this evaluation (opinion?) is useful to you. Thanks for your great editorial content."

Len H. WA2AMW

"Thanks, Len, for your thoughtful comments. Nobody wants to win a beauty contest by default, but as we both discovered, the 'premium' category of portable shortwave radio has only one entrant. That was not always the case. Sony made a tidy profit on high-end portable shortwave radios for decades, but has ditched the category to pursue video game players, computers, car stereos and other more profitable products. Eton also dropped out of this category to put its future into low-ticket analog receivers with little to recommend them. Mass producers Kaito and Sangean haven't even bothered entering the race.

"Unless someone else does, it's likely the category will not appear in next year's *Radio Buyer's Guide*. You did exactly the right thing by kicking in more money and upgrading to the superior, though non-portable, Icom R-75. Thanks again for your comments."

Ken KS4ZR

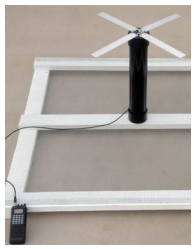
Three Questions for Mike

"Don't know if this E-mail address is still good pending your departure (f*rom MT's VHF/UHF Antenna Topics*). Which, by the way, I am very sorry to see. Being a milcom, loosely 'spooky-comm' kind of guy, I always enjoyed your column in the magazine as it always had a milcom cant to it.

"Is it possible to get answers on three things? What was the 'radio-in-the-suitcase' at your feet in the MIL antenna eval article (*Dec 2010 MT*)? (Next to the H1 wheel is a Halliburton case with a mic cable.)

"Also, who makes the hemispherical dome SOTM antenna pictured in the opening antenna article (*March 2010)*? I've looked till Hades won't have it, and I can't find anything on this approach. This particular configuration is of much interest to me.

"Finally (I promise), how does the phaser for the Satcomm antenna work? *(Found in Part 2, June 2010)* Conventional wisdom says one would have a 1/4 wave section and a 1/2 wave section summed. Would produce a 90 degree rotation at the band center. Sure as shootin', the 3.5 inch piece of coax measures in at 1/2 wave at band center (260 MHz) darn near exactly. But the 13.5 inch piece is 3.8 times as long, what the ....?? Obviously something I'm missing.



"Thanks. Good days."

Reed KF4OYH

Hi Reed,

"No problem on the questions and thanks for the kind words on the *MT* articles. I hope to resume developing antenna projects and working with *MT* in the future when I retire.

"The suitcase radio is a copy of the commo case issued to up armored HUMVEEs where everything can be yanked and run with if the vehicle is disabled. It's a 30-512 MHz MBITR (neutered, no crypto) with a Tricom Research 75W 30-512 MHz amplifier, three BB-390 batteries and a Pelican case. Tricom makes a smaller suitcase version with 25W amp and I acquired the 75W amp and hand made the system you see.

"The Dome shaped satcom antenna is made by Dorne & Margolin and I don't have a model # handy at the moment. It's a 225-400 MHz job with about 2dBic gain or so in an upward hemispherical pattern. These are not very impressive performers and are usually mated with a 200W transmit amp and receive preamp due to the low gain.

"The phasing harness does provide a 90deg phase shift to the opposing pairs of dipoles to create CP and something around 10" in RG-6 coax with a velocity factor in the low 80s will accomplish this. I needed to lengthen the non delayed side a few inches so the 90deg line had to grow by the same amount. After a few hours of tweaking the harness on a Vector Network Analyzer to a perfect 90deg phase shift at band center I also found the extra length helped a little with matching."

Mike Frye

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http://americanbandscan.blogspot.com/ - by Doug Smith

BELOW 500KHZ
http://below500khz.blogspot.com/ - by Kevin Carey

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

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http://monitor-post.blogspot.com/ - by Larry Van Horn

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