Scanning - Shortwave - Ham Radio - Equipment
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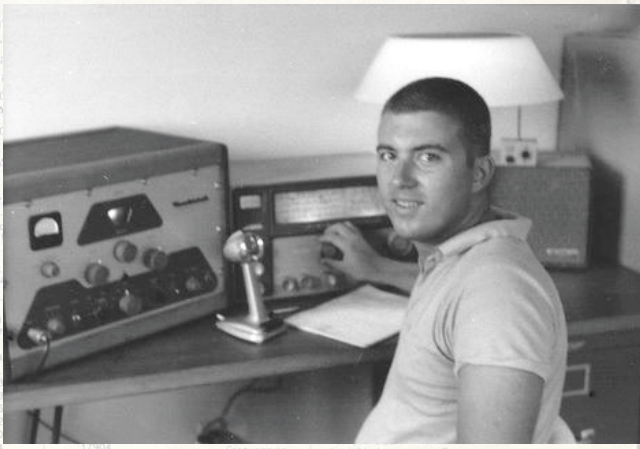
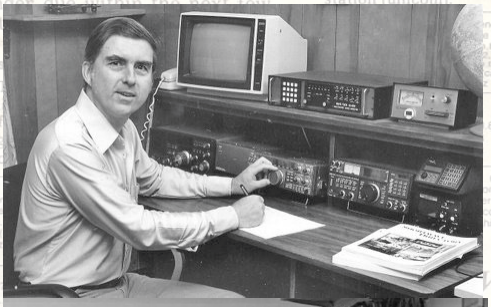
30 Years of Monitoring Times!





First Person Radio: Bob Grove

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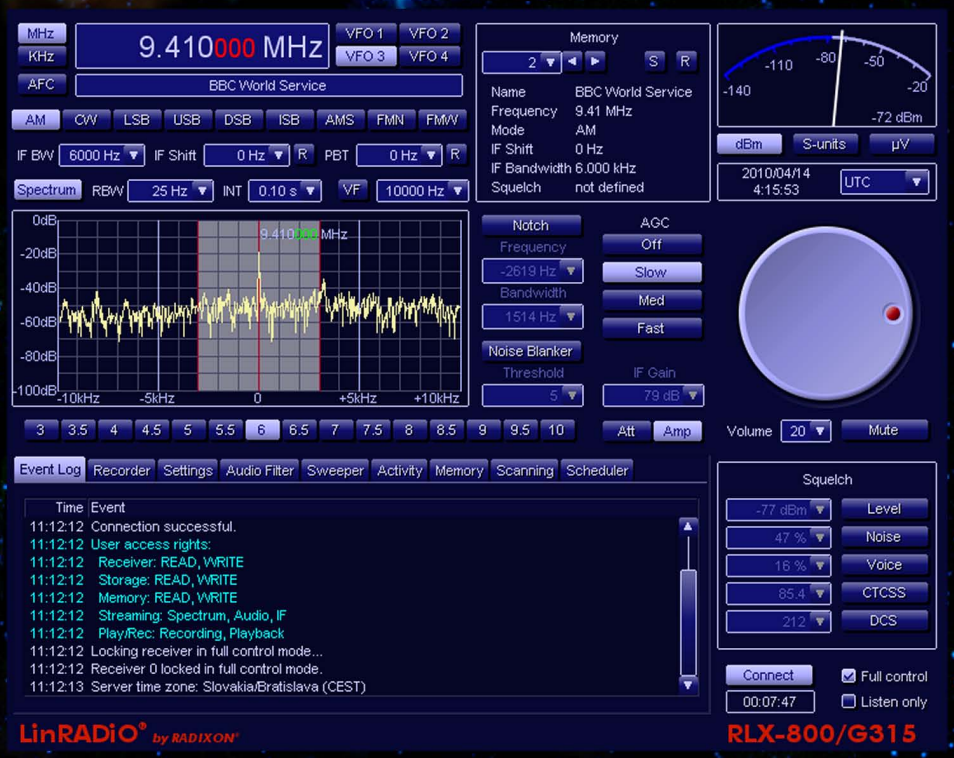

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Monitoring Times

Vol. 30 No. 1 January 2011

MT Turns 30!

Ordinarily January is our tech issue, and while we are taking a look at some interesting uses of today's technology, this January is special as *Monitoring Times* celebrates the start of its 30th anniversary year. Over the last 30 years hundreds of magazine titles have come and gone, more than a few major newspapers with 100 year-old heritages are no longer in business. Many radio-related clubs, organizations and publications have also come and gone. The electronic landscape barely resembles the way people communicated 30 years ago.

Even though no one could have predicted where we would be today, the reason *MT* is still relevant is that it has changed with the technology. *MT* continues to keep readers abreast of the vast changes in the electromagnetic spectrum through authoritative writers with the same curiosity and interest as our readers. And, we've never forgotten our roots: shortwave listening, scanning, AM DX, amateur radio, and everything else in between.

This month you're invited to go back, way back, with Bob Grove in his own First Person Radio story, to the very beginnings of this magazine. And, you're invited to stay with us for another year of amazing stories as our electronic future continues to unfold.

On Our Cover
From newsprint tabloid to digital delivery, MT has come a long way. Thanks to the forward-thinking leadership of Bob and Judy Grove, publishers of Monitoring Times.

C O N T E N T S

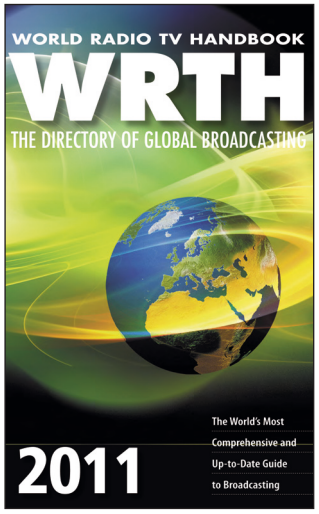
R E V I E W S

We are very pleased to announce the publication of the 2011 edition of *World Radio TV Handbook*, the bestselling directory of global broadcasting on LW, MW, SW & FM

The Features section has an account of the history of Radio St Helena, reviews of the latest equipment, an intriguing look back at some classic 80s & 90s receivers, a visit to AFN in the Florida Keys and much more, including our regular *Digital Update*.

The remaining pages are, as usual, full of information on:

- National and International broadcasts and broadcasters by country with frequencies, powers, languages, contacts, and more, including Clandestine and other target broadcasters
- MW frequency listings by region. International and domestic SW frequency listings, as well as DRM listings
- International SW broadcasts in English, French, German, Portuguese & Spanish.
- Reference section with Transmitter locations, DX clubs, Internet Resources, and much more



Available December 2010

SOME COMMENTS ON WRTH 2010

The 2010 *World Radio TV Handbook* continues to set the radio hobby standard. It remains the best, most authoritative and comprehensive radio reference book in the world
– Gayle Van Horn W4GVH, Monitoring Times

Essential, could not do without it! *– Glenn Hauser, DX Listening Digest*

WRTH gives you more info about a broadcast than any other radio reference book with which I'm familiar. This is one of the reasons it has become a staple reference for serious radio listeners
– Thomas Witherspoon, SWLing.com

WRTH's claim to be the World's most comprehensive and up-to-date guide to broadcasting is indeed more than justified. At Radio Netherlands Worldwide, we couldn't be without it. If you like listening to radio broadcasts from abroad, neither can you
– Radio Netherlands Media Network review

I have just received my 2010 edition of the famous *WRTH* and it's packed with 672 pages of invaluable information. There is no other publication in the world that rivals *WRTH*. It is indeed the ultimate volume for anyone with an interest in radio *– Mike Terry, UK*

The *WRTH* 2010 is, as usual, indispensable and accurate. More necessary now than ever before
– Gil Torbeck, Germany

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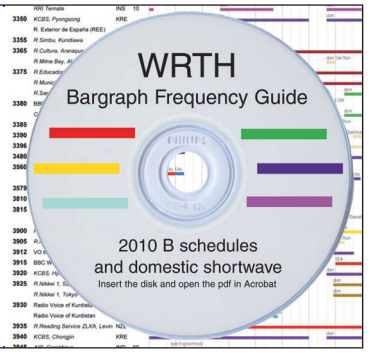

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COMMUNICATIONS

by Ken Reitz

AMATEUR RADIO/SHORTWAVE

Zimbabwe Police Seize SW Sets

According to a report on Zimbabwe's *Radio Voice of the People* (Radio VOP), police raided villages in Mashonaland East, Zimbabwe, seizing shortwave radios provided by various non-governmental organizations (NGO). According to a Zimbabwe human rights organization, police said the sets were distributed without their knowledge and questioned the motives of such organizations, "They argue that the radios are propaganda driving tools meant to discredit the government," Radio VOP said.

Ears to Our World

One such NGO is Ears to Our World (ETOW) a grass-roots, non-profit organization that specializes in distribution of self-powered, shortwave radios to schools and communities in the developing world. According to Thomas Witherspoon, Executive Director of the Cullowhee, North Carolina based group, ETOW doesn't work in Zimbabwe and that they have had great cooperation with governments in countries where they do work. ETOW was recently featured on BBC World's *Digital Planet*. For more information go to: **www.earstoourworld.org**.

W1AW Winter Sked

Want to hone your CW copying skills, practice copying digital transmissions, catch the latest DX news, check band conditions, or just test the receiving capabilities of your portable shortwave radio? There's no better way than to tune in to W1AW, the amateur radio station at the American Radio Relay League's Newington, Connecticut headquarters. Twice yearly the schedule is changed to accommodate seasonal propagation. The winter frequencies and times for the various modes are:

CW Bulletins: 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 MHz at 0100, 0400 and 2200 Z
Digital: 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 MHz at 0200 and 2300Z
Voice: 1.855, 3.990, 7.290, 14.290, 18.160, 21.390, 28.590 MHz at 0245 Z

(Courtesy: Ears to Our World)

AM/FM/TV BROADCASTING

Canadian Radio Future Uncertain

According to a report in *Radio World Online*, Canada's digital radio future suffers from nearly total apathy on the part of both industry and consumers. Commercial efforts to simulcast AM and FM stations via an L-band Digital Audio Broadcast scheme in Canada's biggest markets since 1990 has resulted in "virtually no listeners and no market profile."

And, even though the Canadian Radio-Television and Telecommunications Commission (CRTC) has allowed HD-Radio for experimental use since 2006, not one station has made the switch. The country's broadcast interests are standing by analog AM and FM broadcast technology, having been burned by early digital technology that went nowhere, unwilling to invest in the hybrid HD-Radio system and unprepared for the day when car makers may offer in-dash Internet-capable tuners.

Are We Watching HDTV Yet?

The broadcast survey company Nielson reported on its blog *NielsonWire* in November that, while 56% of U.S. households have HDTV sets, they're only watching 13% of the total day's viewing in HD if they're watching on cable. Satellite TV viewers fared a little better, watching 19% of their viewing day in HD.

Whatever Happened to 3DTV?

An article in the *Washington Post* traces the progress of 3DTV from its initial hype one year ago to its slow fizzle and complete flop of the product as it all but disappeared from the retail consciousness. The piece quotes *NielsonWire's* research in September 2010 on the subject which found that most consumers had a "'wait and see' attitude toward the technology" citing high price, having to wear special glasses, and lack of available 3D programming as reasons for their lack of interest.

PTC: More Profanity in Prime Time

According to an article in *Broadcasting and Cable* magazine, the Parents Television Council (PTC) has documented a dramatic rise in the amount of swearing on prime-time over-the-air (OTA) television. The group's study, called "Habitat for Profanity: Broadcast TVs Sharp Increase in Foul Language," compared the first two weeks of this past September's new season with that of 2005. It found an increase of more than 60% in such language.

The PTC blamed last year's Second Court of Appeals decision to strip the FCC's authority to

W1AW bulletin console (Courtesy: ARRL)

C-band dish (Courtesy: Skyvision)

set decency standards on OTA TV. Fox Network was noted as the biggest contributor to prime-time swearing with incidences on that channel increasing 269% during the same period.

SATELLITES

C-Band Programming Ends (Almost)

After more than twenty years, cable programming via C-band satellite TV ended December 31, 2010. The date capped the slow decline of viewers still using big dish satellite TV systems to watch cable-TV fare in homes not served by cable-TV systems. Satellite Programming Services went out of business in November 2009, and in November 2010 National Programming Service (NPS) gradually ended its C-band services and encouraged subscribers to switch to DISH Network.

Last C-band Receiver Standing (Courtesy: Motorola)

A full decade before the advent of DirecTV and DISH Network's small-dish satellite TV systems, millions of American homes were served cable-TV programming via 10-ft backyard satellite dishes. As early as the late 1970s, hams, familiar with microwave reception, constructed home-brewed dishes, low noise amplifiers and lashed together receivers capable of tuning in the new channels being transmitted via domestic C-band communications satellites. What started out as a hobby quickly escalated into a booming business that saw some, like DISH CEO Charlie Ergen, rise to Fortune 500 status and unimaginable wealth.

There remains one hold out. Skyvision is still providing C-band subscriptions via the last remaining C-band provider, Programming Center (**www.programming-center.net**). The service provides limited, standard definition fare only, via AMC-18 (aka W5) 105ºW using Motorola's DSR410 receiver. Details on the service may be found at **www.skyvision.com** or by calling 800-500-9275. Skyvision says it plans to continue this service.

AGs LOOKING AT XM/SIRIUS

According to SEC documents filed by satellite radio monopoly XM/Sirius, the attorney general for Washington state is reviewing consumer complaints relating to the company's practices regarding subscription cancelling policies, among many others. The Form 10 Quarterly report, filed November 4, notes that Washington joins a growing list of state's attorneys general from Arizona, Connecticut, Florida, Ohio, Tennessee, Vermont and Washington, D.C., which are launching similar investigations. The report also noted a separate investigation by Missouri's AG regarding telemarketing practices performed in that state. The company said it is cooperating fully with all investigations.

Small Dish Victory over HOA

The FCC issued a declaratory ruling November 5 in favor of a Nashville, Tennessee resident against the rules of his Home Owners Association (HOA) which prohibited the installation of a satellite TV dish on a porch connected to the residence he was leasing. According to FCC documents regarding the case, the HOA tried to skip over its own wording in the HOA lease regarding the prohibition of dish antennas and relied instead on wording in a state document intended as a guideline to HOA rules.

In its ruling, the Commission noted: "Because the Association's restriction is an outright ban on individual antennas, even those installed in an area covered by our rule, it certainly impairs installation and use and thus is invalid and unenforceable." Both DirecTV and DISH Network joined the petition in favor of the petitioner.

FCC rules specifically allow anyone who owns, rents, or leases property governed by similar HOA rules to install and use any satellite dish of one meter or less in diameter and includes devices used to receive fixed wireless or broadband Internet signals and antennas designed to receive television broadcast signals.

If you are the victim of illegal HOA rules you have many options to resolve your complaint. One is to present your HOA with a copy of the above declaratory ruling which is binding federal law. You can download a copy here: **http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-10-2150A1.doc**. If your HOA refuses to abide by the law, you can file a complaint with the Satellite Broadcast and Communications Association, a satellite industry trade association, here: **www.sbca.com/otard/default.asp**.

FCC ENFORCEMENT

Verizon Fined $25 Million for "Mystery Fees"

The FCC concluded a 10 month investigation into what it called "mystery fees" charged to as many as 15 million customers by telephone giant Verizon over a several year period. The FCC fined the company $25 million and got the company to agree to refund a minimum of $52.3 million to those customers it wrongly charged. The FCC noted the fine was a record amount and goes directly into the U.S. Treasury.

FCC Gets Picky

With millions of two-way radio sets in operation every day in the U.S. it's hard for the FCC to enforce the relatively few rules they have regarding such devices. But, when their attention is drawn, they get out the yard sticks and magnifying glasses. Here are a couple of examples from a recent 30 day period:

Field agents were investigating the source of interference on marine channel 16 in San Pedro, California, and tracked it to a malfunctioning, unattended VHF transceiver aboard a fishing vessel. Boom! Violation.

Staff at a middle school in Oceanside, California, were using unlicensed, hand-held radios operating close enough to marine channel 16 (156.800 MHz) to cause interference. Boom! Double violation.

Staff at a casino in Las Vegas, Nevada, were operating hand-held radios on 452.0250 MHz, but wait, they had a license! Still, field agents cited them for not identifying according to rules; having antennas too high, and operating as a trunked system, not as a conventional system as their license states. Boom! Triple violation.

And, finally, a Michigan man was cited for operating both AM and FM pirate stations at his residence. Both stations were putting out admirable signals: 3,600 microvolts/meter at 84 meters on the AM transmitter and 6,968 microvolts/meter at 106 meters for the FM transmitter. No word on the citation as to whether the signals were simulcast or independently programmed.

GPS GAFFES

The *Seattle Post-Intelligencer* blog reports that faulty Google maps are to blame for a dispute between Nicaragua and Costa Rica in which Nicaraguan troops allegedly moved onto Costa Rican soil where they set up a camp, raised the Nicaraguan flag and set about destroying a protected forest. Actual paper maps that both countries recognize as official indicate that the Google boundary was off.

Meanwhile, the BBC reported that India protested to the Chinese government regarding Chinese GPS maps that show parts of India as suddenly being part of China. China blamed a software glitch for the apparent mistake.

A story airing on WLWT-TV, Cincinnati explained how two slackers, taking advantage of a woman's lapse in common sense, allegedly stole the women's car that had her purse and cell phone inside. The victim quickly notified police who arranged for the GPS unit in her phone to be activated. Within minutes the two were facing a lengthy list of offenses and a stint in jail.

Finally, an article from the Shrewsbury (Massachusetts) *Chronicle* told the story of a hapless bank robber who knocked over a local bank and fled with a bag of cash. But, unbeknownst to the robber, the well trained and quick thinking teller had slipped a GPS tracking device into the bag along with the cash. The teller was also able to give an accurate description of the robber so that when the police caught up with the GPS unit, minutes later, the robber was easily apprehended.

"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, Larry Durham, Bob Grove, Bill Mullowney and Larry Van Horn.

How I Survived Self-Electrocution, Fame, Congress and the Publishing Industry

By Bob Grove W8JHD
(All photos courtesy the author)

Growing up in Cleveland, Ohio in the mid-Twentieth Century presented many opportunities to an impressionable youngster. I lived alongside the railroad, and often walked the rails. A long-abandoned shack that had housed switchers for the side rails was an open invitation to investigation.

Inside, among the disarrayed papers, was the chassis of an old radio. The temptation was too great; I simply couldn't leave it there, so I brought it home. Plugging it into an AC wall socket, I soon learned the hazards of 120 volts.

For example, it's not a good idea to stand on a wet cement floor while touching the chassis of an AC/DC radio! This first experience with an "all-American five" series-filament radio was shocking to say the least!

The Early Years

Getting zapped on a regular basis would eventually become a staple of my pre-solid-state, high-voltage existence in the vacuum tube era. But for the time being I set the radio aside, not realizing that this relic was my first step into the world of radio communications.

Besides the lure of the rails, we had two nearby movie theaters, and I couldn't get enough of Frankenstein movies with their amazing laboratory electric effects; the Jacob's ladder climbing spark has always been my favorite.

A Fred Astaire dance routine once spurred my juvenile imagination. Spinning around and pointing his finger at the stage, a flash and smoke would arise. I didn't know about stage pyrotechnics at that age, and after considerable thought, I figured he must have been throwing spark plugs! Don't ask me why; it made sense then.

Foraging through a greasy trash can behind a service station, I recovered a spark plug. Now was my chance! I spun around like Fred, threw it to the ground, and…. thud. Nothing. Nothing except the incredulous stares from the service station mechanics who had gathered at the back door to watch my amusing performance.

I walked to school every morning, and would leave a few minutes early on Wednesdays because that was trash collection day; I had to inspect every rubbish can between there and my home before the collection truck would arrive!

Occasionally I'd find a treasure, something with an electric cord on it. I'd hide it behind a large tree in a secure, shaded spot next to a railroad trestle until I could recover it after school. Eventually I had assembled quite a collection of other people's discards. My parents were very tolerant.

By my teens we had moved into the western suburb of Rocky River. My dad and mom had purchased an old farmhouse surrounded by acres of fields. Because of the amount of restoration that would be necessary to make it livable, Dad named our new home "The Acher!"

But fix it up he did, and my basement corner and my bedroom would become the nuclei of my fascination with radio and electricity. Soon my basement laboratory was up and running. I had a small Jacob's ladder zapping, and I could even use it to electrocute weeds and bugs.

Dissecting an old, tube-type car radio, I learned that one of most acrid odors was the smell of ozone-decomposed sponge rubber when you peeled off the metal enclosure of a vibrator. I also learned that one of the coziest experiences is lying in a cozy bed with the musty fragrance wafting from the warm, orange-filament-glowing tubes in an old radio late at night when the lights are out and you're listening to your favorite program.

My bedside radio was an old Philco cathedral model, and it had shortwave coverage. With a long piece of wire strung out my bedroom window, I could hear broadcasts from around the world, and even police calls just above the AM broadcast band. I would log everything I could hear in a spiral notebook.

TV interview with actress Ginger Rogers.

Discovering Ham Radio

The public library was right alongside my junior high school, and every afternoon I would meander over there and peruse their collection of electronics books. I didn't realize it then, but their radio books were terribly outdated, and what I thought I wanted to build would have been archaic.

I barely noticed at the time, but a dignified, elderly gentleman watched me with interest each time I visited that section of the reference shelf. One afternoon he approached me and observed, "So, you're interested in radio?"

"Yes," I admitted.

"Then let me help you by finding the right books; you don't want to build any of these sets."

The gentleman introduced himself as Dave Crossley, W8BCO, and he would become my "Elmer," changing my life's direction indelibly.

Meeting my parents first, Dave invited me to visit his radio shack. Stepping into that room, my eyes grew wide as I saw all the equipment and electronic parts he had. He turned on his WWII BC-348 receiver and tuned in a Morse code signal. When the dots and dashes stopped, he then started tapping his key, and the other station responded. I was hooked.

Dave was a confirmed CW operator; he didn't even own a microphone. He gave me a list of Morse code symbols to memorize, a code practice oscillator, and a study guide for the

Early test lab at Grove Enterprises.

Bob, Judy and youngest son Bill at hamfest in the 1980s.

amateur radio exam. Soon I was ready for my Novice code and theory test – or so I thought.

That darned FCC examiner was deliberately sending too fast, I just knew it! I only had to copy five words per minute, but he must have been sending 100…or so it seemed. But on the third try a couple of months later, I passed, and my life was about to change. A few weeks later my license arrived: WN8JHD – I was a licensed ham at age 13!

While awaiting that license, I carefully planned my ham station. Fortunately, after WWII, surplus radio parts and equipment abounded, selling typically at twenty-five cents a pound!

In Cleveland, the favorite vendor was Western Salvage, and I spent many hours poring over their bins, drooling over the tons of radio gear.

Dave presented me with a wiring diagram of a two-tube transmitter for 80 meter CW operation; it consisted of a 6AG7 oscillator and a 6L6 amplifier, a popular design for that era.

With acquired parts on the kitchen table, a drilled and punched chassis awaiting sockets and jacks, a roll of solder, and a big soldering iron heating in the flame of our kitchen gas stove, I was ready to build!

Lessons Hard Learned

And build it I did. Alongside a borrowed BC-348 receiver, I worked the world with a random-wire antenna strung out the window to a tree. I alternated the antenna between the transmitter and receiver with a big knife switch.

But after a few weeks, the transmitter became erratic. Examining the connections, I made the horrifying discovery that green corrosion was spreading throughout the chassis.

"Dave, what can I do?" I tearfully asked my mentor over the phone.

"Read me the label on the solder," he responded.

"Acid core solder…..Ohhhhh…."

Dave patiently told me how to neutralize and wash off the acid flux and repair as necessary, but with rosin core solder. Soon I was back on the air.

Some time later, Dave showed me how to test a battery without any test equipment.

"See this flashlight battery?" he was about to demonstrate. He placed the flat (negative) end against his upper lip, and then touched his tongue to the center terminal (positive).

"It tastes salty," he continued; "Here, you try it."

Wiping it off first, I confirmed his findings. Remembering this simple, cost-free test, I decided to test some of my own batteries at home. An AA cell tested good; a C cell, not so good. Then up came a 90 volt battery!

Now, I wasn't so stupid as to think that sticking a 90 volt battery across my lip and tongue was a good idea, so I decided I would just touch my tongue to the positive terminal while I lightly touched the negative terminal with my finger, thus using my body as a big resistor! Seemed like a brilliant idea at the time. Unfortunately, I hadn't counted on my finger accidentally touching my ear. All I can recall is the bright flash I saw in my eyeballs and picking myself up from the other side of the room!

Reporting my findings to Dave, he replied with a combination of amusement and concern, "Bob, I think you should get some simple test equipment. A multimeter would be a great asset since you could measure voltage, resistance, and current." I was relieved that he didn't add any comments about further damaging my brain.

His suggestion seemed like a good one. Accompanied by $7.95 worth of birthday money, I visited Progress Electronics, a long-time ham radio outlet in Cleveland where I selected a simple volt-ohm-milliameter (VOM).

Hurrying home, I could hardly wait to use it. But knowing nothing about such meters, I decided to learn. Unfortunately, I learned the hard way.

Setting the meter switch to "Resistance," I decided to see how many ohms there were in an AC wall socket. Another bad idea. A loud "crack" followed by a puff of smoke undeniably informed me that I might have misjudged something. Indeed, nothing worked on the meter after that.

With great optimism, I returned the meter to the man behind the counter at Progress Radio. "I think this meter is defective," I told him honestly – with certain rather obvious omissions. The look he gave me made it quite clear that he knew exactly what had happened and no, he wasn't going to exchange it for another one!

During one warm summer morning, I awoke to the thunder of a distant storm coming in. Curiously, a sharp "Snap" sound accompanied each remote lightning stroke. I got out of bed and sat down on the carpet next to the window to watch the lightning and to try to locate that sound. "Snap!" There went another one, and it sounded like it was under me!

I rolled up the edge of the carpet just in time to see the source of the sound: Lightning-induced high-voltage spikes were jumping between my antenna wire and ground wire right under where I was sitting!

Moving up to General Class

Although my Novice Class license limited me to CW on the shortwave frequencies, I could use phone on two meters. A requirement to do a project for my science class led me to borrow an old WWII SCR-522 VHF transmitter/receiver from another local ham to demonstrate amateur radio to my science class.

Sticking a two-meter antenna out the school window, picking up the microphone and successfully calling the other ham who was a good many miles away, impressed my teacher; I got an "A" for that performance!

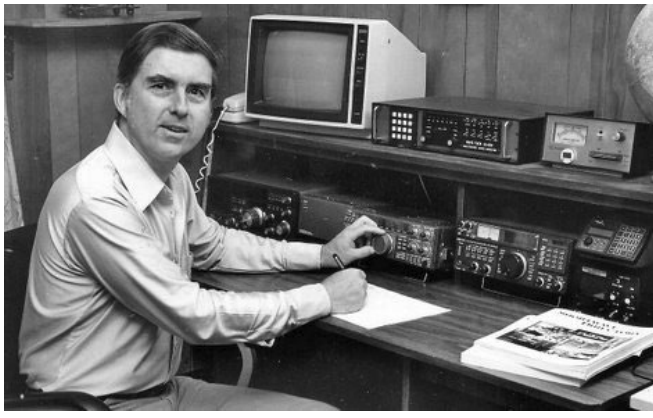
Although I enjoyed CW, I preferred voice communications. Another local ham, Tom Tabler, W8WZH, was exclusively a phone operator. Tom let me use his impressive, six-foot rack transmitter and Hallicrafters SX-28 receiver in his basement to practice phone communications. Since I was operating under his license and using his call sign, he was very particular about correct on-air technique.

"CQ, CQ, here is W8WZH" I identified. Tom came running down the basement stairs.

"You say 'This is W8WZH,' not 'Here is W8WZH!'" I shamefully acquiesced.

I finally upgraded my amateur radio license to General Class and beamed broadly when I opened the envelope from the FCC revealing my new call sign: W8JHD. Now I could exer-

Working the Jerry Lewis Telethon.



The home shack and office where MT was born.

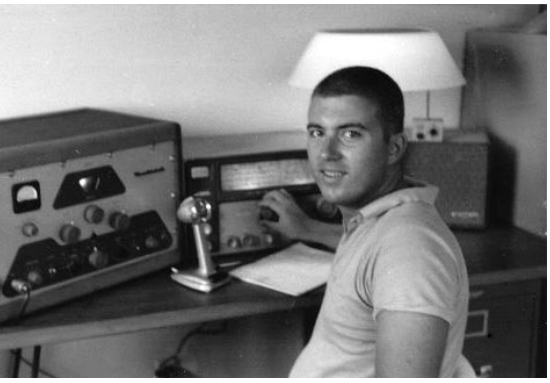
cise phone privileges in the high frequency (HF) bands, especially 10 meters, my favorite band.

When I was old enough to drive, I outfitted my car with a Multi-Elmac A54H transmitter, a Monitoradio receiver, and an eight-foot, bumper-mounted whip swinging in the breeze. Now that was cool!

When hams spotted each other on the road we would often send a "HI" on our car horns by Morse code – "di-di-di-dit di-dit." The corresponding ham would acknowledge with a polite "di-dit." Sometimes we'd hold a short two-way conversation with our car horns! Try that now and you will probably be wearing an irate motorist's bumper!

But in the 1950s, about the only folks on the road with long whip antennas were hams and police. I can recall one ham telling me over the air, "Hey, there's a ham with his call letters on the door – PO1ICE!"

My major investment at the time was the purchase of a $189.95 Heathkit DX-100 transmitter kit. Building it was quite an adventure, but the prize I owned when I finished was worth it.



Bob with Heathkit DX-100 he built.

The Broadcasting Business

When I started college, ham radio had to take a back seat for a while, but my interest in radio never failed. I earned some money as a studio engineer for WCMW in Canton, Ohio, and was the Music Director at WKSU (Kent State University).

Even after graduating, I pursued broadcasting, eventually becoming Public Affairs Director at WEAT-TV/FM/AM, an ABC affiliate in West Palm Beach. It was a very visible occupation, with my face seen on TV more than any other on-air "personality."

The fame was fun – for about a week. Judy and I couldn't go anywhere without hoards of "fans" interrupting us for autographs. I was patient and appreciative, but that got old in a hurry. Probably for the best, WEAT was bought out, and when the staff was transferred, my public affairs department wasn't included.

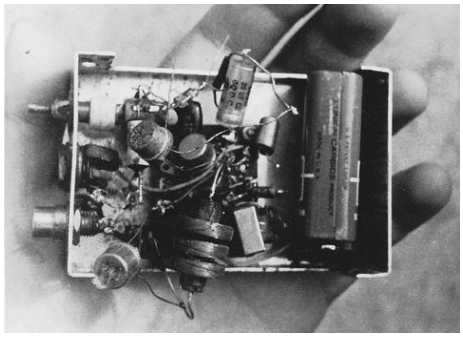
I went back to college and earned a Master of Science in Teaching (MST) degree, and with 17 years as a science/English/psychology teacher, ham radio was always at my fingertips, either in my home or my car, or even a ham club at school – and sometimes all three.

The Great Treasure Hunt

Coming up with gadgets was an early obsession. Metal detectors were particularly fascinating to me, and my next-door neighbor convinced me that I could market them. He owned an aluminum fabricating business and we decided to give it a try. I named the fledgling company Electronic Development, Inc. (EDI).

Starting with a haywire lab prototype with parts hanging out, I eventually condensed the circuitry into a neat box. Since my new business partner had just read an article about treasure hunting in Ecuador, he thought that would be a great place to field test the metal detector.

That was quite an adventure, exploring and digging in the Andes Mountains. Since we didn't speak Spanish and the skeptical Quechua Indians didn't speak English, we decided to cut the trip short, bringing home a few broken pieces of pottery. Coin shooting on the beaches of Florida proved far more profitable, and much safer!



Prototype metal detector was a mess.

A Better Idea

Frequent writing contributions to a number of electronic magazines built a small following of loyal readers who would share their wish lists with me. This gave me an idea: How about offering some of these products as a side business?

The idea worked, and Grove Enterprises was born with a factory-modified TV antenna, the Scanner Beam, being our first product. Neighbors manned the telephones. Soon our catalog contained listening tips, and regular customers clamored for more information. You guessed it: *Monitoring Times* hit the mails and the newsstands.

Beachcombing pays off!

MONITORING TIMES

VOLUME 1 – NUMBER 5 BRASSTOWN, NORTH CAROLINA 28902 SEPTEMBER/OCTOBER, 1982

New Worldwide Aeronautical Frequencies

EXCLUSIVE!

New RTTY Decoder Copies Encrypted Messages!

MT Volume 1 Number 5, when the magazine was a 24 page tabloid-sized bi-monthly. Note the $1.75 price.

Not a Bed of Roses

As much as I'd like to say that the success of *Monitoring Times* and Grove Enterprises has been easy sailing, the fact is that the demands of both have put me in positions that I would have preferred to avoid.

Long-time readers probably recall our attempt to launch a high-end receiver with many features not then found in competitive products. The SW-100 project was an intensive, three-year development effort that required the acquisition of engineers, technicians, and an expensive inventory of production parts.

We had a deadline to meet – a trade show at which we were scheduled to reveal our advanced receiver. But when the opening day arrived, the production unit was nowhere near ready. We had an impressive box with knobs, dials, and buttons, but not a finished receiver.

With a half-million dollars invested, we ran out of funds, our design engineer quit, and I had to admit that we had failed. It was a tough lesson, but it taught me some valuable things about business. You can't be prepared for everything as my next disaster would prove.

Our accountant discovered some irregularities during routine bookkeeping, but they were attributed to understandable errors made by a long-term, trusted employee. Sadly, it soon became apparent that these errors weren't accidental, they were intentional. Confronting the employee, she denied any wrongdoing, but the continued investigation of our financial records revealed the theft of well over thirteen thousand dollars and counting.

Finally, with irrevocable evidence in hand, we had the sheriff come to the office, arrest her, and take her to jail. It was a sad experience for our entire staff, but eventually she paid it back – with money she stole from her next employer!

But perhaps the most difficult time I had was when I was called to Washington to appear before Congress to testify in defense of our selling cellular-capable scanners.

During the mid-1990s, the 1986 Electronic

Doing a TV interview with Eddie Albert of "Green Acres" sitcom fame.

Communications Privacy Act (ECPA) was amended to prohibit the sale, manufacture, import, or possession of scanning receivers which included cellular telephone frequencies.

Many scanners of that period could be easily modified to include cellular coverage, and we sold them. We had even published instructions on how the modifications could be done, and a special Congressional subcommittee had been called to grill me, even though I was complying with directives from regulatory officials of the FCC. But off to our nation's capitol I went, paying my own way for transportation, room, board, and parking.

As I walked through the Congressional hallways toward the hearing chamber, I was overwhelmed by the history and lofty character of that building. I felt a pride for the processes that had created our legislative system and looked forward to the imminent experience. But, I should have paid more attention to the warnings cast in my direction by members of the scanning community who had come to witness the procedure: "They're going to ambush you!" they repeated. "Nah, these folks were too professional to stoop to that," I thought.

Upon entering the vast room, I was seated at a table in the center of the floor. Soon, members of Congress came in, one by one, and took their places in an elevated gallery where they could look down on me. It reminded me of a sports event in the Roman Coliseum.

After I made a prepared presentation in my defense, it was time for the legislators to take aim, and take aim they did. It was a grueling four hours of spotlighting themselves in the cameras for their adoring constituents, and I was the target.

"May I answer that?" I requested of the accusatory Congresswoman from Ohio.

"No," she replied, "I have five minutes!"

And so it went, the longest four-hour day I've ever spent, and it was very disillusioning. I drove home sadder but wiser.

Soon after that, the weight of the receiver failure, the theft by a trusted employee, and feeling crushed by a political gambit, my health began to wane. One morning my wife Judy couldn't wake me, so she called an ambulance.

I did awaken shortly, but I was admitted to the hospital anyway for several days of cardiac diagnosis, including five heart catheters performed in a darkened surgical suite that reminded me of Frankenstein's laboratory! But with plenty of Valium in my system, I was actually enjoying the procedure!

Fortunately, the diagnostics revealed no irregularities or damage; I had merely succumbed to stress. But it was an eye opener, and I down-shifted my drive to more productive, less stressful endeavors. One of those was making sure that *Monitoring Times* was on the right track and that we were following the listening trends of our market.

A Brighter Future

Apparently it has worked. In spite of the demise of many of our hobby's publications, *MT* is going strong as we see our print subscriptions bolstered by an increasing number of on-line requests for *MTXpress*. This is not only reassuring, but validating.

As I look back, I consider the continuing success of *MT* as my greatest professional achievement. Even with the downslide of other print publications, *MT* has held the forefront for more than 30 years by offering authoritative articles, on subjects of greatest interest, written by high-credibility authors.

And while armchair critics have been saying for years that radio monitoring is going by the wayside, we don't see that at all. As new communications technologies challenge manufacturers, new products are being developed to meet those challenges.

Bob enjoying one of his latest endeavors; drumming!

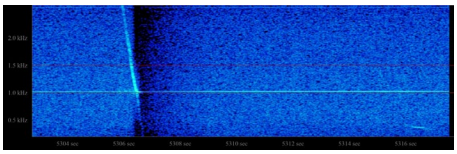
MT will continue to be your best listening reference, and you can find me sitting in my radio room listening to radio communications on a software-defined receiver, a microphone readied by my ham rig, and the latest copy of *Monitoring Times* at my side!

MT

Meteor Monitoring

By Stan Nelson KB5VL
(All charts and images are original by the author)

Looking for space invaders? Try detecting them by radio. Meteors, small as grains of sand and up, bombard our atmosphere twenty-four hours a day. Few of us will have one land in our back yard. However, you can catch many of them 'electronically' using reflections off of the ionized trails created when the meteor streaks into the ionosphere high above the Earth. The meteor's friction causes a short lived 'radio mirror' that reflect radios waves from an Earth based transmitter. Some of the reflected radio waves can arrive at your location. This effect is called Forward-Scatter.



Meteor detection by radio was discovered around 1929-1930 by engineers while studying the effects on radio waves in the ionosphere (McKinley, 1961). They noticed short-lived enhanced signals on their recordings. Eventually, meteor radars were developed utilizing VHF (Very High Frequencies) to bounce signals off of the meteor trails. It enabled astronomers to detect the path, velocity, and duration of meteors. However, this technique is expensive and mostly out of the range of amateurs.

I would like to share with you some of the techniques I have used in my quest to find a relatively low cost method to capture meteor echoes using distant radio signals.

Detecting Meteors using FM Radio Stations

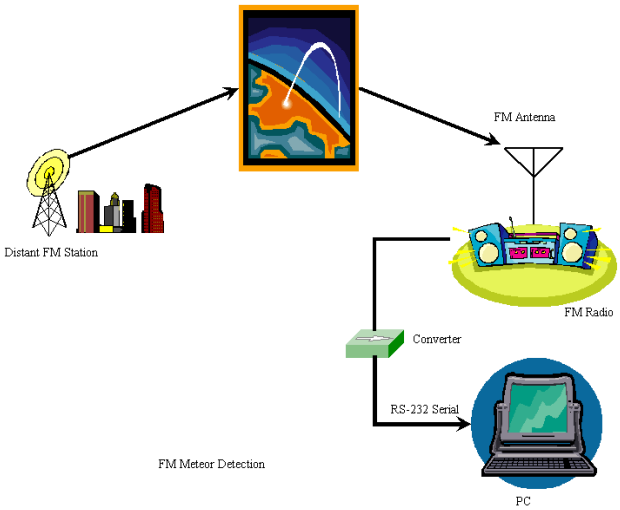
Ten years ago, after reading an article on using FM (Frequency Modulation) stations to detect meteors, I gave it a try. I quickly found out it requires a stable, digitally tuned FM receiver and a simple FM beam antenna. This scheme relies on not having a nearby signal and being able to hear a station's reflected signals from perhaps a thousand miles away. You basically hear a sudden signal enhancement, even hearing voice or music for a few moments until the reflector in the sky, the forward scattered signal, fades. Then the noise returns.

Several techniques have been used to log the activity. Pierre Tierrer in France developed a computer program that uses a simple electronic interface between your FM receiver's audio and a computer's serial port (RS-232) compatible signal. The disappearance of standard serial ports on newer computers may require you to purchase a USB-to-Serial Port converter to get the signal into the PC. His program logs signal enhancements as bar charts. The meteor counting software can be obtained free from: Pierre Terrier [*pierre.terrier@free.fr*] See **http://radio.meteor.free.fr/us/main.html**

I ran two to three FM receivers this way on 88.7, 88.9, and 107.1 MHz for several years. Eventually 88.9 MHz went on the air locally causing interference. During the years I ran the FM scheme, I sent my data to a depository along with other folks around the world using similar equipment. The results of contributor's data can be seen at: **http://radio.data.free.fr/main.php3**

One of the advantages of this method is low cost. However, finding a high powered FM station located a long way off, about a thousand miles, without any nearby stations within a couple of hundred miles is challenging. Another problem is propagation. The signal can travel further than normal under the right weather or temperature conditions. The 'enhanced' signals can 'swamp' your receiver with steady signals. During times when this type of propagation is active, FM meteor detection is almost impossible and detected counts are extremely high due to the almost continuous signal.

Below is a sketch of the basic receiving scheme I used. I had good luck with a Radio Shack FM beam antenna pointed upward about 15 degrees above the horizon, orientated towards the northeast. I finally used a Morantz FM receiver that had a narrow band option and it improved the detection considerably, cutting down adjacent channel-interference from the channel above or below the one I was tuned to.



The PC was connected to my LAN (Local Area Network)/WAN (Wide Area Network), a.k.a. Internet, to upload the daily counts automatically. Even though I am not currently using FM, I do plan to get back on and see if I can find some desirable station to monitor. It is a great way to get involved in meteor detection at a low cost. The software is free, too.

Detecting Meteors using CW RADAR

The NAVSPASUR (Navy Space Surveillance System), now an Air Force operation, is a more difficult but rewarding source of radio waves bouncing off meteor trails. Several sites across the Southern United States are linked to provide detection of space objects using high powered CW (Continuous Wave) transmission. It currently consists of three transmitter sites and 6 receiving sites across a 91 to 272 (east to west) degree line from San Diego to Georgia.

Receivers detect the reflections and timing that provides position and tracking information. One article (see references below) notes NAVSPASUR could detect objects the size of basketballs at 7,500 miles above the Earth. The CW radar is a useful signal for meteor burst, but unfortunately it seems to be available only along the narrow radio path from west to east created by the 'Electronic Fence.' I live on that line, 300 miles west of Lake Kickapoo, Texas, where one of the high powered sites is located. After reading an article on www.SpaceWeather.com where a listener in Louisiana was detecting meteors using the Space Surveillance system's transmissions, I quickly tuned up my Icom R-8500 receiver on 216.979 Megahertz using USB (Upper Side Band) detection.

The efficiency of radio waves bouncing off meteor trails diminishes as the frequency increases. As a result, it takes high transmitter power of the ground station and a sensitive receiver and good antenna gain at the receiving site to successfully receive these signals. This combo exists at my site and others placed along the NAVSPASUR beam's path. I don't have an exact calculation, but experience indicates you probably need to be within 50 to 100 miles of the

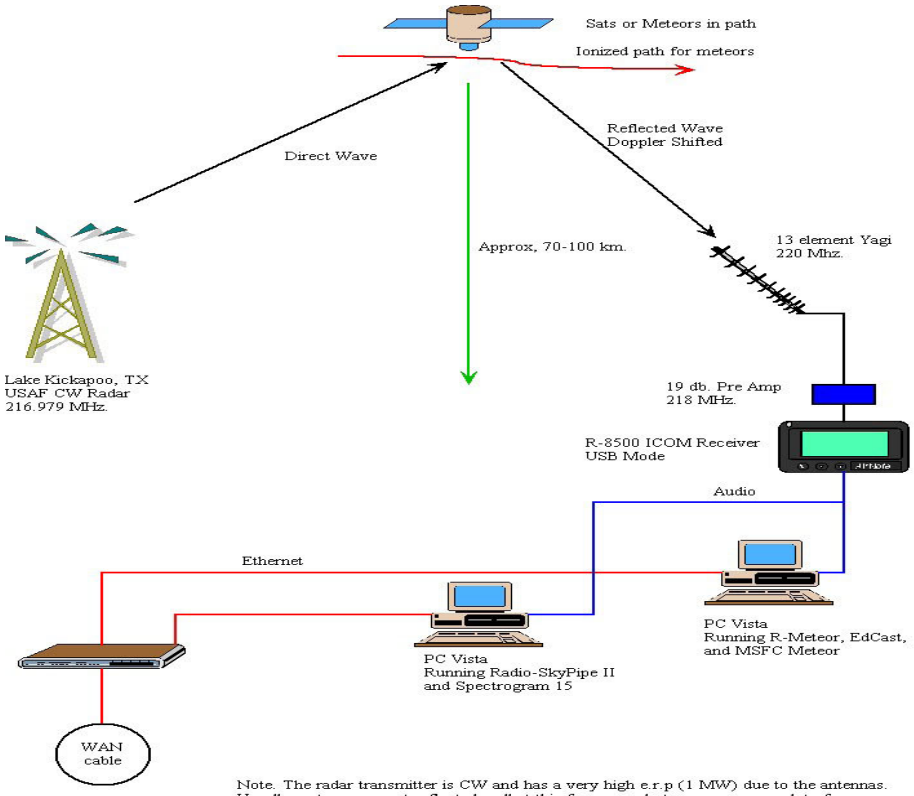
path to detect the reflections. I have not heard of anyone detecting the 216 MHz signals very far north or south of the line.

Another important factor is that the signals that arrive at my site in Roswell, New Mexico are reflected mostly from the mid-point between the transmitter and the receiver. That means we detect meteors from a relatively small area of the sky. I have my antenna raised about twenty degrees to intercept the midpoint.

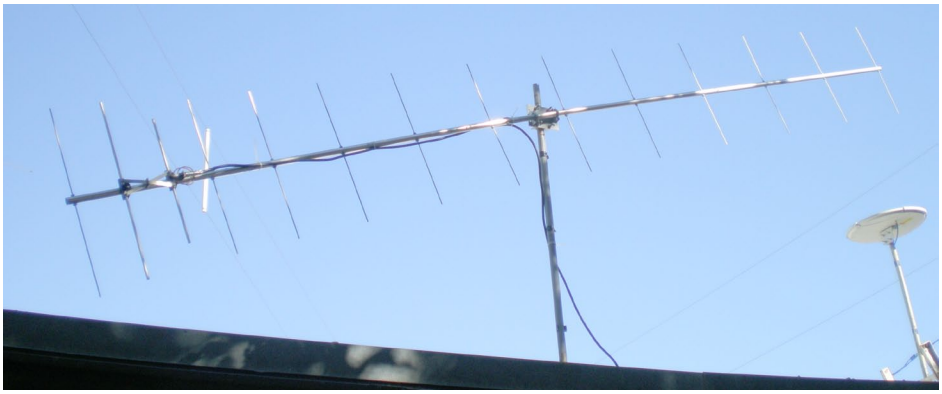
On my first attempts at using NAVSPASUR, I pointed my beam antenna east, and after some patience I detected a reflection. After fussing with several different antennas, I finally ordered a 13 dB 220 MHz beam and began to get good results. I then sent some of the captured audio files (using Bill Horne's Spectrogram software, which converts PC sound card input into a spectrum chart and digital files as WAVs) to Dr. Tony Phillips at **http://SpaceWeather.com**. He published one on his web site and after that I was hooked. Later, we discussed the possibility of transmitting the radio's audio continuously so the 'World' on the Web could hear the echoes.

We eventually found a way to broadcast the audio to the public using NASA web broadcast facilities, and we did this for a couple of years. It later became unavailable and we were off-the-air for awhile. We now use a commercial webcasting service sponsored by **http://SpaceWeather Radio.com** and other donors. During the last meteor shower, we had close to 600 listeners during the peak. My audio is fed to the web broadcast service 24/7.

The scheme above has been modified slightly. I recently replaced the old Vista PC decoding 216 MHz radar with a Compaq running Windows 7. R_Meteor, Spectrogram 16, and Ed-cast (software that sends the digital audio to the webcasting service) runs continuously.



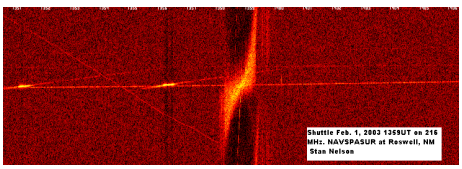
I caught the tragic re-entry of the Shuttle by chance. I knew the Shuttle was scheduled to fly across Northern New Mexico early Saturday morning, February 1, 2003. I started recording



Meteor monitoring via FM radio

the audio a few minutes before the re-entry and then watched it streak across the sky and listened to the Doppler on the radio. Then my wife and I went out to breakfast. While eating, we saw the television announcement indicated the Shuttle had crashed. I quickly headed home and recovered the trace shown below. The WAV file was about 30 Megabytes. I decided to call the local news and left a message that I had detected it. They called Monday and it made the news. I sent the audio files on to NASA.

The below chart was created with audio from the ICOM R-8500 receiver using R_Meteor software which 'paints' and saves the traces as BMP images. Regardless of what technique you choose to use to capture meteor burst signals, I highly recommend this program to be used at the same time. It converts the audio into a BMP (Windows Bit Mapped Graphic) that can be easily viewed and worked with using Windows Paint. Each BMP image is saved every four hours.



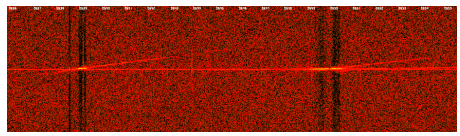
The Shuttle echoes in the image above were 'clipped out' from that image, now representing fifteen minutes. R_Meteor gives you a broad look at meteor activity over the last 15 minutes on the monitor and any four-hour segment can be retrieved at a later time.

Two interesting additional phenomena we can detect with forward scatter are aircraft and lightning strikes. The aircraft in the Lubbock, Texas area enhance the radar reflections and of course have a low Doppler effect due to their slow relative motion. You can see two of them in the R_Meteor trace above. They slope upward slowly. One listener in Dallas notes he tracks them on my signal feed and correlates them using the Flight Aware web site. Indeed, any aircraft in the Lubbock area shows up. Lightning shows up as sharp spikes with no noticeable Doppler effect.

The R_Meteor trace above is from October 2, 2010. The time is local (MDT) Mountain Daylight Time from 0616 to 0635 Hours. The two traces that slowly slope upward are aircraft. The sharp spikes are meteors. However, lightning can appear about the same on the slow trace, though with little width.

An interesting fact about the Doppler effect is the frequency shift is greater with higher frequencies. Most of experience Doppler shift in the audio range, when the speeding train's whistle increases in pitch as it approaches and decreases as it speeds away from us. It happens with radio waves, too. The basic formula says, if you divide the change in wavelength by the wavelength at rest and then multiply it by the speed of light, you come up with the velocity relative to the receiver.

Space Weather Radio now announces when the ISS (international Space Station) passes over Lubbock, Texas. I have found the space station can be detected with my system about 15 seconds before and after its predicted pass. I have used **www.heavens-above.com** for assistance to find the pass time. Below is a typical ISS pass chart using Spectrogram to log the Doppler shift. Note the trace is ten seconds with a shift of frequency of over two kilohertz.



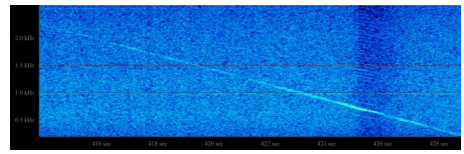
(Above) A typical early morning trace using R_Meteor.

Detecting Meteors using TV Carriers

Television was a very good source of high powered signals using TV video carriers, but these signals mostly disappeared with the advent of digital TV transmissions. I used TV Channel 4 video carrier for several years using an ICOM portable shortwave radio tuned to 67.24 MHz USB for a number years.

It was fairly easy to build a simple beam using plastic pipe and wire, with the antenna pointing upwards. The beam was based on a design obtained from Rob Suggs at NASA.

We broadcasted the TV carrier echoes for awhile. Again, unwanted propagation (signals that travel over long distances due to ducting, temperature inversions, etc.) signals often swamp out the received signals from meteor echoes. I have been unable to detect any TV video carriers since the digital conversion.



Other Sources of Meteor Burst

There a number of other possible sources of signals that can be used for meteor detection. Radio Amateur beacons, SNOTEL, and other meteor burst communications signals are possibilities. SNOTEL is a system that communicates with remote facilities that measure the depth of snow in various parts of the country/world. See (ref. 10). Try listening on 40.53 MHz.

Like any monitoring pursuit, it's always fun to hear something new. Capturing meteor bursts is fun simply because of their unpredictable arrival. Find a good receiver and antenna and start listening for that burst.

REFERENCES:

IMO (International Meteor Association)
Meteor Science and Engineering by D.W.R. McKinley. McGraw-Hill, 1961

www.SpaceWeatherRadio.com
You can listen to my meteor burst detection at Roswell via web broadcasts.

www.RoswellMeteor.com
My personal web site. I post recorded pings and audio files on different types of echoes.

Dr. Tony Phillips, **http://SpaceWeather.com**

Pierre Terrier [*pierre.terrier@free.fr*]
See **http://radio.meteor.free.fr/us/main.html**

R_Meteor can be purchased at
www.coaa.co.uk/r_meteor.htm

Space Surveillance Radar System
www.fas.org/spp/military/program/track/spasur_at.htm

http://spaceweather.com/glossary/forwardscatter.html

SNOTEL Article
http://iahs.info/redbooks/a197/iahs_197_0229.pdf

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WiNRADiO AX-91M magnetic antenna base	ANT48	$24.95
Icom AH-8000 Wide-coverage Discone	ANT54	$249.95
Grove Flex-tenna HVU	ANT45	$14.95
Grove Flex-tenna VU	ANT46	$9.95
Professional Wideband Discone	ANT 9	$99.95
Scantenna + 50' coax	ANT 7	$49.95
Super-M Ultra Base Station	ANT61MBS	$189.95
Super-M Ultra Mobile antenna w/NMO mount	ANT61NMO	$109.95
Super-M Ultra Mobile mag mount	ANT61	$124.95
Super-M Multiband base antenna	ANT10MBS	$99.95
Super-M Mobile antennna w/ NMO mount	ANT10NMO	$79.95
AOR DA3200 ultra wideband discone antenna	ANT 62	$184.95
AOR MA500 Wide Range	ANT 12	$99.00
AOR SA7000 super-wide receiving	ANT 39	$229.95
WiNRADiO WR-AX-31C Log-Periodic Antenna	ANT 58	$139.95
WiNRADiO AX-24B discone antenna	ANT 63	$349.95
Grove Universal Telescoping Whip	ANT 6	$14.95
Diamond HT/Receiving & Scanner antenna	ANT 64	$24.95
Super-M Superior Mobile Antenna	ANT 10	$94.95
Create CLP51301N Log-Periodic Antenna	ANT 16	$409.95
Create CLP51302N Log-Periodic Antenna	ANT 17	$299.95
25' of RG-6U cable	CBL25	$14.95
50' of RG-6U cable	CBL 50	$19.95
100' of RG-6U cable	CBL 100	$24.95

MISCELLANEOUS ACCESSORIES

UNIDEN UA-72 DC CORD	DCC 19	$19.95
Universal Cigarette Adaptor	DCC 3	$12.95
Ramsey Broadband Preamp	PRE 2	$59.95
Scancat Gold for Windows	SFT 2W	$99.95
Scancat Gold for Windows SE Upgrade	SFT 2SE	$59.95
Scancat-Lite Plus	SFT 19	$29.95
PAR VHF Intermod Filter 152MHz	FTR 152DS	$69.95
PAR VHF Intermod Filter 158MHZ	FTR 158DS	$69.95
PAR VHF Intermod Filter 462MHz	FTR 462DS	$69.95
FM Trap Filter 88-108MHz	FTR-FMDS	$69.95
PAR NOAA Weather Filter 162 MHz	FTR 162DS	$69.95
GRE Superamplifier	PRE 1	$59.95
Noise Cancelling Mobile Speaker	SPK 7	$8.95

Shortwave's Unlikely Future: Disco Palace

By Hans Johnson

Disco never dies! I think that was actually about rock-n-roll as sung by Neil Young, but disco does live, in the form of a shortwave program now celebrating its first anniversary. "The Disco Palace," as the station is known, is heard two hours a day; one hour directed to Europe and the other broadcast to North America.

Disco Palace joins a small group of international broadcasters using a digital mode of transmission known as Digital Radio Mondiale, usually referred to simply as DRM. Unlike analog shortwave signals, to tune in to DRM programs listeners will need a shortwave radio capable of decoding the digital stream being transmitted. The channel belongs to an even smaller group of international broadcasters transmitting in DRM that are actually receivable in North America. Currently, the bulk of DRM action is happening in Europe.

If you're not familiar with the music genre, just what is or what was disco? Disco was a dance craze from the 1970s and you either loved it or hated it. Disco clubs throbbing with the infectious music popped up all across North America and Europe, with movies such as *Saturday Night Fever* depicting aspects of the fad that included outlandish fashions and seriously slick hair-dos. For some reason, this type of music is the format of the Disco Palace which started broadcasting in February last year.

But, just what is Disco Palace up to? International shortwave broadcasters get on the air a number of ways. One is to be a national voice such as BBC or Deutsche Welle. For the most part, they actually own their own studios, transmitters and antenna sites. But, a programmer may also purchase or exchange airtime in order to transmit its programs to a particular audience. Radio Japan and Radio Canada International (RCI) have an airtime exchange agreement dating back decades. This way Radio Japan gains better reception in North America and, conversely, RCI in Asia.

Programmers without any transmission facilities of their own may simply purchase a block of airtime. Unlike an advertisement, the programmer is purchasing the entire time, whether it is 15 minutes a week or dozens of hours a day.

There are many examples among American shortwave stations: WBCQ and WRMI, for example, offer brokered time slots. These stations assemble the purchased airtime into a long schedule on a single frequency. Format is often sacrificed as the listener might hear an English language program one hour and a Spanish Christian program the next.

Sometimes programmers do not want to be tied to other programs. In such cases, the facility's transmitter would start the first hour on frequency "one" for programmer "A." At the end of the hour, the facility would switch to frequency "two" for programmer "B." The transmitting facility assumes no responsibility for promoting or branding the program. That rests solely with the programmer.

The programmer not only has a choice as to what type of facility they would like to use, they also have a choice of whether to use a broker or deal with the station/facility directly.

A brokered program like the Disco Palace, which is run by a Florida-based limited liability corporation, is happy to inform listeners where they are transmitting from and who is behind the station.

The Disco Palace chose to go through a long-time shortwave broker, the Belgium-based Transmitter Documentation Project or TDP. While sporting the address of a Miami, Florida, business park, music programs like The Disco Palace can be produced just about anywhere with a computer and some software. The program content is sent via the Internt from the programmer's computer to the transmission facility.

The goal of The Disco Palace is simple, "We want to show the possibilities of DRM on shortwave," says Paul Turner spokesperson for Disco Palace. To do so, they've constructed a sort of fantasy land based around a mythical place called the Disco Palace. Turner estimates The Disco Palace's audience at a few hundred each in North America and Europe – and, by *audience*, Paul means regular listeners who like disco music. While the Disco Palace plans to issue QSL cards, Paul noted, "We haven't sent them yet because we have been too busy, but we will be sending them to the printer."

The crew behind Disco Palace have two longer term objectives: promote DRM to the extent that additional, less expensive models of DRM receivers are produced, and to serve as a broker for new programmers wishing to broadcast in DRM.

DRM Receivers: The chicken or the egg?

For years, DRM receiver manufacturers have said that they need more transmissions in order to produce receivers. Some broadcasters have refrained from adopting DRM because there have not been enough receivers available, particularly inexpensive ones.

The Disco Palace has taken the bold step of putting DRM transmissions on the air for a year with the feeling that the more DRM transmissions there are, the more DRM receivers there will be available.

Radios come and go, and manufacturers enter and leave the market. They design new models and drop old ones. It is a constantly changing scene and this is particularly true of the DRM market. Currently, there are no portable DRM radios readily available to North America, though there are a few available in the European market.

The UniWave Di-Wave 100 (see review in *MT* April, 2010) had been available from Universal Radio, but they've sold out of their supply and it's not clear whether more radios will be available. At press time the company stated that they are not accepting orders for this product.

But, all is not lost for DRM listeners and fans of disco on shortwave. Many current software defined radios (SDRs) such as TenTec's 320D, WiNRADiO G3 series and others can tune DRM transmissions just by adding the free downloadable software.

Dicso Palace Broadcast Schedule:

For Europe 1400-1500 UTC 6015 kHz and for North America 2000-2100 UTC 15,755 kHz.

Transmissions to Europe are via TDF's transmission provider in Issoudun, France using 60 kilowatts of power. The transmissions for North America are brokered via the Radio Netherlands site on the Dutch Island of Bonaire in the Southern Caribbean with 100 kilowatts.

About the author: Hans Johnson is a long-time shortwave listener and has contributed a number of articles about shortwave listening to MT and several other publications.

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

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China's Global Electronic Reach

By Ken Reitz KS4ZR

There is no better example of the confluence of money, technology and global opportunity than the story of China's emergence in the 21st century as not only a top global power but an impressive leader in worldwide communications.

China Radio International (CRI) was originally called XNCR, the "Voice of Liberated China," and began broadcasting in 1941 during the Chinese civil war. According to CRI history, the station broadcast from a studio literally built in a cave in the small village of Shahe, in the Taihang Mountains of northern China. After the founding of the People's Republic in 1949, the station moved to Peking, changing its name to Radio Peking in 1950. In 1983 it became Radio Beijing and finally, ten years later, was renamed China Radio International.

During the first 50 years, China's centrally controlled media, Xinhua (official news service), CRI (official radio voice), China Central Television (official television channel) and the official daily newspapers (*People's Daily* and *China Daily*) were introspective, carefully laying out the official party line and reacting to events at home and abroad in a style more akin to Soviet Russia.

But, over the last 10 years, everything has changed. China is flush with cash. What was seen in the West as a wholesale economic collapse in 2008 was but a mere speed bump for China's economy, roaring along in the fast lane. Money gushed into every media outlet, including, most importantly, CRI and CCTV. And, at a time when older western shortwave services started scuttling transmitter sites, cutting back on programming and begging their governments for pocket change to continue operating, enough money poured into the main state-supported media ($6.6 billion dollars in 2009) to make even a western hedge fund manager blush.

Li Wei, right, vice minister of the (China) State Administration of Radio, Film and Television and Wang Gengnian, CRI director-general push the button to launch CRI's overseas radio station in Tijuana, Mexico, at CRI's headquarters in Beijing, China on Tuesday morning, November 2, 2010. (Photo: CRI Online)

Controlling the Airwaves

China is now the envy of the international broadcast world with a budget lavish enough to spread the message of China's culture and politics on different media platforms all over the world. As a result, they're everywhere, with seemingly countless shortwave and satellite transmissions to Europe, Asia, the South Pacific, Africa, as well as North and South America. CRI is often the biggest signal on any band.

Not content to own the shortwave bands, CRI has invested heavily in brokered AM and FM broadcasts around the world. The policy, described by Hong Kong journalism professor Chan Yuen-Ying in an article he wrote for *Global Asia* this past June, is known as zou chuqu ("go out") and began with FM 91.9 in Nairobi, Kenya in 2006. Since then, CRI has been rapidly expanding its global radio reach, broadcasting its positive message in 41 native languages through the broadcasts of CRI programming on 50 local AM and FM stations around the world. And, according to CRI, that makes them second only to the BBC in number of overseas bases.

In the last few years CRI has successfully deployed its strategy of cash-for-broadcasts across North America. Its latest conquest came November 1, 2010, when XERCN-AM 1470 Tijuana, Mexico (5 kW non-directional) became "the first Spanish speaking station in Latin America and the fiftieth overseas station on CRI's massive network," according to a press release from CRI, "The programs will mainly target the local audience and the Spanish-speaking communities in the United States." The broadcast, according to CRI's overly optimistic projection, will reach six million people.

Optimism may be a fault for CRI planners. Earlier this year CRI signed a five year agreement to lease all program time on KGBC-AM 1540 Galveston, Texas (2.5 kW day, 250 watts night), which is owned by Siga Broadcasting. Time brokerage, on the formerly all-oldies format and locally run station, was said to have been arranged by Pacific Media International, a California-based corporation headed by James Su.

A diagram on Siga's website (taken directly from Radio-Locator.com) depicts the broadcast contours of KGBC and shows the bulk of the station's signal feeding the fishes in the Gulf of Mexico. It also clearly shows coverage over a portion of Houston. Not so, according to an article in the *Houston Chronicle* from March, 2010, which quotes a former employee as saying CRI didn't realize it wasn't covering the Houston market with KGBC's signal. Station management is said to be preparing an FCC

The First female English Announcer of China's Overseas Broadcasting, Wei Lin in 1952. (Courtesy: CRI)

China Now broadcast team (Courtesy; CRI)

CRI English service with friendly voices in recognizable accents: Susan Ossman, former BBC Radio host (England), Duggy Day (Scotland), Thomas Rippe (U.S.), and "Mark" (Canada). (Courtesy: CRI)

application for a power increase to cover the market the Chinese thought they were buying.

In late 2009, CRI entered into a similar agreement with the equally struggling KHCM-AM 880 Honolulu, Hawaii, (2 kW day/night, non-directional) owned by Salem Media, a programmer of Christian-related talk radio. Pacific Media International was said to have put that deal together as well.

The choice of stations may seem puzzling, but makes perfect economic sense to CRI as it looks for the most coverage for its Yuan. That's how CRI's part-time programming ends up on the strangest stations: WROL-AM, a Boston Christian station, and WBIG-AM, a Chicago shopping station, for example. But, a quick look at their schedule shows the savvy time purchases that, for the most part, put CRI news squarely in competition with the big players in those markets during the crucial afternoon drive-time.

CRI, like any other international media outlet, takes care in choosing which on-air personalities make it to our ears. Sensitive to the need for comfortably recognizable voices to present the news stateside, CRI has done an excellent job of sounding as much like VoA and BBC as possible. In fact, one staff member, Susan Ossman, came from a fourteen year stint at BBC Radio. Voices from America (Thomas Rippe), Canada (someone known simply as "Mark"), and Scotland (Duggy Day) give a certain reassurance to the news from China through familiar sounding accents.

Controlling the Content

But broadcasting, as with many aspects when dealing with China, is not done on a level playing field. China does not allow purchase of programming blocks on any of its domestic outlets. Quite the contrary, programming on local media are strictly controlled. It's what Professor Chan calls a "commanding heights media system" where the government "serves as financier, management and regulator."

And, if they can't control on-air content, maybe they can block it. That's often the charge by international broadcasters regarding interference on the shortwave bands by powerful transmitters said to operate within Chinese borders. One jamming technique popular with the Chinese government is a type of Chinese folk music known as Firedrake and has been widely deployed. Complaints of Firedrake jamming of such signals as Radio Free Asia and Voice of America's Mandarin Chinese and Tibetan shortwave services abound as well as reports of Firedrake jamming of BBC, and Taiwan's Sound of Hope, among others.

One shortwave and satellite TV DXer, based in Australia, located a 60 minute audio feed of Firedrake music on an audio subcarrier of a transponder on ChinaSat 6B, a satellite used by China National Radio. An interview with Keith Perron, a former CRI broadcaster, and Mark Fahey regarding the CD-quality Firedrake satellite feed may be heard here: **www.youtube.com/watch?v=39XdFBkPmjo&feature=related.**

With its own fleet of home-built and home-launched communications satellites, China dominates the satellite TV skies over Asia. But, it hasn't ignored the West. China has extensive transponder leases on at least three domestic U.S. satellites, as well as several European satellites broadcasting in Russian, Arabic, Spanish, French and English languages. No other country even comes close, though both BBC and VoA give China a run for its money, with Japan (NHK) and Germany (Deutsche Welle) running a distant third and fourth. But if money is the issue, it could be some years, if ever, before any country can outspend the Chinese.

With radio, television, print and online media strictly controlled in its own homeland, China enjoys a great advantage abroad, leasing full-time satellite transponders around the world; buying the entire broadcast time of local AM and FM stations, and making select program buys on strategically located stations around the world to promote the well polished image of the largest and most successful Communist country in the world. As Professor Chan has warned in his article in *Global Asia* magazine, "It would be a grave error to dismiss the impact of China's media on the world, especially in developing countries."

MT

Full-time CRI Programming in U.S.
Galveston, Texas KGBC-AM 1540
Honolulu, Hawaii KHCM-AM 880
Tijuana, Mexico XERCN-AM 1470

Regularly Scheduled Programs
U.S.
*Baltimore WBIS-AM 1190 2:00-3:00 PM
Boston WROL-AM 950 4:30-5:30 PM
2:00-3:00 AM
Chicago WBIG-AM 1280 6:00-7:00 PM
Northern California/Nevada KCFJ-AM 570 5:00-6:00 PM
*Philadelphia WNWR-AM 7:00-9:00 AM
Los Angeles KWRN-AM 1370 5:00-6:00 PM
San Diego KCEO-AM 1000 6:00-7:00 AM
*Washington, D.C. WUST-AM 9:00-10:00 AM
*Part of New World Radio network

Canada
(Canada limits foreign content by law)
Ottawa CHIN-FM 97.9 5:00-6:00 PM
Toronto CKMW-AM 530 12:00-1:00 PM
Toronto CHIN-AM 1540 5:00-6:00 PM
Toronto CHIN-FM 100.7 5:00-6:00 PM
Vancouver CHMB-AM 1320 8:00-9:00 PM
Winnipeg CKJS-AM 810 5:00-7:00 PM

China Radio and TV Programming via Satellite

The satellite listings below are well known to satellite TV DXers, though they are not officially listed on the CRI main web page. In addition to CRI shortwave audio, carried in several languages on Intelsat 9, China maintains full-time satellite transponders for TV programming from China Central Television (CCTV) on both C and Ku-band satellites viewable throughout North and South America. Video and audio services from RCI and CCTV are Free-to-Air (FTA), available 24/7 and can be received on any standard FTA receiver. The CCTV4 service on G17 below is also FTA but can only be seen using a Motorola 4DTV receiver.

Galaxy 17 (91ºW) 4.180 GHz (4DTV) V Polarity
CCTV4 (Chinese)

Galaxy 3C (95ºW) 11.780 GHz 20.760 SR H Polarity
CCTV 4 (Chinese)
CCTV 9 (English)
CCTV F (French)
CCTV E (Spanish)

Intelsat 9 (58ºW) 3.880 GHz 27.684 SR H Polarity
CCTV 4 (Chinese)
CCTV 9 (English)
CCTV F (French)
CCTV E (Spanish)
China Radio International

Times and frequencies for CRI broadcasts to North America and the Caribbean via shortwave may be found here: **http://english.cri.cn/7146/2010/03/30/2141s560015.htm**

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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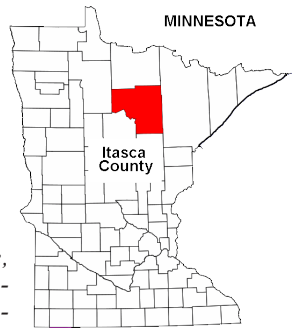
www.signalharbor.com

Dragged into the Digital Age

The New Year is a great time to learn new things and try new activities. This month I'll go into detail helping a reader in the frozen north get straight on the details of a new digital trunking system in his area.

❖ Itasca County, Minnesota



I live in Northern Minnesota, Itasca County. We have gotten a new trunked system for the Itasca County Sheriff's office, and of course, nobody's scanner works anymore, including the $575 one I bought. I have had this scanner a couple of years, and possibly because of a brain injury and no memory, I am having troubles. First, there is only one control frequency for the two licenses that the Itasca County Sheriff's office uses. It is my understanding that I only have to program in that one frequency, the others issued with the two licenses will "follow," once the control frequency is programmed. Is that right?

Also, there are talkgroups mentioned in the manual. I would assume that as long as there is one control frequency, there is only one talk group. Do I program a talk group "Itasca. S.O." for example, then set the frequency?

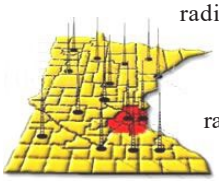
What about PL tones? Is a PL tone something I have to program into the scanner to hear the frequency, or is the PL tone something the Itasca County Sheriff's office already has programmed?

I have called and e-mailed the FCC, but the lady there I talked to did not know what a PL tone was. Any, I repeat, ANY, HELP or suggestions, would be appreciated. Thanks,

Pat in Minnesota

Itasca County is located in northern Minnesota and is home to about 45,000 residents. It covers almost 3,000 square miles of land and water and has the city of Grand Rapids as county seat.

The county is part of the Allied Radio Matrix for Emergency Response (ARMER), a statewide Project 25 digital radio system operating in the 800 MHz band. ARMER started out in 2001 as a public safety radio system for the nine counties that make up the Minneapolis-St. Paul region. In 2005, a second phase began in order to expand coverage to 23 additional counties in central and southeast Minnesota. The final phase, now underway, will complete coverage to the remaining 55 counties in the state. The entire project cost has been estimated at more than $184 million.



Itasca County recently moved most of their public safety radio operations over to the ARMER system at a cost of nearly $11 million, mostly for new radios and equipment.

The ARMER frequencies in use in the county are 851.0125, 851.4125, 851.5125, 852.0125, 852.1625, 852.5125, 852.6000 and 852.7500, all transmitted simultaneously from 11 sites. Of these eight channels, seven are voice channels that carry all of the radio conversations taking place in the county. The eighth is a control channel that the system uses to coordinate the operation of the first seven.

The coordination task has two basic goals. First, the seven voice channels have to be shared among all of the state, county, and local radio users in the coverage area. Second, users participating in one conversation do not want to hear other conversations – they only want to hear their own.

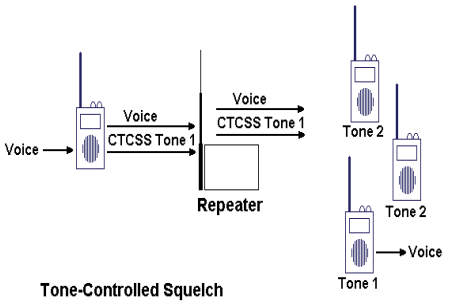
❖ Sharing Channels

There are several common ways of coordinating the use of a shared voice channel. Imagine a single radio channel that four users need to share. When User 1 wants to talk to User 2, he or she can listen to the channel and if it is quiet, press the push-to-talk button and start speaking. Because the channel is shared, all of the users will hear the transmission, including Users 3 and 4. The same is true when User 3 wants to speak with User 4; Users 1 and 2 will hear the conversation as well.

This is the simplest form of sharing – everyone hears everything and talks only when the channel is not in use. This is typical for many operations, such as small police department dispatching, where everyone wants to hear everything that's going on.

❖ Tone Coding

For channels that have users who do not want to hear everything, there is a technical solution called continuous tone-coded squelch system (CTCSS). This is the same thing as a "PL tone" except that "Private Line" (PL) is a Motorola trademark. CTCSS uses sub-audible tones (tones that are below the normal range of human hearing, below 300 Hertz) to separate conversations. A special circuit inside each radio generates and transmits the tone when the user is speaking and another circuit listens for the tone and only activates the speaker when it receives the tone.



Tone-Controlled Squelch

In our example, Users 1 and 2 would be assigned one CTCSS tone (tone #1) and Users 3 and 4 would be assigned a different CTCSS tone (tone #2). Their radios would be programmed to transmit the assigned CTCSS tone whenever they were talking and to listen for the assigned CTCSS when they were idle. So, when User 1 is talking, he or she is also transmitting tone #1.

Even though Users 2, 3, and 4 all receive the transmission from User 1, only User 2 will hear it. It works like this: the radio for User 2 checks the received tone (tone #1) against the tone it was assigned (also tone #1). Since the two tones are the same, the speaker turns on and User 2 can hear User 1 talking. The radio for User 3 checks the received tone (tone #1) against the tone it was assigned (tone #2). Because these tones are different, the speaker does not turn on and therefore User 3 does not hear User 1. The same thing happens for User 4, who also does not hear the User 1.

In the same way, when User 3 wants to speak with User 4, tone #2 is transmitted and the radios assigned to tone #1 will not hear the transmission.

❖ Interference

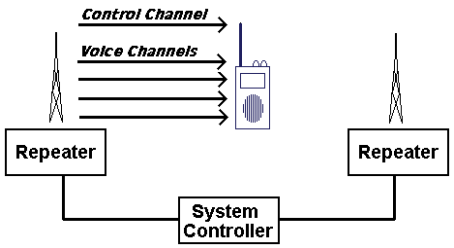
By using CTCSS, each set of users has the impression that the radio channel is dedicated to them, since they never hear any activity other than their own.

Well, almost never. It is possible for more than one user to try and use the channel at the same time. Because the radio is silent when a different set of users are talking, a user may think the channel is idle and could start transmitting, thus interfering with an on-going conversation.

CTCSS is used in conventional (non-trunked) systems that carry voice in analog form. Trunked systems and digital voice systems have more sophisticated mechanisms to control which radios can hear a conversation and which ones cannot. These mechanisms also solve the interference problem caused by users transmitting at the same time.

❖ Talkgroup Operation

Conversations in a conventional system are organized by frequency and may be identified by a CTCSS tone. Departments are assigned one or more frequencies and they stick to those frequencies. If the frequencies are shared among more than one department, CTCSS tones might be used to separate conversations, allowing radios programmed to accept a particular CTCSS tone to ignore transmissions that carry a different tone.



Trunked Radio System

In a trunked system, things are much different. Any department is able to use any of the voice channels in the system. A conversation may jump from one frequency to another as different users take their turn talking. CTCSS tones are usually not used, but a control channel shared by all radios provides a means of coordinating what conversations take place on which voice channels.

Trunked systems organize conversations by assigning a number known as a *Talkgroup Identifier* (talkgroup for short) to a particular agency or department. This number is used by radios to determine whether they should participate in a conversation. If a radio is programmed with a particular talkgroup, it is able to communicate with other radios that are also programmed with that talkgroup. A large trunked system may have hundreds of talkgroups that are assigned to dozens of agencies and departments. A central computer known as a *system controller* uses these numbers to coordinate the conversations taking place on the system. It does this by sending and receiving messages on the control channel that include talkgroup identifiers and voice channel numbers.

For instance, imagine a simple trunked radio system with two voice channels used by a police department, a fire department, a water department, and a maintenance department. The system operator assigns one talkgroup to the police department, a second talkgroup to the fire department, a third talkgroup to the water department, and a fourth talkgroup to the maintenance department. A fifth talkgroup is assigned to both the police and the fire departments to provide interoperability.

Department	Talkgroup Identifier
Police	1
Fire	2
Water	3
Maintenance	4
Police and Fire Shared	5

Radios used by police officers will be programmed with the police talkgroup number and the shared talkgroup. Radios used by firefighters will be programmed with the fire talkgroup number and the shared talkgroup. Water Department radios would have the water talkgroup and the Maintenance folks would have radios with the maintenance talkgroup.

When a police officer wants to talk to the police dispatcher, he or she selects the "police" talkgroup on the radio (by rotating a selector knob or entering a code on the keypad) and presses the push-to-talk button. The radio immediately sends a digital request message on the control channel to the system controller. The request includes the talkgroup selected by the user (in this case the "police" talkgroup).

Message	Talkgroup
Request	1

The system controller receives the request and looks through a list of available voice channels and chooses one that is not in use. It assigns that channel to the "police" talkgroup and transmits an announcement message on the control channel informing all of the listening radios that the "police" talkgroup is now active on the chosen voice channel. The controller will repeat this announcement for as long as the requesting radio is transmitting.

Message	Talkgroup	Channel
Announcement	1	1

Keep in mind that in a trunked system, when a radio is not involved in a conversation, it is tuned to the control channel and is monitoring messages from the system controller. Every radio tuned to the control channel now receives the announcement from the system controller. The radio that originally sent the request message receives the announcement, tunes to the assigned voice channel and emits an audible signal (for instance, a double-beep), informing the user that he or she can begin speaking. Other radios that are set to use the "police" talkgroup immediately tune to the chosen voice channel and activate their speaker, allowing their user to hear the conversation. Radios that are not set to use the "police" talkgroup ignore the announcement and continue monitoring control channel messages without disturbing their user.

All of this happens very quickly, typically

in less than one second.

When the officer finally stops talking and releases the push-to-talk button, his or her radio sends a message to the system controller letting it know that it's finished. The system controller then stops sending out the talkgroup announcement message and marks the voice channel as idle. Radios that were tuned to that voice channel turn off their speakers and go back to monitoring the control channel for new messages.

Message	Talkgroup
Release	1

All of this took place without the other departments hearing a thing, since their radios ignored the announcement message for the "police" talkgroup. In fact, the water crews could have had their own conversation going at the same time. If a Water Department user wanted to talk at the same time the police officer was talking, the system controller could have assigned a second voice channel to the "water" talkgroup and announced that on the control channel. Under that scenario, police radios would be tuned to one voice channel listening to the "police" talkgroup and water radios would be turned to the second voice channel listening to the "water" talkgroup.

Message	Talkgroup	Channel
Announcement	1	1
Announcement	3	2

Over the course of a day, the two voice channels could carry conversations for any of the talkgroups in the system. As long as no more than two users wanted to talk at the same instant, the system controller would be able to assign voice channels properly.

If two conversations were underway and a user from a third talkgroup sent a request (by pressing the push-to-talk button), the system controller would respond with a "reject" message, indicating that it could not satisfy the request. For instance, if the "police" and "water" talkgroups were both active and a Maintenance person wanted to talk, the control channel might look like this:

Message	Talkgroup	Channel
Announcement	1	1
Announcement	3	2
Reject		4

So, to answer one of Pat's questions, the number of talkgroups in a system is independent of the number of voice channels, but there has to be a sufficient number of voice channels to support the combined activity in all of the talkgroups.

❖ Talkgroup Representation

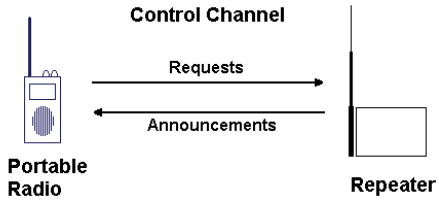
The radio system operator assigns talkgroup numbers to organizations, usually according to geographic location and department. These numbers are shown in one of two ways, using either base-10 or base-16 representation. Base-10 is the normal decimal notation we use every day with the digits 0 through 9. Base-16, also called hexadecimal ("hex" for short) uses 16 digits to represent a number. Hex uses digits 0 through 9, and the letters A through F.

Decimal	Hex
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F
16	10

Base-16 is often used because it is a more compact way to represent numbers and is a more natural means of showing computer-related values. Many talkgroup listings will show both the decimal number and the equivalent hex value. Use whichever representation is understood by your scanner and is most convenient, since both refer to the same talkgroup identifier.

❖ Project 25 Monitoring

Because ARMER is based on Project 25 (P25) standards and is a digital system, listeners will need a newer digital-capable scanner in order to track and monitor activity. These scanners do not need to be programmed with all of the voice channel frequencies for P25 operation. By programming just the active and any alternate control channel frequencies, the scanner will automatically determine the proper voice frequencies. For Itasca County, programming the control channel frequency of 852.7500 MHz is sufficient.



Once the control channel is correctly programmed, the scanner should initially be run in "open" mode, allowing it to stop on any activity. This will let you hear all conversations taking place on the system regardless of which talkgroup happens to be in use.

Later, if you want to limit your listening to only a specific set of talkgroups, you can switch to "closed" mode. This will cause the scanner to check a talkgroup it is receiving against a list of talkgroups you've programmed into it. If the active talkgroup is in your programmed list, the scanner will activate the speaker and you can hear the conversation. If the active talkgroup is not in your list, the scanner will skip the conversation and continue scanning. This behavior is exactly what the real two-way radios are doing on the system.

To give you a head start, the following is a list of talkgroups that have been reported as active in Itasca County. Each entry has both the decimal and the hexadecimal representation of the talkgroup identifier along with a brief description of which department or agency uses it.

Decimal	Hex	Description
38800	9790	Sheriff's Office (Administration)
38802	9792	Search and Rescue
38812	979C	Sheriff's Office (Dispatch)
38814	979E	Sheriff's Office (Car to Car)
38816	97A0	Sheriff's Office (Records)
38818	97A2	Grand Rapids Police Department (Operations)
38820	97A4	County Fire (Dispatch)
38822	97A6	County Fire
38824	97A8	County Fire
38828	97AC	County Emergency Medical Services
38830	97AE	County Emergency Medical Services
38838	97B6	Minnesota State Emergency Frequency (Patch)
38840	97B8	County Fire (Mutual Aid)
38866	97D2	Grand Rapids Police Department (Administration)
38872	97D8	Coleraine Police Department
38874	97DA	Deer River Police Department
38880	97E0	Balsam Fire
38884	97E4	Bovey Fire
38888	97E8	Cohasset Fire
38890	97EA	Coleraine Fire
38896	97F0	Grand Rapids Police Department
38902	97F6	County Fire (Administration)
38910	97FE	Bigfork Emergency Medical Services
38916	9804	Meds One Emergency Medical Services
38918	9806	Nashwauk Emergency Medical Services
38932	9814	County Emergency Medical Services
38934	9816	County Law Enforcement
38938	981A	County Emergency Medical Services
38954	982A	County Public Safety (Common)

Despite moving to the ARMER system, there are still conventional frequencies in use for public safety in the county. These carry voice in analog format and can be monitored by nearly any scanner made in the past 30 years.

Frequency	Description
151.295	Forestry Department
153.920	Grand Rapids Police/Fire/EMS
154.115	Grand Rapids Public Safety
154.235	County Fire and Emergency Medical Services
154.295	Statewide
155.145	Grand Rapids Police/Fire/EMS
155.280	Meds One Inc. Emergency Medical Services (Dispatch)
155.355	Area Hospitals
155.5575	Itasca Paging
155.565	Sheriff's Office
155.625	Sheriff's Office
155.760	City of Grand Rapids
155.880	Grand Rapids Public Works
158.760	Sheriff's Office (Dispatch)
158.835	County Transportation Department

That's all for this month. As always, I welcome your e-mail at *danveeneman@monitoringtimes.com*. You can also find more radio-related information on my web site at **www.signalharbor.com**. Until next month, keep scanning and have a Happy New Year!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

***Q.** I live 5 miles from Huntington, WV and listen to fire and EMS frequencies in the 155 and 450 MHz ranges. My antenna is on a mast two stories above ground level and picks up 155 MHz signals 25-30 miles away, but 460 MHz reception is spotty only 7-8 miles away. I've tried moving the antenna and combining multiple antennas, but nothing seems to work. Do I need a booster? (Michael Fink, WV)*

A. Since I don't know what kind of scanner, antenna, or coax cable or its length that you are using, it's difficult for me to suggest improvements. But here are some suggestions.

Try another scanner on that same antenna setup to verify that it's not the scanner.

Check out the coax and connectors to be sure they are in good condition (not old, weathered, or moisture-intruded) and are making good connections with your scanner and antenna. Check the center hole of the BNC connector to be sure the center blades are not splayed out. Be sure your adapters are making good connections.

Is the UHF station you want to hear using a repeater, or are they just a low-power base station for their immediate city limits?

The coax should be RG-6/U since it has much lower loss than RG-58/U, especially at the higher frequencies like UHF.

If your antenna is a discone which has no gain; try a gain antenna like the Scantenna (**www.grove-ent.com/ANT7.html**) or, even better, if the stations you want to hear are in the same compass direction, the Grove Scanner Beam, which is directional and really improves distant reception and weak signal pickup (**www.grove-ent.com/scannerbeam3.html**).

If these measures don't provide better reception (they should), you might try a preamplifier ("booster") like the Ramsey (**www.grove-ent.com/PRE2.html**).

***Q.** I previously had a problem with too much overload on my portable shortwave receiver, so I bought an MFJ-1046 preselector. I have now upgraded receivers and have moved so I no longer have any overload problems. Can I still put my preselector to any use? (Ted, email)*

A. The primary purpose of a preselector is to choose a very narrow swath of spectrum (ideally, one signal) that you want to hear, while rejecting (attenuating) all others. You were using it to suppress those off-frequency signals that were overloading your receiver.

Unless you are still encountering overload problems, such as overall insensitivity to weak signals or multiple spots on the dial where you are hearing the overload signal, the preselector will be of little use.

***Q.** During World War II, what countries banned ham radio? (J.J. Owens, Fayetteville, NC)*

A. In 1939, the United Kingdom, the British Commonwealth, Canada, and all of Europe (with the exception of some German spy stations) banned ham radio. Japan banned ham radio just prior to the attack on Pearl Harbor in 1941, after which the United States banned ham radio. However, there were still some hams operating as members of the War Emergency Radio Service.

***Q.** A friend told me recently that with a small linear amplifier connected to his CB, his whip antenna would get warm to the touch. Is this really possible? (Mark, IN)*

A. Yes, it's possible, depending on how "small" his linear amplifier is! RF travels slightly under the surface of an antenna element, so the thin "skin" may have enough resistance to get warm with enough current. Regardless, use of any sized linear amplifier with a CB radio is prohibited by FCC rules and could result in fines and confiscation of equipment.

***Q.** I've heard that you can protect the input circuitry of a receiver from overload damage with a pair of diodes connected in parallel, but cross polarized, across the antenna jack. But wouldn't this cause spurious signals from mixing strong signals?*

A. This is a common myth. Many manufacturers offer PIN diodes for just such an application. Recently, I connected a pair of cross-polarized diodes across the input of a spectrum analyzer connected to a receiving antenna and transmitted 100 watts into an antenna just a few feet away. No mixer products were seen anywhere in the spectrum. I repeated the experiment using a variety of rectifier, germanium and silicon diodes. The choice of diodes should be those with the lowest junction capacitance to avoid signal attenuation at VHF/UHF frequencies. PIN diodes are well suited for this use.

***Q.** I recently purchased an ICOM R-75 as an upgrade for my multiband portable, but the manual doesn't explain when I should select such features as filter bandwidth, passband tuning, or noise blanking. How do I know when to select these options? (Jack Dully, Yonkers, NY)*

A. "Wide" and "Narrow" filters refer to the bandwidth that the receiver will listen to on a specific center frequency. For example, a typical AM broadcaster may take up 10 kHz of spectrum space, and if you want to hear it crisply, you would select a wide filter like the 15 kHz.

If, however, there is another station on a nearby frequency causing interference, you would select a narrower filter to reject that interference while accepting the desired station. In this case, 6 kHz.

Single sideband (SSB) broadcast stations use upper sideband (USB) (which is what most SSB signals are), or lower sideband (LSB) (which hams use below 10 MHz); all require less than 3 kHz of bandwidth, so you'd select the narrower filter (2.4 kHz).

Passband tuning (PBT) is a method of electrically separating an interfering signal frequency from one you want to hear. Try it first so that you can use the wider filter for reception, providing better sound quality. If passband tuning doesn't effectively remove the interference, then you will have to use the narrower filter. In some severe-interference cases you might have to use both.

The pulse noise blanker is useful in a mobile installation for rejecting ignition noise as well as in the home, office, or other indoor location which is subjected to AC power line noise, fluorescent light noise, and other sources of electrical interference.

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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Canadian Navy Closes CFH WEFAX/RTTY

CFH, the radio voice of the Canadian Forces in Halifax, Nova Scotia, has been a fixture on the utility bands for generations. Its best known transmissions were the weather data on 122.5, 4271.0, 6496.4, 10536.0, and 13510.0 kilohertz (kHz).

CFH broadcast radiofacsimile (FAX) weather charts at the top of the hour, then filled in the rest of the time with text in radio teletype (RTTY). Unencrypted RTTY is getting rare in North America, and these were good places to give one's software a workout. In both modes, the content came from the Canadian Forces Meteorological and Oceanic (METOC) Centre.

Given all this history, listeners were rather shocked when all these frequencies suddenly went silent in November of 2010. Days of monitoring since have turned up absolutely nothing. At press time, they remain silent.

The only information available is the single line in the official CFH schedules published online: "This schedule of chart and text transmission is subject to short notice change according to the requirements of the Canadian Forces." It appears very likely that the fleet decided it didn't need either mode any more at all.

In fact, this "short notice" was actually given, though no one quite remembers how. Some stations run the announcement of their demise for weeks. This one appears to have aired for a few days at the most.

We've seen this kind of sudden disappearance before with weather broadcasts from the world's militaries. In the United States, the Navy and Air Force RTTY and FAX came and went for a while, as the military's need for them varied. Finally, they went away for good.

This is typical. These services are generally considered "legacy" products. While the public is welcome to make use of them, that's not why they are kept going. As soon as everyone finally has the latest sexy satellite gear, it's bye-bye to old technology.

If all of the above looks suspiciously like conjecture, it's because that's just what it is. Reliable, quotable information is notoriously hard to find whenever shortwave radiofax is involved. Phone calls can be frustrating. Not only do the people at the other end have not the slightest idea who handles that, but usually they can't believe shortwave still exists.

The World Wide Web is seldom very much better. In the case of CFH, all links found with search engines or referral pages went nowhere. Pages, and often whole servers, had vanished. No one issued Notices to Mariners. No one updated the official Canadian radio manual – an otherwise authoritative document called RAMN (Radio Aids to Marine Navigation), available online from Canadian Coast Guard. It strongly appears as if the plug was pulled too fast for even the Internet to keep up.

Will these broadcasts ever come back? Experience with other agencies would suggest not. However, it will be most interesting to see what happens in the North Atlantic ice season. It begins right about when most readers will see this column. The Canadian Coast Guard retains some seasonal ice faxes on other frequencies, and the service is definitely considered an important part of maritime safety radio. Time will tell.

❖ CFH Lives!

CFH, also known as "Halifax Military," is still a large radio operation with several important missions. It's run from HMCS (Her Majesty's Canadian Ship) *Trinity*, which actually isn't a ship at all. It's a major communications and intelligence center very much on dry land, in the Stadacona area of Canadian Forces Base (CFB) Halifax. Several other Canadian shoreside command centers for the Maritime Command (MARCOM) use similar ship-like designators.

HMCS *Trinity* is the control point for a large transmitting site at NRS (Naval Radio Station) Newport Corner, about 30 miles northwest of Halifax. The remotely-controlled receive farm is at NRS Mill Cove, on the coast about 25 miles west of Halifax. These are both old stations, with histories of proud service.

CFH also passes search and rescue (SAR) information to the internationally registered JRCC Halifax. This stands for Joint Rescue Coordination Centre. It is so named because its responsibilities include both aeronautical and maritime operations. It is located at CFB Halifax, in the same building as Maritime Forces Atlantic Headquarters (MARLANT). Recently reported voice frequencies for this operation are 3047, 4560, 5717, 6694, 9010, and 11232 kHz, in upper sideband (USB). 5717 is listed as a primary SAR frequency.

At least for now, one can still copy RTTY from CFH. The most commonly reported frequencies are approximately 5097, 10945, and 15920 kHz. These are approximate due to differences in how people determine RTTY frequencies. Rather than get into that can of worms, let's just say tune around until it's there.

Baud rate is 75, shift is 850 hertz (Hz). All channels idle on the mark tone, with the following marker transmitted every thirty seconds: "NAWS DE CFH ZKR F1 [frequency list] AR." NAWS is a collective all-vessels call sign meaning Notice to Allied War Ships. ZKR is a military procedural signal meaning "I am maintaining a watch on… [frequencies]." AR, of course, means "end of message."

The following frequencies have recently come up in these markers: 2822, 3287, 3394, 4155, 4158, 4161, 4167, 4170, 6236, 6238, 6242, 6248, 6254, 6258, 6260, 8303, 8312, 8315, 8324, 12371, 12374, 12377, 12380, 12392, 12395, 12401, 16552, 16576, 22182, and 22212 kHz RTTY. While activity is very low, it is possible to get lucky and hear CFH work somebody.

Finally, it's possible to hear a narrow-shift, Naval teleprinting transmission on the low frequency of 73.6 kHz, and a newer mode called STANAG 4285 on approximately 8540.2, 8564.2, and 8695.2 kHz. STANAG 4285 is 8-state phase shift keying, and sounds like a jet plane when tuned in USB. The name stands for STANdardization AGreement, on the list of standards maintained by the North Atlantic Treaty Organization (NATO). It has largely replaced the older RTTY (also known as RATT) in most allied militaries.

❖ North Atlantic Ice Season Begins

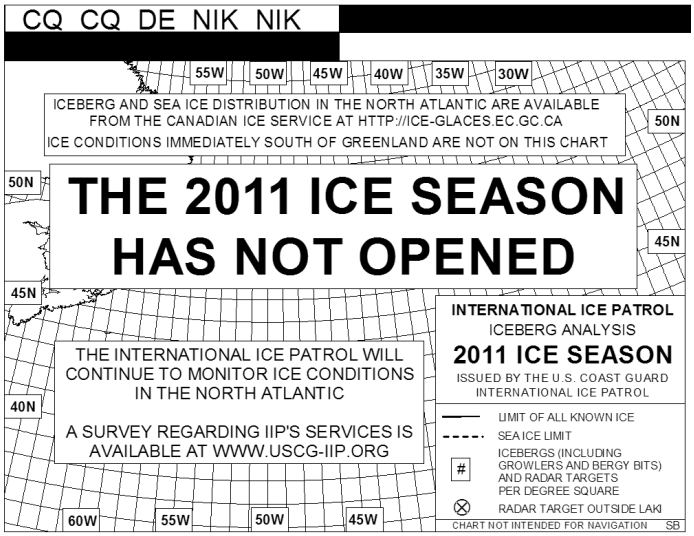
The 2011 ice season in the North Atlantic Ocean should be getting underway in January. While icebergs can form any time after December, the greatest danger to shipping comes in the spring months. After all, the April, 1912 *Titanic* disaster is the reason we have an International Ice Patrol (IIP) in the first place.

The IIP is currently funded by 17 nations, and headquartered at the US Coast Guard base in New London, CT. HC-130J recon aircraft deploy to St. John's, Newfoundland for the season. Satellites are also used.

IIP's web site is at **www.uscg-iip.org/cms/** The daily chart is broadcast in radiofax by the US Coast Guard Boston station, using IIP's old NIK call sign. Times are approximately 0438, 1600, and 1810 UTC. Frequencies are 4235, 6340, 9110, and 12750 kHz. Different ones are active depending on time of day.

There is also a Canadian Ice Service. Its ice charts are available, in season, at **www.ec.gc.ca/glaces-ice/default.asp**

Hudson Bay radiofax ice charts are broadcast on VFF, Iqaluit, at 0500 and 2125, on 3253 and 7710 kHz. Newfoundland, Gulf of St. Lawrence, and general iceberg charts are on VCO, Sydney. Times are approximately 1121, 1142, 1741, 2200, and 2331 UTC. Frequencies are 4416 (day) and 6915.1 (night).



ABBREVIATIONS USED IN THIS COLUMN

ALE ..... Automatic Link Establishment
AM..... Amplitude Modulation
ANDVT..... Advanced Narrowband Digital Voice Terminal
ASCII ..... American Standard Code for Information Interchange
AWACS ..... Airborne Warning and Control System
BOM..... Australian Bureau Of Meteorology
COTHEN..... US Customs Over-The-Horizon Enforcement Network
CW..... On-off keyed "Continuous Wave" Morse telegraphy
DHFCS..... UK Defence High Frequency Communications Service
DSC..... Digital Selective Calling
E06..... Russian numbers in English, weird computer voice
E10..... Israeli female phonetic voice, 5-letter groups
EAM..... Emergency Action Message
FAX..... Radiofacsimile
FSK..... Frequency-Shift Keying
FEMA..... US Federal Emergency Management Agency
HFDL ..... High-Frequency Data Link
HF-GCS ..... High-Frequency Global Communication System
MARS..... US Military Auxiliary Radio System
MFA..... Ministry of Foreign Affairs
NASA..... US National Aeronautics and Space Administration
NAVTEX..... Navigational Telex
NS/EP ..... US National Security/ Emergency Preparedness
RTTY ..... Radio Teletype
Selcal..... Selective Calling
SHARES..... SHAred RESources, US federal frequency pool
SITOR..... Simplex Telex Over Radio, modes A & B
UK..... United Kingdom
Unid ..... Unidentified
US ..... United States
USAF..... US Air Force
USCG ..... US Coast Guard
V2A ..... Cuban "Atencion" female, 3-message format
VOLMET..... Aviation weather broadcasts ("Flying Weather").

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 ().

129.1 DCF49-European power company long-wave teleswitching, Mainflingen, Germany, identifier in ASCII bursts at 1945 (ALF-Germany).
135.6 HGA22-European power switching, Lakihegy, Hungary, ASCII identifier at 1930 (ALF-Germany).
139.0 DCF39-European power switching, Burg, Germany, ASCII identifier at 2000 (ALF-Germany).
147.3 DDH47-German Weather Office, RTTY sea state forecasts via Pinneberg, at 1040 (MPJ-UK).
501.5 PE1GRL-Amateur 600 meter experimental beacon, Netherlands, CW marker at 1725 (ALF-Germany).
518.0 TFA-Grindavik NAVTEX, Iceland, SITOR-B ice warnings, at 1950 (PPA-Netherlands).
1677.0 EJM-Malinhead Coast Guard, Ireland, navigation warnings at 2036 (PPA-Netherlands).
2142.5 ZLST-German Customs Control Post, Cuxhaven, ALE and follow-on data with ZHEL (Customs Cruiser Helgoland), and ZHID (Customs Cruiser Hiddensee), at 2017 (MPJ-UK).
2187.5 002734411-Novorossiysk Radio, Russia, DSC test at 2040 (PPA-Netherlands).
2226.0 Aberdeen-UK Coast Guard, weather by areas at 1838 (Michel Lacroix-France).
2656.0 IPA-Ancona Radio, Italy, weather in Italian at 2100 (MPJ-UK).
2680.0 IDC-Cagliari Radio, Italy, gale warning for Sardinia in English and Italian, at 2111 (MPJ-UK).
2719.0 IZN-Porto Torres Radio, Italy, weather in Italian at 2114 (MPJ-UK).
3201.0 KNNP491WV-American Red Cross, WV; also on 2326, 4490, 5135, 5140, 6858, 7480, 7932, and 7935; ALE soundings at 1235 (Jack Metcalfe-KY).
3270.0 Unid-Israeli phonetic numbers (E10), weak and in progress, parallel 4880, at 2138 (Ary Boender-Netherlands).
3310.0 ESA-Tallinn Radio, Estonia, safety warnings at 1837 (PPA-Netherlands).
3330.0 RWZ72-Russian weather, Moscow, RTTY test loop and coded observations, also on 5150 RVO73, at 2350 (ALF-Germany).
3802.5 REMER-Red Radio de Emergencia, Spain, large net with EA2CPR and "tango" stations, at 2032 (ALF-Germany).
3810.0 HD2IOA-Ecuador Navy, Guayaquil, time pips and Spanish announcements, at 0516 (PPA-Netherlands).
3850.0 BP24-German Police Boat 24 (Bad Bramstedt), working BPLEZS, Cuxhaven control center, similar on 5258, ALE at 2104 (MPJ-UK).
3881.0 FAV22-French military Morse code training, encrypted CW messages at 0700 (Lacroix-France).
4168.5 XCP-Unknown UK military, calling XSS (UK DHFCS control, Forest Moor), both went to 4239.5, ALE at 2038 (MPJ-UK).
4250.5 FEARLESINTEL-Possible US Navy, ALE and data with INTEL, HEBREWINTEL and BOSTONINTEL; also on 4883, 6939.5, 7945.5, 9871.5, 10520, 11114.5, and 11504.5; at 0104 (Metcalfe-KY).
4319.0 "American Forces Network"-US Navy feed of satellite broadcast service, Diego Garcia, news at 1736 (PPA-Netherlands).
4446.5 BROOK-US Army or National Guard, with helicopter R26611, also on 7361.5, 8161.5, and 9081.5, ALE at 0108 (Metcalfe-KY).
4553.5 ZLST-German Customs, Cuxhaven, working BMEK, fishery protection vessel Meerkatze, ALE at 2153 (MPJ-UK).
4601.5 CVVD-Irish Navy vessel, working CVVR at 0932 (ALF-Germany).
4836.0 Unid-Russian Intelligence "English Man" (E06), AM callup 472 678/15, loud at 2030 (Mike-West Sussex, UK).
4941.0 USDAEOC2-US Department of Agriculture, MD; also on 5901, ALE at 1229 (Metcalfe-KY).
5100.0 VMC-BOM, Charleville, Australia, Asian FAX wind chart, at 1808 (PPA-Netherlands).
5178.0 "H-5-H"-UK Royal Navy, target tracking reports to "F-5-P," at 0939 (ALF-Germany).
5195.0 DRA5-Deutscher Amateur Radio Club, Kiel, Germany, CW experimental propagation beacon, at 1643 (Lacroix-France).
5206.0 Control-Weekly military exercise involving UK Royal Navy and others, voice and ALE, at 1156 (Lacroix-France).
5290.5 OV1BCN-Amateur 60 meter experimental beacon, Vinstrup, Denmark, CW marker at 0957 (ALF-Germany).
5370.0 Calorie-French Air Force, voice test loop in French, at 0438 (ALF-Germany).
5405.0 Ashkhabad Center-Ashkabad Airport, Turkmenistan, calling Kizyl Arvat Airport, Turkmenistan, in Russian, at 0350 (ALF-Germany).
5430.0 USDSRAYF-Tarko-Sale Airport, Russia, RTTY traffic for USDPRAYF, Krasnoselkup Airport, listening on 5196, at 0510 (ALF-Germany).
5438.0 VGK General Staff Moscow-Russian military, FSK Morse and RTTY message for RDL, also on 7657, at 0428 (ALF-Germany).
5544.0 OD-MRR-Middle East Airlines A320, flight ME0268, HFDL log-on with Bahrain, at 2120 (MPJ-UK).
5598.0 A6-ORX-Gulfstream G450 bizjet, Abu Dhabi, answered selcal GR-FK from Shanwick, at 1922 (ALF-Germany).
5616.0 N74GG-Gulfstream IV bizjet, selcal GM-BC and position for Gander, at 2311. Spar 76-USAF C-37A/ Gulfstream V, tail number 01-0076, selcal CQ-PS from Gander, at 2315 (ALF-Germany).
5649.0 Speedbird 284-British Airways B747 registration G-BNLR, answering selcal BD-FM from Shanwick, at 0718 (Lacroix-France).
5667.0 Bahrain-Middle East air route control, selcal GL-CJ to PIA741, a Pakistan International Airlines B747 registration AP-BFY, at 1800 (Patrice Privat-France).
5670.0 GIA7302-Garuda Indonesia, special Hajj pilgrimage flight from Jakarta to Medina, reporting GODAV waypoint at 2151 (Privat-France).
5680.0 Kinloss Rescue-Rescue Coordination Centre, Scotland, working Navy 195, Rescue Alpha, and others aiding a burning fishing vessel, at 0947 (MPJ-UK).
5699.0 Higgins-Unknown US military, any-station radio check with no joy, at 2124 (Metcalfe-KY).
5708.0 Romeo 02-US Army or National Guard, net with Romeo 01 and 03, passing mission reports at 1927 (Metcalfe-KY).
5717.0 Rescue 903-Canadian Forces, reporting on-scene to Halifax Military and requesting any traffic from Joint Rescue Coordination Centre, Halifax, at 2345 (Metcalfe-KY).
5723.0 Juliet Kilo-US Navy, passing 25-line message, then tracking net with Echo Whiskey and units with single-letter calls, at 2008 (Metcalfe-KY).
5747.0 202E3F-French Air Force E-3F AWACS, ALE link check with MOBE3F (unknown ground station), at 1100 (ALF-Germany).
5883.0 Unid-Cuban Spanish female "numbers" voice (V2A), 5-number groups in progress at 0708 (Lacroix-France).

6340.5 NMF-USCG, Boston, MA, grainy FAX charts at 2035 (MPJ-UK).
6393.5 UDK2-Murmansk Radio, Russia, RTTY marker and coastal warnings, at 1732 (ALF-Germany).
6535.0 NOY932-Noy Aviation (Israel), Bombardier Challenger 604 registration 4X-CMY, selcal JR-AB from Dakar, Senegal, at 0107 (ALF-Germany).
6556.0 Calcutta-Air route control, India, working Lufthansa 783, at 1855 (PPA-Netherlands).
6586.0 VCV3012-Conviasa, Venezuela, cleared for oceanic entry by New York, at 0436 (ALF-Germany). New York, selcal check MS-DJ with ARE207, an AIRES Colombia B737, registration HK-4695, at 0902 (Allan Stern-FL).
6676.0 HSD-Bangkok Volmet, formatted aviation weather at 1614 (Lacroix-France). 9VA40-Singapore Volmet, aviation weather at 1724 (PPA-Netherlands).
6688.0 Capitole-French Air Force, getting arrival weather from unknown station, at 1401 (Lacroix-France).
6690.0 DHN66-Geilenkirchen AWACS control, Germany, working Magic 82, UK Royal Air Force E-3D back end, similar comm on 10315, voice and RTTY, at 1214 (Lacroix-France).
6721.0 591519-USAF KC-135R Stratotanker, tail number 59-1519, calling GUA (Andersen AFB, Guam) ALE at 0103 (ALF-Germany). FAA-US Federal Aviation Administration headquarters, Washington, DC, ALE sounding at 2300 (Metcalfe-KY).
6733.0 IMA-Unknown Italian Navy, crypto setup with IDR, Rome, at 0449 (ALF-Germany).
6765.0 WGY9937-FEMA auxiliary mobile. MI, using SHARES Northern Net, at 1618. KTQ315, US Environmental Protection Agency, IL, SHARES net at 1648 (Metcalfe-KY).
6767.5 COBRA-VA National Guard, working STONEWALL, also on 6876.5 and 8137.5, ALE at 1339 (Metcalfe-KY).
6803.1 WNHP857-BellSouth NS/EP, Gadsden, AL, calling Chapin, SC, at 1400 (Metcalfe-KY).
6840.0 EZI-Israeli phonetic station (E10), 93-group message at 1433 (Boender-Netherlands).
6850.0 Shotgun-US military, radio checks with Romeo Zero at 2305 (Metcalfe-KY).
6988.0 "7-F-F"-Unknown military, giving 28-character message, similar on 7700 and 10183, at 2112 (Metcalfe-KY).
6989.0 RAL2-Russian Naval Air, CW net with RHQ2 and RBL66, at 2114 (MPJ-UK).
6993.0 SALUT-Unknown Russian or Georgian military, voice setup in Russian for packet radio connections with GLOBUS and STAVKA, at 1446 (ALF-Germany).
6994.8 "UK Beacon Project"-Unlicensed beacon, England, CW marker at 1217 (ALF-Germany).
6998.5 LJDP-Unknown Russian Military, weird CW message concerning "spirit of awenture," at 1604 (ALF-Germany).
7348.0 WGY908-FEMA Region 8, CO, voice and ALE (as FC8FEM) with WGY957, Lincoln, NE (ALE as NE7FEM), at 1601 (Metcalfe-KY).
7477.0 2104CTSCSP-CT State Police, ALE sounding at 1220 (Metcalfe-KY).
7535.0 USS Gunston Hall-US Navy Dock Landing Ship LSD-44, testing with Norfolk at 1611 (Metcalfe-KY).
7540.0 AFA1WW-USAF MARS, MA, testing and calling up "Transcon Digital Net" in 16-tone FSK, at 2252 (ALF-Germany).
7632.0 KHA935-NASA Langley Research Center, VA, SHARES Region 4 net at 1604 (Metcalfe-KY).
7635.0 Middle East 34-US Civil Air Patrol, Middle Eastern Region (US), net with Head Cap 58, at 1408 (Metcalfe-KY).
7697.1 DTRTMI150-NS/EP, Detroit, MI, ALE with CHGOIL120, Chicago, IL, at 1618 (Metcalfe-KY).
7781.0 AAA-Israeli Air Force, Tel-Aviv, ALE and follow-on voice with aircraft T21, also on 7965, at 1928 (PPA-Netherlands).
8058.6 WNG740-US Department of State Emergency Net, ALE sounding at 2310 (ALF-Germany).
8196.5 IGSS-Italian Coast Guard Patrol Vessel Ubaldo Diciotti, working ICI, Rome, in Italian at 2320 (ALF-Germany).
8337.6 Delta 99-Unknown net control station, working Shark 19 (USCG Cutter Confidence), Shark 21 (Cutter Valiant), and Shark 29 (Cutter Decisive), clear and secure, at 2325 (ALF-Germany).
8414.5 249090000-Cruise ship Celebrity Solstice (9HRJ9), DSC test with 003669997, USCG Miami, at 0712 (PPA-Netherlands).
8416.5 VFF-Canadian Coast Guard, Iqaluit, Nunavut, SITOR-B navigation warnings at 0410 (ALF-Germany).
8484.0 HLG-Seoul Radio, Korea, CW marker and traffic list, then traffic with vessels, at 1951 (MPJ-UK).
8743.0 HSW-Bangkok Radio, Thailand, weather at 1652 (PPA-Netherlands).
8765.0 MORTON25-Polish Army, calling WATFORD87, ALE at 1141 (Lacroix-France).
8864.0 Reach 511-USAF Air Mobility Command, position for Gander at 2041 (ALF-Germany).
8867.0 Brisbane-South Pacific air route control, Australia, working Air New Zealand 101, at 1930 (Privat-France).
8879.0 Mumbai-Indian Ocean air route control, India, selcal BK-EJ to Express India 343, an Air India Express B737 registration VT-AXQ, at 1600 (Privat-France).
8891.0 LH442-Lufthansa A330 registration D-AIKB, answered selcal DS-GQ from Gander, at 1418 (Lacroix-France).
8894.0 TR-AFJ-Afrijet Business Service Falcon 900B, position for Niamey (Niger), at 0230 (ALF-Germany).
8906.0 KEA5-New York Aeradio, reading a significant weather advisory to all flights, at 2000 (PPA-Netherlands). Navy EG756-US Navy, position for New York at 2047 (ALF-Germany).
8912.0 LNT-USCG CAMSLANT, VA, COTHEN ALE and voice with helicopter J16/ Juliet 16, at 0032. UP0391-United Parcel Service B757 freighter, registration N485UP, working Riverhead in HFDL, also at 0032 (Hugh Stegman-CA). "04"-HFDL ground station, Riverhead, NY, uplinks at 2016 (PPA-Netherlands). [Yes,they're still on the same frequency, though everyone seems to get through. -Hugh]
8930.0 Camber 525-USAF contract transport (Atlas Air B747 registration N540MC), selcal RS-HJ and position for Stockholm, at 1510 (ALF-Germany).
8936.0 "09"-HFDL ground station, Barrow, AK, fluttery HFDL squitters, at 1526 (PPA-Netherlands).
8942.0 CES551-China Eastern Airlines A320 registration B-6335, HFDL position for Shannon, at 1605 (Lacroix-France).
8951.0 Nukus Radio-Nukus Airport, Uzbekistan, working Kirensk Airport in Russian, at 0325 (ALF-Germany).
8974.0 Foxtrot Whiskey-US Navy, net with Sierra Whiskey, Romeo, and Mike, at 2045 (Metcalfe-KY).
9025.0 E30577-USAF E-3B, tail number 78-0578, ALE link checks with ADW (Andrews), GUA (Andersen AFB, Guam), AED (Elmendorf AFB, AK), and HIK (Hickam AFB, HI), at 1500 (ALF-Germany).
9253.0 PWGN-Brazil Navy Patrol Vessel Guanabara, voice and teleprinting (CW identifier NPAGBR), working WB44 (PWB44?), at 2015 (ALF-Germany).
9462.0 WGY901-FEMA Region 1, MA, working WGY923, PA, also exchanging ALE message text as FC1FEM and PA3FEM, at 1505 (Metcalfe-KY).
9496.0 CHPNSC141P-NS/EP portable, Chapin, SC, working LTRCAR176, Little Rock, AR, ALE at 1522 (Metcalfe-KY).
10066.0 "06"-HFDL ground station, Hat Yai, Thailand, uplinks at 1800 (PPA-Netherlands).
10072.0 Unid-Air India company frequency, Mumbai, working unknown aircraft at 1744 (PPA-Netherlands).
10648.0 YHF2-E10 null-message format, at 1323, 1329, and 1332 (Boender-Netherlands).
10756.5 RIT-Russian Navy Northern Fleet headquarters, Severomorsk, teleprinting with RHY73, who was using 6994 CW for orderwire, at 1535 (ALF-Germany).
10780.0 KING 24-USAF rescue HC-130P, radio check at 2219 (Metcalfe-KY).
10818.0 TOC229-US Army, working TAC229; also on 5233.5, 7361.5, 7650, and 9081.5; ALE at 2025 (Metcalfe-KY).
10945.0 CFH-Canadian Forces, Halifax, NS, RTTY idler and marker with listen frequencies, simulkeyed on 15920, at 1416 (MPJ-UK).
11056.7 Unid-Egyptian MFA, selcalling XBVQ, Paris embassy, gone at 1832 (MPJ-UK).
11175.0 Hypnotize-US military, calling Andrews HF-GCS, raised Offutt (Offutt HF-GCS, NE), later raised Andrews regarding traffic destinations, at 1848. Soso 24-US military, passed 4-character message to Skymaster at 2311. Soso 25 passed same message to Skymaster at 2340 (Jeff Haverlah-TX). Andrews-USAF, MD, numerous EAMs, then announced net watch on HF-GCS freqs 4724, 6739, 8992, 11175, 13200, and 15016; at 2300 (Metcalfe-KY).
11220.0 Reach 098-USAF Air Mobility Command, working Andrews at 1552 (Lacroix-France). Protozoa-US military, came from 11175, unsuccessful patches via Offutt HF-GCS, at 2342 (Haverlah-TX).
11300.0 Tripoli-African air route control, working N933ML, a Bombardier Challenger 600 bizjet, at 1722 (Privat-France).
11387.0 Sydney Volmet, Australia, weather for Darwin at 1902 (Lacroix-France).
12000.5 OFF-USAF, Offutt AFB, NE, calling B69, ALE at 2023 (Metcalfe-KY).
12579.0 NMF-USCG, North Atlantic weather in SITOR-B, at 1649 (Lacroix-France).
12585.0 NRV-USCG, Guam, CW identifier in SITOR-A marker, at 1607 (Lacroix-France).
12599.5 UAT-Moscow Radio, Russia, CW identifier in SITOR-A marker, at 1601 (Lacroix-France).
12613.0 XSQ-Guangzhou Radio, China, CW identifier in SITOR-A marker, at 1610 (Lacroix-France).
12969.0 XSV-Tianjin Radio, China, CW messages in coded Chinese characters, at 1355 (MPJ-UK).
13050.0 UDK2-Murmansk Radio, Russia, RTTY schedule in third-shift Cyrillic Russian, at 1304 (MPJ-UK).
13200.0 Andrews-USAF HF-GCS, 6-character exercise EAM "for X-ray force," at 1902 (Haverlah-TX).
13303.0 CO0065-Continental Airlines flight, HFDL position for Canarias, at 1205 (Lacroix-France).
13900.0 BMF-Taipei weather, Taiwan, FAX Asia chart at 1333 (MPJ-UK).
13920.0 VMC-BOM, Charleville, Australia, poor FAX chart, at 1320 (MPJ-UK).
13927.0 AFA7HS-USAF MARS, KS, morale patch from Shadow 96 to a commercial number, at 1529 (Stern-FL).
14325.0 W5LK-Control of amateur Hurricane Watch Net for Tomas, taking weather report from a station in Cap Haitien, Haiti, at 1639 (Stegman-CA).
14455.0 KHA908-NASA Ames Research Center, CA, opening the weekly net at 1633 (Metcalfe-KY).
14484.0 AAA9USA-US Army MARS, net control at 1610 (Metcalfe-KY).
14664.0 RDL-Russian Military, FSK Morse strategic broadcast, similar on 16112, at 1337 (MPJ-UK).
14976.0 JNRSPR-USAF Secure Internet Protocol Routed Network gateway, Salinas, Puerto Rico, working MOBD05DAT, at 1307 (MPJ-UK).
16402.0 AB1-Unknown, ALE and follow-on voice in unknown language, at 1359 (MPJ-UK).
16619.0 Unid-Two stations using largely unreadable hand-sent CW, at 1450 (MPJ-UK).
16830.5 SVO-Olympia Radio, Greece, SITOR-B news in Greek, at 1322 (MPJ-UK).
17435.0 1002-Moroccan Civil Defense, calling 2403, 2202, and 2203; also on 9200, 13499, and 16240; ALE at 1047 (MPJ-UK).
18980.0 Unid-Very long text message in CW, possibly an international organization from Indonesia, at 1251 (Lacroix-France).
20613.0 FS53PQ-Swiss Joint Military/ Diplomatic Net, link protected ALE and data, at 1136 (MPJ-UK).
21982.0 "15"-HFDL ground station, Al-Muharraq, Bahrain, uplinks at 1056 (PPA-Netherlands).
25120.0 C2-Moroccan Army, working T4, also on 12160 and 14550, ALE at 1201 (MPJ-UK).

DIGITAL DIGEST

DIGITAL MODES ON HF

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Digital Modes on the Air

So, what exactly can I hear with a cheap or free decoder?

This was just the question posed to me by reader Lynn K. a few weeks ago. Lynn was correct to point out, as we have done many times in past issues of this column, that many of the more expensive decoders support modes whose time is long past and are really only useful once in a blue moon when backup links are tested or other circumstances require a "dusting off" of the old HF gear. So, while regular readers might be able to compile an answer to Lynn's challenge by piecing together many columns, perhaps it's worth revisiting this subject for the benefit of everyone.

But first, some interesting news.

❖ Decoding on Apple's iPad

Yes, you read that correctly! Chris Smolinski, owner of Black Cat Systems, and developer of the Mac decoder software *MultiMode*, has recreated most of the program on this most modern of platforms. Available now on the Apple iTunes App Store are individual programs that allow you to decode SSTV, Morse, AX.25 Packet Radio, VHF ACARS, HF Weather Fax, NAVTEX (SITOR-B) and PSK31.

Received audio can be fed into the iPad by simply placing the receiver's speaker next to the microphone or piping the USB audio from something like Griffin's iMic (see recent issues of this column) into the iPad's dock connector using Apple's iPad Camera Connection Kit ($29). Each app costs a very reasonable $2.99.

❖ Decoding Targets

CW Stations

Have a Morse decoder like CWGet, MultiMode or fldigi in your toolkit? The maritime bands used to be your best bet, but most coast stations are now using proprietary PacTOR variants instead of CW. However, there is still plenty to be found elsewhere...

Russian Intel Number Stations:

These stations are distinctive with their use of a 5 minute call-up using a 3 digit agent identifier and fairly slow (12wpm) code. If there's no traffic for the agent, the call-up is like "852 852 852 000" or "941 941 941 00000" repeatedly using a cut zero (so "0" will decode as "T"). If there's traffic for the agent, 5 digit groups will be sent, usually in faster code, with everything ending in "000 000" or "00000".

Schedules and frequencies vary but always start on the hour or at any 10 minute interval after the hour. The same transmission often repeats several times at the next 10 or 20 minute interval on a different frequency.

Cuban Intelligence Numbers Stations:

Can use both regular CW as well as MCW (CW tone keyed on an AM carrier) and typically uses all cut numbers where 1 through 0 is represented as "ANDUWRIGMT".

tRY: 5800, 6845, 6931, 7887, 7974, 8009, 8186, 9112, 10714, 12116, 13374 and 16272 kHz

Russian Naval Warships and Bases:

There's plenty of communication from Russian bases and ships throughout the world on long-established HF channels. Among the main bases are RIT (Sveromorsk), RIW (Moscow) and RCV (Sevastopol), whereas ships have alphanumeric callsigns like RHJ58, etc. Procedural codes are used heavily, so watch out for plenty of Q and Z codes in addition to coded 5 letter groups traffic.

Try 5224, 6394, 7664, 7848, 8345, 8380, 9111, 9179, 10332, 10550, 10796, 11155, 11892, 13449, 14446 and 14556 kHz

❖ Baudot RTTY Stations

Alas, there is very little by way of standard Baudot RTTY outside the amateur bands today, but a few weather stations and other military traffic are still sent using this ancient mode.

German Weather Service, Pinneberg:

This long-time HF station continues to this day with both Fax and RTTY transmissions of weather around Germany and its coastal areas. RTTY is sent using 50bd and 450Hz shift (sometimes switching to 850Hz shift).

Try 4583, 7646, 10100.8, 11039, 13882.5, 14467.3 and 15988 kHz.

Canadian Forces, Halifax:

Like Pinneberg, station CFH has been a long-term occupant on HF and can still be heard sending NAWS (Notice to Applied Warships) messages. CFH uses 75bd and 850Hz shift RTTY.

Try 4271, 5097, 6389, 10945 and 15920 kHz.

French Air Force:

Less common but still often heard are the various stations of the French Air Force. These are mostly test tapes with the classic phrase, "voyez le brick geant que j'examine pres du wharf" contained in them. Most commonly heard is FDI22, the station in Narbonne. Settings of 50bd and 400Hz shift are usual, but 170Hz and even a tiny 85Hz shift have been heard.

Try: 4022, 5184, 5257.5, 5293, 5437, 5446.5, 5748, 6864, 7601, 7828, 7859, 7949, 8052.8, 10166.5, 10712.5, 10835, 13870.2, 13940.5, 13941.6, 14585, 14661, 14723.5, 16347.5, 20705 and 20843.6 kHz.

NATO, Lisbon:

Like its Canadian counterpart, the NATO base outside Lisbon, Portugal also keeps a NAWS transmission going 24 hours on a variety of frequencies using the callsign CTP. 75bd and 850Hz shift is used.

Try: 3782, 6389, 8551.5, 12823.5 and 16986 kHz.

Brazilian Navy:

Various naval bases on the Brazilian coast including PWZ33 (Rio), and PWX33 (Brasilia) can be heard sending news, weather and navigation reports in both Portuguese and English. 75bd and 850Hz shift is used.

Try: 6450, 8582, 12170, 12711, 16976 and 22475.5 kHz.

❖ ASCII Stations

Bulgarian Diplomatic Service:

Yes, believe it or not, the venerable computer code is still used on-air by MFA Sofia, mainly as a call-up and link test mechanism for traffic that is sent with more modern equipment. The MFA uses the fictitious callsign "DOR" and embassies have other three letter callsigns. Settings are 75bd and 500Hz shift.

Try: 3864.25, 8070, 9055.25, 10154.25, 10256, 11054.25, 11146.75, 11164.25, 12124.325, 12134.25, 12138.25, 12204.75, 12216.75, 12227.25, 13426.25, 13928.75, 13933.25, 14382.25, 14387.25, 14755.25, 14830.25, 16036.25, and 19365.25 kHz.

❖ MIL-188-141 ALE

There are literally thousands of networks spread across thousands of channels using this modern link establishment mode and many software decoders including PC-ALE, MultiMode, MultiPSK and others will be able to decode the traffic. For digital utility monitors, much of the fun and focus on these networks comes from trying to figure out which organizations are behind the often cryptic identifiers. Unfortunately, we're out of room and we'll have to give examples another month!

Send in your comments and suggestions and perhaps you'll see your idea appear in Digital Digest!

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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Paradigm Shift

As I write this, my 250th column about amateur radio – but my first for *MT* – I'm right in the middle of a déjà vu moment. I've just finished playing around in the CW November Sweepstakes, and, unlike my previous 30 or so November outings, this time I'm using a newfangled software-defined radio: FlexRadio's Flex-1500, a teeny but powerful entry-level QRP SDR. With quite a bit more clarity than I can usually muster, I'm experiencing the fleeting, transitory nature of our wonderful hobby. Old gives way to new, past becomes present, and the future beckons seductively.

The future – where ham radio is going and what it's becoming – is completely a product of what exists now and what has already come before. Today's amateurs exist on the leading edge of a continuum that started (very slowly) a few hundred years ago with basic explorations of electricity and magnetism, but is rushing forward at an exponential pace. (Just look at the compactness of the Flex-1500! Dozens – maybe even hundreds – of these full-featured, dc-to-daylight rigs could be stacked in the space of a single spark-gap transmitter!)

This rapid evolution of technology in general isn't radio exclusive, of course, but it's still amazing to simply step back and take it all in. It's easy to "miss the magic" because we're surrounded by the products of modern science every minute of every day. But, even if we don't usually notice it, the technology train is barreling down the tracks at an ever-increasing pace.

Today's computers (an easy to understand example) are still much like the computers built in the '50s and '60s, but they're enormously faster and more functional than those built only a decade ago. Ham radio and ham technology is also streaking forward and, in some ways, is approaching a point of no return.

Unlike the equestrian arts, for example, in which riding a horse under an English saddle is substantially the same today as it was 100 or even 500 years ago, ham radio isn't quite the same. Spark-gap transmitters have been duly outlawed and, save for a relatively small cadre of enthusiasts, plate-modulated AM isn't heard much anymore, either. Regenerative receivers are all home-brew these days, lovingly crafted by a few caretakers who still safeguard the Major's gift. The elegant mechanical designs that made earlier radios so special – and sometimes frustrating – with ganged capacitors, clever synchronized cam-and-lever assemblies and robust mechanical dials, have all been replaced with software and programmable logic arrays.

❖ The Digital Future

Radio is firmly embedded in the digital domain, and hams are now exploring and competing with global data networks, global positioning systems, and computers that are radios (and radios that are computers). RFID tags will soon be tucked away in everything (and everybody). Cell phone technology is almost ubiquitous, from New York City to mountain peaks in Tibet. Thanks to the internet, virtualized amateur radio simulators such as Hamsphere and QSOnet blur the lines between what's radio and what's not, while internet/radio hybrids such as Echolink more clearly mark the dividing line between the past and the future.

I'm not trying to be even a teeny bit alarmist, but if you think that these future systems won't supplant what we now think of as amateur radio, evolution and ham radio's first century will almost certainly prove you wrong!

Ham radio's first hundred years witnessed dramatic change, and in another hundred years we probably won't recognize what ham radio has become – if it exists at all. If we mute our emotions and widen our perspective to "geologic time," ham radio will likely have come and gone in a finite, and rather small, window of evolution.

Think about that! With what we know about the evolutionary progression of other technologies, species, etc, and all of the evidence we've collected to date, there's a good chance that the phenomenon we call amateur radio will have been born, matured, evolved and "died," in a 150-250 year period. Period!

And as if this deja vu fueled thought-experiment isn't unsettling enough, let's not forget to marvel at the quirks of solar and planetary physics that enable radio at the fundamental level. Electricity and magnetism – still largely unfathomable, even though we take them for granted on a practical level – comprise radio on a local level, but "global radio" requires an ionosphere, which is itself powered by the sun, whose output varies in mysterious cycles, etc. The list of dependencies and "coincidences" is really starting to add up! And if you take away even one part of the whole interdependent system – poof! – no radio.

Radio philosophy and RF spirituality aside, if you love amateur radio, you'd better get busy enjoying it – this afternoon! – because our entire hobby likely exists in a precious, precarious evolutionary bubble, never experienced before and probably never again (socially, governmentally and technologically).

In the present moment, though, amateur radio is still very much alive and well and the far-off future is yet to be determined. Our hobby is evolving rapidly, but the full breadth of past and present radio is available for exploring (spark gaps excepted!). We can build a classic regenerative receiver or buy a state-of-the-art synthesized radio. We can use Morse code or the most advanced computerized digital signal modulation. Or we can use a primitive regen to copy the most advanced digital signals! It's up to us.

❖ Possibilities Galore

Within the legal, social and technological boundaries that shape ham radio today, there's a lot of room for enjoying radio as we move inexorably forward. That's the stuff I'd like to explore in this MT column: The forces and the issues that are shaping and driving today's amateur radio, with plenty of practical how-to information and nods to the past as necessary.

Off the top, a few potential topics include:

- **Behind the numbers.**

No, not numbers stations! I'm talking about the performance numbers of various radios (and radio architectures) touted by today's manufacturers. In the process of working up material for last November's Buyer's Guide, I noticed that there seem to be clear trends in receiver performance between traditional (up-conversion), SDR and "hybrid" (down conversion + roofing filter + DSP/SDR) designs. What do these trends mean for the "ham on the street" and how much "real world" differences are there between the various approaches?

- **Computerized logbooks – love 'em or leave 'em?**

Why use them, or why not? Of the many commercial and open-source logbooks out there, how do we choose? How can we keep our data safe over the long haul, and how can we convert our log data if we decide to – or have to – switch vendors? And what about the ARRL's Logbook of the World? Does eQSL work the same way?

- **Be a model citizen.**

Antenna modeling software has been around for decades, but has it gotten any easier to use as it's gotten more powerful and accurate? Are the freeware versions adequate or do we need to ante up to get something usable?

- **Detailed analysis.**

We've used our trusty SWR meters for

years, but wouldn't a fancier SWR analyzer or one of the newer, more affordable vector network analyzers work better? Would a VNA or an analyzer tell us something about our antennas that we don't already know?

• What's up with antenna tuners?

My rig's built-in antenna tuner seems to work with just about any old wire, but my buddy's is very fussy. Why? Most antenna tuners are shack-mounted, but there's evidence that tuners might work best if mounted at the antenna feed point. Do remote tuners actually work better? And what about real-world signal loss inside the tuner itself?

• Condo hell!

More and more hams live in condos, apartments or neighborhoods that are besieged by deed restrictions, CC&Rs and draconian neighborhood associations. Despite these challenges, getting on the air and getting out a usable signal is usually possible. As a condo-dwelling QRP DXer and contester, stealth radio is a hot topic nowadays, and it's one of my favorites!

• Your perspective.

As I mentioned, this is just a quickie list. If you have topics you'd like covered, just drop me an e-mail and let's discuss it.

❖ New Opportunities

January 2011 marks a new year and plenty of other "new" stuff for all of us. A new writing gig for me (thanks!). A new columnist for you, the reader. Like many of you, I've been playing around with a newfangled software-defined radio, noting the good and the bad. (From my point of view, of course. A more detailed assessment may even find its way into MT later this spring).

Our new solar cycle has been showing signs of finally waking up a bit, too. Diehard low-band DXers aside, an increase in the solar flux is good news all around! See you next month.–NT0Z

"Visual Aids" Then and Now

Pure software-defined radios (SDRs) – those requiring a computer and a computer display – aren't exactly new. They've been sneaking into the mix for at least a decade, but I suspect that their rate of adoption in the average shack is accelerating. One of the main reasons is the built-in "band scope," or panoramic tuning display that graphically shows the location and strength of signals up and down the band in addition to the signal being received.

Using a radio in this fashion is a real paradigm shift for those of us who are used to tuning (and interacting with) a radio conventionally with a VFO knob and a tuning dial or digital frequency display. I had used "black box" receivers before, most notably the Ten-Tec RX-320, a compact computer controlled shortwave receiver that has no front panel or conventional controls and requires a computer to operate. And I have used plenty of rig-control packages such as Ham Radio Deluxe and DXLab's Commander with conventional transceivers over the years. But I discovered that using a pure SDR with "band scope tuning" as the primary interface is something else entirely.

Hand-held SDR: FlexRadio's Flex-1500 QRP SDR isn't a walkie-talkie, but you can hold it in your hand! I included my QSL card and a 9-V battery for perspective.

As mentioned, the CW November Sweepstakes was the first contest outing for me while using an SDR, FlexRadio's Flex-1500. Because I'm a longtime QRP Weenie, the rig's 5-W output was right up my alley, but it was the band scope that really defined the experience. It's almost embarrassing, but when the contest fired up, I actually made a mental note to later investigate why participation had fallen off so significantly!

As stations appeared on the band scope I simply clicked on them with the mouse and poof! – there they were, perfectly tuned in and readily workable. As soon as another station popped up on the scope it was like shampoo: lather, rinse and repeat!

The odd thing was, there was no adjacent station interference which, in all outings past, had defined the push and shove of what 40 meters sounds like during a domestic contest. The process seemed strangely sterile until I realized that I had selected a 100-Hz filter bandwidth! With PowerSDR, the software that runs the Flex-1500, even with such a narrow filter in place I could simply click on a signal

Modern band scope: Five signals on the digital subband on 20 meters as shown by PowerSDR on a day when propagation was down in the dumps. I wish I had made a screen capture during the Sweepstakes contest, as the band was packed with moderate to strong signals.

and it would be tuned in right on the button and right inside the super-narrow filter passband. When I selected a 2.4-kHz filter bandwidth to approximate what I'd been hearing in years past, the cacophony roared back. Stations were walking all over each other. There was no fall-off in participation after all! I was simply not used to contesting with such a narrow filter!

My conventional transceiver has a 250-Hz narrow CW filter, but it's not easy to tune up and down the bands with it engaged (and the crystal filter doesn't sound as clean as the SDR's DSP filter, which doesn't sound distorted or "ringy"). The SDR's band scope tuning and its dramatically better close-in dynamic range made for a completely new experience. I will follow up with more about SDRs in future columns.

Classic band scope: This US Army Signal Corps BC-1031 panoramic adapter was used by Allied forces during World War II and later. An early spectrum analyzer, this BC-1031, built by New London Instrument Company, displays signals up to 100 kHz above and below the signal tuned in on a companion receiver (almost any single-conversion superhet with a 455-kHz IF can be used). All were designed by and based on patents held by Panoramic Radio Corporation. (Photo courtesy of and taken by Richard Post, KB8TAD, of Athens, Ohio. For more photos, see Richard's Boat Anchor Pix website at http://oak.cats.ohiou.edu/~postr/bapix/index.htm)

GETTING STARTED

THE BEGINNER'S CORNER

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Beginner HF Protocol Part III: QSL those Contacts!

In the previous two columns I wrote about High Frequency (HF) operating for beginners regarding on-air activities; paying attention to frequency and net protocol, as well as chasing DX. This month, assuming you've caught the DX bug, I look at confirming those DX contacts: The Art of the QSL.

Even in the short amount of time that I've been a ham (22 years), the subject of confirming contacts, known as QSLing, has changed dramatically. It would be hard to explain to newly minted hams how tough it was to confirm a contact as recently as the early 1990s. Imagine, if you will, taking away e-mail options, QRZ.com, CD ROMs, and doing away with QSL managers that you found through Internet research.

Many hams had to rely on being able to give out their street address or other postal directions over the air. That'll grind a pile-up to a halt! Anyone who was seriously interested in getting DX QSL cards had only two options. The first would be to send your QSL directly to the ham you just worked (more on that later). Second, would be to send your card through "the bureau," an agency established by each country, through international agreement, to forward all QSLs sent to their country directly to the call sign to which it was addressed.

But, there were always problems: QSL bureaus only handle international QSLs, not domestic QSLs; even now, some countries have no bureau; many DX hams don't belong to their own country's radio association, and many bureaus will not forward QSLs sent through the bureau to non-members. In addition, QSLs sent to some countries, such as Cuba, have to go through a third country's bureau due to lack of diplomatic relations.

❖ The Callbook

If you wanted to QSL the ham in Wyoming that you just worked on 10 meters, and he didn't give his address on the air, you had only one option: *The Callbook*. This was an annual publication the size of a big city phone book that, in the smallest possible print, listed hundreds of thousands of hams and their addresses worldwide. The problem was that *Callbooks* were expensive, so most hams didn't buy one every year, if at all. And, while the *Callbook* was available in some libraries, most didn't carry it. If you were lucky, the ham had not changed his or her call sign or address since the *Callbook* you had was printed. If the ham had done either, there would be no way to know the change.

There was some help in those days. In the case of DXpeditions, QSL addresses were printed in *QST* or other DX-oriented publications, and most DX operators took time out every few calls to laboriously read out the full QSL mailing instructions. Imagine doing that today. Talk about slowing down the contact rate to a crawl!

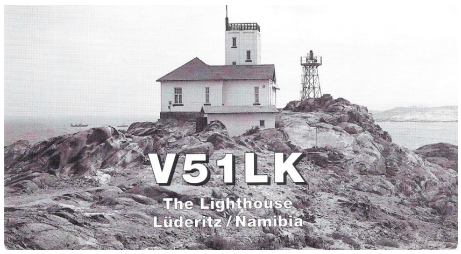
6V7O, Senegal, took only a year via the operator's manager going through the bureau.

Many local ham clubs had readily available *Callbooks,* or an individual in a club who had one would be happy to occasionally look up an address in a new *Callbook* if you contacted them via a local 2 meter repeater for the information. The Callbook still exists but is a CD ROM-based publication along with other similar publications such as HamCall, both of which are available from www.arrl.org

❖ Why are QSL Returns so Slow?

With the advent of the Internet, e-mail, CD ROMs, QRZ.com, and numerous other sources of official amateur radio databases, finding the right address has become easier than ever. But, it doesn't necessarily mean you'll get speedy returns on your QSLs, or that you'll get a QSL at all!

One reason is that official databases aren't necessarily correct. Some do not enter new call signs immediately into all databases. Many countries still don't have QSL bureaus. And, many hams, particularly in developing countries, cannot afford to belong to their country's national amateur radio association. To further slow things down, many national QSL bureaus are notoriously slow (Argentina and Chile take forever to process QSLs, while Brazil is far and away the fastest).



This QSL for an RTTY contact from the lighthouse at Luderitz in Namibia could have taken a long time via the bureau; instead it took just weeks going direct to the operator's German home call address.

The amount of time it takes for your QSL to go to the U.S. outgoing QSL bureau and reach its destination is only a fraction of the time it will take to get a reply QSL through your own bureau. That's because all bureaus are staffed by volunteer hams who sort QSLs only occasionally. But, for you to receive QSLs through the bureau, you have to first ensure they have self-addressed stamped envelopes available into which they can put the return QSL. Only when the envelope has reached a prescribed fullness – usually 30 or 40 QSL cards – will it be mailed back to you. Depending on how active you are, that alone could take months.

Then, it's also up to you to determine how quickly you respond to QSLs sent to you via the bureau. I have to confess that I have a small stack of QSLs that have been setting on my desk since July. Golly, I'd better get on the stick! Looking through that stack I see I have a QSL from Argentina confirming a contact that was made in May, over five years ago. Well, a couple of more months won't hurt. But, that's nothing: I have two from Kenya also five years old, one from Tunisia that's six years old, and one of my own cards to a ham in Thailand, that's been kicking around their bureau since 2002, has been returned with a rubber stamp on the back that says Return: No Bureau Accept Prefer Direct Only! Thanks a heap for the heads up! Glad I wasn't waiting the last 8 years for this QSL to get DXCC #1 Honor Roll (which I don't have anyway).

Some bureaus are amazingly fast. Depending on how active you are on the air, most Euro-zone countries will get QSLs back and forth stateside in as little as a few weeks. In the aforementioned batch I have a QSL from 6V7O, Senegal, Africa that's less than a year old. You mean Senegal's bureau is that fast? No, the card was sent to the operator's home call (Belgium) via their bureau. Details on using inbound and outbound QSL bureaus may be found here: **www.arrl.org/qsl-service**.

I haven't even addressed the issues involved in sending QSLs direct through the mail, which are even more numerous than going through the

bureau. First, postal services around the world vary in reliability. Most Americans have no idea how error-free and corruption-free our dear old local post offices are. Despite being a national joke, psychological curiosity, and chronically in debt (Why does that sound familiar?), First Class mail gets through virtually without a hitch. With the exception of Canada and most of Europe, the same can't be said for the rest of the world.

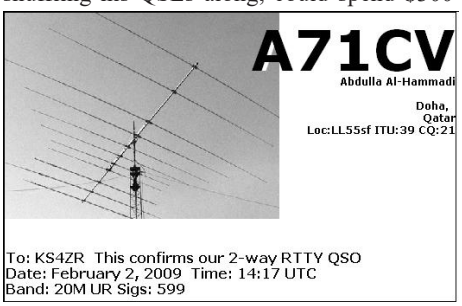
When my daughter was in the Peace Corps in the 1990s, her address was literally the instructions to get to her doorstep from a known landmark in town; no street names, no house numbers. A bicycle messenger was dispatched to her doorstep, not to deliver the mail, but to let her know there was mail for her at the post office.

Much of the world has a similar postal service. So imagine your QSL card stuffed into an envelope with two one-dollar bills and lay bets on just how far along the postal system it gets before the bills disappear. Naturally, the QSL recipient now has your QSL, but it's up to him to cough up the postage for reply or somehow get word back to you that there was no money in the envelope. Some don't bother and earn a false reputation for begging for money on the ham bands and not QSLing. Remember, too, that some postal services don't recognize IRCs. You might as well have enclosed a piece of Monopoly money.

How much is that QSL Worth?

Next, the sticky question of money. When I first started collecting QSLs from on-air contacts, all domestic and most DX operators expected no money. It was considered a common courtesy to exchange, without charge, any QSL received. Many times the dollar or IRC I would send with a QSL would be returned along with the reciprocal QSL. Then, sometime in the late 1990s things started to change. Postal rates started going up around the world, currency exchange rates got out of whack and suddenly all DX stations were advising everyone to send 1 "Green Stamp," as U.S. dollars are often called, along with your self-addressed envelope. Then it was 2 Green Stamps, and in the last five years even European DX are asking for $3 cash. DX in other parts of the world may ask even more.

A new ham starting out today, who didn't want to wait until the bureau took its sweet time shuffling his QSLs along, could spend $300



E-QSL for RTTY contact with A71CV, Doha, Qatar came in just days via e-QSL but won't count toward DXCC or any other awards. However, the paper QSL he also sent, that took weeks to receive, will count.

HV5PUL, the Pontifica Universita Lateranense, Vatican City State, took years and a second attempt before it finally came through the bureau.

just to confirm the first 100 countries. Imagine having to shell out over $1,000 in cash just to get all 338 DXCC entities! Don't forget that you also had to buy a First Class International postage stamp just to send your QSL and the cash. For the same amount of money you could have bought a new rig!

Don't forget, no one ever got a 100% return rate. You might have to send two, three, four or many more cards to some DXCC entities before you finally get a QSL. Even if you use only stateside managers, it will still cost First Class postage, a self-addressed, stamped envelope and, of course, the cost of your QSL card and the mailing envelope: nearly a dollar.

Electronics to the Rescue

The bureau is looking better and better. Sure it's slow, but the price of QSLing several hundred DXCC entities is a fraction of the cost of going direct. Still, there are other options: *Logbook of the World* (known by the initials LOTW) and *e-QSL*. Don't confuse the two because they're totally different organizations. While the ARRL, which administrates many of the big DX achievement awards, doesn't recognize e-QSLs, it does recognize QSLs posted to LOTW. You can learn more about LOTW here: **www.arrl.org/logbook-of-the-world**. Information about e-QSLs may be found here: **www.eqsl.cc/qslcard/Index.cfm**.

The big advantage of electronic QSLs is that you can get an almost instant confirmation and that use of LOTW becomes a fast, virtual method of earning the myriad awards available to hams without ever having to wait or lick a stamp. The big problem with electronic QSL services is that you get no paper QSL – no tangible evidence of the contact, no decorative "wall paper." It's possible that in the future, the expense of QSLing direct will be prohibitive and consigned to museums. Today we still have a choice.

Final QSL Tips

For the first 16 years as a ham I didn't paid much attention to sending and receiving QSL cards or chasing DX. Then I decided to make a more thorough study of the subject. I started a log of QSL cards that I had sent direct to the hams I made contact with. I was interested to see just how long they took to be received and roughly what percentage actually came through. Over the six year period, I sent more than 300 QSLs direct, of which fewer than 20 never returned (most of those were to Cuba or other Latin America countries). Most were received within two months, with a few taking as long as six months. Here's how to boost your own percentage returns (in order of speed):

Direct

Fastest returns are direct. Go to **www.qrz.com** and enter the DX operator's call and follow the operator's directions for QSLing. Use security-lined, self-addressed envelopes (SAE) and put the required Green Stamps or IRCs inside the SAE. Don't put any call signs on the envelope. I use window envelopes to make the letter look more like a bill (nobody wants to open those!). Make sure the IRC is the one currently accepted.

QSL Manager

Second fastest, and slightly less expensive, is to use a QSL manager (preferably a stateside manager). Again, use security-lined, SAEs and nest the Green Stamps or IRCs if required. For most stateside managers, only SASE (self-addressed, *stamped* envelopes) are required. To find out if a DX operator has a QSL manager, look up the call sign here: **www.qslinfo.de** or here: **www.ik3qar.it/manager**.

Bureau

To send via bureau, if you've got time to kill (years!), follow directions at **www.arrl.org/outgoing-qsl-service**.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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Programs to Warm Your Heart

January 2011. Oh my, it seems like we just started 2010! This month we'll shine the *Programming Spotlight* on some programming that will warm your heart during our cold winter months! First, we look at the celebration of Orthodox Christmas, then take a look at Scotland and the Scottish Diaspora as reflected in radio, and finish up with a famous actor/musician in a not so famous radio show.

❖ Orthodox Christmas

Radio offers a unique opportunity to join in the Christmas festivities of those who embrace the Orthodox Christian faith. Some, although not all Orthodox churches celebrate Christmas according to the Julian calendar, as opposed to the commonly used Gregorian calendar. As a result, these churches celebrate Christmas on January 6/7.

"Christmas Day is a public holiday on January 7 in countries such as Belarus, Egypt, Ethiopia, Georgia, Kazakhstan, Macedonia, Moldova, Montenegro, Serbia, Russia, and the Ukraine. Some countries, such as Armenia, observe Christmas Day on January 6." (*www.timeanddate.com*)

The Voice of Russia has two programs that should cover this important holiday in the Russian Orthodox calendar.

"***The Christian Message from Moscow*** is a weekly program telling you about Orthodoxy, about the lives of the Saints, works by Orthodox Saints, sermons by priests and monks, spiritual prose by Russian authors. It covers the most interesting Orthodox periodicals, looks at the composers, performers, and the history of the Russian church music, features stories by laymen and clerics recounting how they found their way to the Lord. It's about the believers' life and their effort bent for the sake of Our Lord Jesus Christ. We are also trying to answer your questions and preparing a new series of programs about the history of the Russian Orthodox Church.

"The program is prepared by **Tatyana Shvetsova.**

"***The Christian Message from Moscow*** weekly feature is on the air on Saturday and at 01.30, 05.30, 08.30, 16.30, 19.30, and Sunday at 00.30, 13.30, 18.30 and 22.30 UTC."

"***Spiritual Flowerbed*** is a brief supplement series to our weekly feature ***The Christian Message from Moscow,*** addressing not only Christians but all the people concerned with matters spiritual. In the programs of the series you'll get acquainted with reflections and recommendations from the clergy and authoritative figures of the Russian Orthodox Church.

"The series is prepared by **Tatiana Shvetsova**.

"Please tune in to ***Spiritual Flowerbed*** on Monday at 08.30, 15.30 and 18.30, Tuesday at 03.30, Wednesday at 15.30 and Thursday at 03.30, 10.30 UTC."

It's still kind of mind blowing to consider this type of programming originating from the country that gave us Marxism-Leninism. If nothing else, it's evidence that times have certainly changed in Russia! Quite possibly Orthodox Christmas will be covered in other **Voice of Russia** programs as well. It might also be worth checking Russian language broadcasts for special programming at this time, such as ***Golos Rossii*** at **http://rus.ruvr.ru/** or ***Radio Rossii*** at **www.radiorus.ru/**.

Other countries, which may have special programming at this time, include the former Yugoslav republics of Serbia and Montenegro. Check some of the Serbian radio stations listed at **www.listenlive.eu/serbia.html** and also check ***Radio Crne Gore*** **(Radio Montenegro)** at **www.rtcg.me/** ***Radio Ukraine International*** has been off and on shortwave in recent years, but check out their webcast at **www.nrcu.gov.ua/index.php?id=157**

And finally, ***Radio Bulgaria***, one of the last decent shortwave signals from the region, may mention it, although most Bulgarians celebrate Christmas with the rest of us in December. As Christmas approaches, in both the Julian and Gregorian calendars, I will post up to date tips and last minute information at my website **www.doghousecharlie.com**.

❖ Scotland the Brave!

January is not just a time for celebration in the Orthodox tradition. **Hogmanay**, in Scotland, involves the celebration of the last day of the old year and the first day of the new. "The most widespread national custom is the practice of 'first-footing' which starts immediately after midnight. This involves being the first person to cross the threshold of a friend or neighbor and often involves the giving of symbolic gifts" (Wikipedia).

Another hogmanay tradition is the singing, often with linked arms, of *Auld Lang Syne* by the Scottish bard, Robert Burns (whose birthday is January 25, often celebrated with a Burns Supper featuring haggis and performances of his notable works).

Scotland, as part of the United Kingdom, has not been an independent radio nation, but its influence is felt throughout the world. Countries like Canada, the United States and Australia were highly influenced by Scottish immigration. The Canadian province of Nova Scotia takes its name from Scotland. Nova Scotia is Latin for New Scotland.

One of the benefits of the Internet age is that we can use our computers like a powerful world band receiver. One of the delightful stations audible online is ***BBC Radio Scotland.***

❖ Live and On Demand

Take the Floor is your program featuring traditional Scottish dance music Hosted by **Robbie Shepherd**, it is a rousing two hours that can be heard on demand 24/7 at **www.bbc.co.uk/programmes/b0079g5m**

Get it On with **Bryan Burnett** is a daily music request program. Each program has a theme: for instance, "Songs that get you singing," or for Remembrance Day, "Songs of Remembrance and Thanks."

Of course, Scotland has to have a program devoted to the music of the pipes. ***Pipeline*** is the "definitive pipe music program," featuring news and recordings from the world of bagpipes. Although I do not have a Scottish background, one of my best friends does, and has educated me over the years on the merits of Haggis, the Kilt, and of course, the Pipes. It really is something to hear: In 1980 I attended the Scottish World Festival Tattoo in Toronto, the highlight of which was a performance by the massed pipes and drums of ALL of the bands present. Simply moving and amazing! Give ***Pipeline*** a listen for a taste of this experience: **www.bbc.co.uk/programmes/b0079g6v**

Other music programs on **BBC Radio Scotland** include ***The Jazz House***, ***The Music Cafe*** and ***Iain Anderson*** presenting country, folk, blues, soul and rock and roll. Check out the music programs at **www.bbc.co.uk/radioscotland/programmes/genres/music**

BBC Radio Scotland is not just about music, although that in itself makes it worth hearing. Scotland is a nation with a long, proud history and this is reflected in the programming. The schedule is replete with programs about history, the people, and the land. In November there was a particularly moving program about the 51st Highland Regiment, which fought on in France after Dunkirk. In July and repeated in November there was a five and a half-hour long marathon program about the turbulent history of the Highlands from MacBeth to the Loch Ness Monster.

And finally, **BBC Radio Scotland** is worth listening to for its current events. The Scottish National Party is participating in the government of Scotland. Like Canada's Parti Quebecois, its ultimate goal is independence for Scotland. It's fascinating to keep an eye on the politics of Scotland as they affect the future of the United Kingdom.

Perhaps the two best news/current events programs are ***Scotland at Ten***, "a full roundup of politics at Hollyrood (the Scottish Parliament) and Westminster from a Scottish perspective," and ***Good Morning Scotland***, hosted by **Gary Robertson** and **Aileen Clarke.** To hear the cut and thrust of Parliament, ***First Minister's Question Time*** is compelling listening. **www.bbc.co.uk/programmes/b00ccm5x**

❖ Podcasts

Many **BBC Scotland** programs are available as podcasts at **www.bbc.co.uk/radioscotland/podcasts/**. Some of these include ***Scotland's Funny Bits*** (comedy highlights from the past week), ***Scotland Outdoors, Scottish Life, Scottish Business, Scottish Football, Scotland Introducing*** (Alternative and Indie music from Scotland), ***Sports Weekly*** and ***Walking Through Landscape***.

And, if you want to experience Robert Burns a bit more, subscribe to the ***Completely Burns*** podcast at the link above. In celebration of the 250th anniversary of the birth of Robert Burns, actors from all generations have recorded over 300 poems. It's a good way to hear the works of Scotland's national poet.

❖ The Scottish Diaspora

As mentioned earlier, there is a worldwide Scottish Diaspora, especially in Canada and Australia. Recently, Toronto radio station **CFZM (AM 740)** marked a broadcasting milestone. In October, ***A Little Breath of Scotland***, hosted by **Denis Snowdon** marked its 45th anniversary on the air, making it one of the longest running programs, with the same host, in Canadian broadcast history. As Snowdon proclaims, the program is "a gateway to Scotland without the airfare."

On Sundays, one can hear ***A Little Breath of Scotland*** between 4 and 6pm. In the winter months it is not impossible to hear this station at great distances from Toronto as darkness sets in early. Can't hear it on your radio? No worries. It's online at **http://zoomerradio.ca/**

Another program in the same vein originates in Australia at **Triple U-FM 104.5** in Shoalhaven, New South Wales. It is hosted by **Jock Dundee**. No word if he is related to "Crocodile," but I digress. You can listen to many, many programs hosted by **Jock** at **www.electricscotland.com/radio/**. You can also listen at this link to a fascinating history program about Scotland called ***The Saga of Scotland***. There is about a thousand years of Scottish history to absorb in this program. It's well worth hearing!

❖ Rocky Fortune

In 2011, one can look back and take in the entirety of Frank Sinatra's career, one filled with acclaim as both a singer and a movie star. He was and is the "Chairman of the Board." But it wasn't always that way. In 1953, his career was at a crossroads. His popularity as a singer was not what it once was. In that year he starred in a radio series that ran for 26 weeks, called ***Rocky Fortune***. Sinatra played the title role, a "footloose and fancy free, frequently unemployed young man, called Rocky Fortune (real name Rocco Fortunato). Fortune often balanced precariously on the edge of the law, and seemed to be a magnet for trouble. He had a soft heart behind a tough exterior. Sinatra seemed to have a lot of fun with this one. Most critics tend to pan this series, but I like it. It's a slice of radio drama from a bygone era, with a lot of wit and humor, even if a lot of the plots are improbable.

Where else can you hear "Old Blue Eyes" baby-sit a chimp, or possibly become the first man in space (remember, this was 1953)? There are many inside jokes, too. *From Here to Eternity* had been released, and as the Oscars approached, Sinatra managed to slide the movie title into a number of episodes. Fortunately (unfortunately?) Sinatra did win the Oscar and gave up this radio drama forever, after just 26 episodes.

You can download the series and listen to it at your leisure. Go to: **www.archive.org/details/OTRR_Certified_Rocky_Fortune** If you are a fan of Sinatra, or even if you aren't, it's an interesting little footnote to his long and successful career. And, in my humble opinion, it's lots of fun. Just the "hep" lingo makes it worthwhile.

❖ What's New?

RFI – African Media

This is an interesting little program discovered recently. Not sure if it is new, but it is to me. The program promises "Everything you want to know about the vibrant media scene in Africa. Tune in to the weekly talk-show hosted by Zeenat Hansrod." It is heard on Saturdays during the 1600 UTC broadcast.

While the claim that the program will tell you "everything you want to know" is a bit ambitious, still it's an interesting insight into all media (print, radio, TV, even photojournalism) of a continent that sadly flies under the radar most of the time in this part of the world. Many of the programs have dealt with issues of Press Freedom in such diverse places as South Africa,

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

CONVERT YOUR TIME TO UTC

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

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

FIND THE STATION YOU WANT TO HEAR

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

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

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

CHOOSE 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.

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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*; FCC; Media Broadcast, Play DX; WWDXC-BC DX-*Top News*; World DX Club/*Contact*, World Radio TV Handbook.

Adelheid Lucas/Deutsche Welle; Adrian Sainsbury/Radio NZ Int'l; Aleksandr Diadschev, Ukraine; Alexey Zinevich, Bulgaria; Alokesh Gupta, New Delhi, India; Andreas Volk, Austria/ADDX; Andrew Flynn/CVC UK; Arnie Coro/Radio Havana Cuba; Arnulf Piontek, Berlin, Germany; Ashik Eqbal Tokon, Bangladesh; Bill Damick/TWR; Dragan Lekic, Serbia; Drita Cico/Radio Tirana; Evelyn Marcy/WYFR; Tom Solomon/WYFR Intl; Gérald Théoret/Radio Canada Intl-CBC Transmissions; Gerard Adriaanse/HCJB Australia; Glen Tapley/WEWN; Hans Johnson/WINB; Jeff White/WRMI; Mrs. Robinson/WTJC; Sarah/BVBC; Leo van de Wounde/Radio Netherlands; Mike Barraclough, UK; Mike Bethge, Germany/TWR Europe; Mustafa Cankurt, Turkey; Ivo Ivanov/Radio Bulgaria; Jeff Bernald/PABC; Valentine Stoyanov/Radio Bulgaria; Tom Taylor, UK; Radu Ianculescu/Radio Romania Int'l; Sean Gilbert, UK/WRTH; Stephen John Jones/IRRS; William Hague, Austria/NWDXC; Wolfgang Büeschel, Stuttgart, Germany; Yimber Gaviria, Colombia; 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 - 7PM EST / 6PM CST / 4PM PST

0000	0030		Egypt, Radio Cairo	11590na		
0000	0030	vl	Guyana, Voice of Guyana	3290va		
0000	0030		USA, Voice of America	7405af		
0000	0045		India, All India Radio	6055as	7305as	
			9705as	9950as	11645as	13605as
0000	0057		Canada, Radio Canada International			9880af
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		China, China Radio International			6020eu
			6075as	6180as	7350eu	7415as
			9570eu	11790as	11885as	13750as
0000	0100		Germany, Deutsche Welle	11855as		
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100		New Zealand, Radio NZ International			15720pa
0000	0100	DRM	New Zealand, Radio NZ International			13730pa
0000	0100		Spain, Radio Exterior de Espana			5970na
0000	0100		Sri Lanka, SLBC	6005as	9770as	15745as
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	m	USA, WHRI Cypress Creek SC			7315am
0000	0100	Sun	USA, WHRI Cypress Creek SC			5875am
			5920am			
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	3185va	3215na	
			5050va			
0000	0100		USA, WYFR/Family Radio Worldwide			5950am
			6085am	7360ca	9505am	11720ca
			11730ca	15440am		
0004	0100	twhfa	Canada, Radio Canada International			9755na
0030	0100		China, China Radio International			11730as
0030	0100	fas	UK, Bible Voice Broadcasting Network			5950as
0030	0100		USA, Voice of America/Special English			6170va
			9325va	9490va	9715va	11695va
			12005va	15185va	15205va	15290va
0045	0100	Sun	Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			

0100 UTC - 8PM EST/ 7PM CST / 5PM PST

0100	0104	twhfa	Canada, Radio Canada International			9755na
0100	0127		Czech Republic, Radio Prague			7410na
0100	0130		China, China Radio International			11730as
0100	0130		Slovakia, Radio Slovakia International			6040na
			9440na			
0100	0130		Vietnam, Voice of Vietnam	6175am		
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		China, China Radio International			6020eu
			6175eu	9410eu	9470eu	9535eu
			9570eu	9580na	9790na	11870as
			15785as			
0100	0200	DRM	China, China Radio International			6080na
0100	0200		Cuba, Radio Havana Cuba	6000na	6050na	
0100	0200	vl	Guyana, Voice of Guyana	3290va		
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200		New Zealand, Radio NZ International			15720pa
0100	0200	DRM	New Zealand, Radio NZ International			13730pa
0100	0200		Romania, Radio Romania International			6145na
			7315na			
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, Radio Taiwan International			11875as
0100	0200		Uganda, UBC Radio	4975do		
0100	0200		UK, BBC World Service	5940as	5970as	
			9740as	11750as		
0100	0200		Ukraine, Radio Ukraine International			7440na
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, KJES Vado NM	7555na		
0100	0200		USA, Voice of America	7325va	9435va	
			11705va			
0100	0200		USA, WBCQ Monticello ME	5110na	7415am	
			9330am			
0100	0200	twhfa	USA, WHRI Cypress Creek SC			5920am
			7315am			
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	
			5050va			
0100	0200		USA, WYFR/Family Radio Worldwide			6100ca
			7445am	9505am	15440am	
0104	0200		Canada, Radio Canada International			9755na
0130	0145	twhfas	Albania, Radio Tirana	6130na		
0130	0200		Iran, VOIRI/IRIB	6120na	7250na	
0130	0200	mtwhfa	Serbia, International Radio of Serbia			6190na
0130	0200	twhfa	USA, Voice of America/Special English			5960va
			7465va			
0140	0200		Vatican City State, Vatican Radio			7335va
			9580as	9650va	11850va	

0200 UTC - 9PM EST / 8PM CST / 6PM PST

0200	0204		Canada, Radio Canada International			9755na
0200	0215		Croatia, Croatian Radio	3985eu	7375am	
0200	0227		Czech Republic, Radio Prague			7410na
0200	0227		Iran, VOIRI/IRIB	6120na	7250na	
0200	0230		Thailand, Radio Thailand World Service			15275na
0200	0230		USA, KJES Vado NM	7555na		
0200	0257		North Korea, Voice of Korea	13650as	15100as	
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300	twhfa	Argentina, Radio Nacional RAE			11710am
0200	0300		Australia, ABC NT Alice Springs			4835do
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek			4910do
0200	0300		Australia, Radio Australia	9660pa	12080pa	
			13690pa	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		China, China Radio International			11770as
			13640as			
0200	0300		Cuba, Radio Havana Cuba	6000na	6050na	
0200	0300		Egypt, Radio Cairo	6270na		
0200	0300	vl	Guyana, Voice of Guyana	3290va		
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		New Zealand, Radio NZ International			15720pa
0200	0300	DRM	New Zealand, Radio NZ International			13730pa
0200	0300		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	15510me		
0200	0300		South Korea, KBS World Radio			9580sa
0200	0300		Taiwan, Radio Taiwan International			5950na
			9680ca			
0200	0300		UK, BBC World Service	5875me	5940as	
			7445af			

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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, WBCQ Monticello ME	5110na		7415am
			9330am			
0200	0300	twhfa	USA, WHRI Cypress Creek SC			5875na
			7315am			
0200	0300		USA, WINB Red Lion PA	9265am		
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	3185va		3215va
			5050va			
0200	0300		USA, WYFR/Family Radio Worldwide			5930ca
			5985ca	6885ca	6890ca	7455am
			9505am	9525am		
0215	0230		Nepal, Radio Nepal	5005as		
0215	0300		Uganda, UBC Radio	4975do		
0230	0300		Vietnam, Voice of Vietnam	6175am		
0245	0300	twhfas	Albania, Radio Tirana	6130na		
0245	0300		Australia, HCJB Global Australia			15400as
0245	0300		India, All India Radio	3945do		
0250	0300		Vatican City State, Vatican Radio			7305am
			9610am			
0255	0300	Sun	Swaziland, TWR Swaziland	3200af		

0300 UTC - 10PM EST / 9PM CST / 7PM PST

0300	0325	Sun	Swaziland, TWR Swaziland	3200af		
0300	0330		Egypt, Radio Cairo	6270na		
0300	0330		Myanmar, Myanmar Radio	9730do		
0300	0330		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	15510me		
0300	0330		Sri Lanka, SLBC	6005as	9770as	15745as
0300	0330		Vatican City State, Vatican Radio			7360af
			9660af			
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 NQ SW Service			9625na
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St Johns NF	6160na		
0300	0400		Canada, CKZU Vancouver BC			6160na
0300	0400		China, China Radio International			9690na
			9790na	11770as	15110as	15120eu
			15785as			
0300	0400		Cuba, Radio Havana Cuba	6000na		6050na
0300	0400	vl	Guyana, Voice of Guyana	3290va		
0300	0400		Malaysia, RTM/Traxx FM	7295do		
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		Slovakia, NEXUS/IRRS SW	9670af		
0300	0400		South Africa, Channel Africa	3345af		6120af
0300	0400		Taiwan, Radio Taiwan International			6875na
			15320as			
0300	0400		Uganda, UBC Radio	4975do		
0300	0400		UK, BBC World Service	3255af		5940va
			6100af	6145af	6190af	7255af
			7445af	9410as	9460af	
0300	0400		Ukraine, Radio Ukraine International			7440na
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	Sat	USA, WHRI Cypress Creek SC			7315am
0300	0400		USA, WINB Red Lion PA	9265am		
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	3185va		3215va
			5050va			
0300	0400		USA, WYFR/Family Radio Worldwide			7455am
			9505am	9930ca	9985ca	
0315	0330		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
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		
0340	0400		Vatican City State, Vatican Radio			15460va
0345	0400	vl/Sat/Sun	Uganda, UBC Radio	4975do		

0400 UTC - 11PM EST / 10PM CST / 8PM PST

0400	0427		Czech Republic, Radio Prague			7345na
0400	0430	mtwhf	France, Radio France Internationale			7425af
			9805af			
0400	0430	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0400	0455		Turkey, Voice of Turkey	7240as		9655va
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 NQ SW Service			9625na
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St Johns NF	6160na		
0400	0500		Canada, CKZU Vancouver BC			6160na
0400	0500		China, China Radio International			6020na
			6080na	13750as	15120eu	15785as
			17730af	17855af		
0400	0500		Cuba, Radio Havana Cuba	6000na		6050na
0400	0500	vl	Guyana, Voice of Guyana	3290va		
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Romania, Radio Romania International			6130na
			7305na	9690as	11895as	
0400	0500	DRM	Russia, Voice of Russia	15735as		
0400	0500		Slovakia, NEXUS/IRRS SW	9670af		
0400	0500		South Africa, Channel Africa	7230af		
0400	0500		Sri Lanka, SLBC	6005as	9770as	15745as
0400	0500		Uganda, UBC Radio	4975do		
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	Sun	USA, WHRI Cypress Creek SC			7365eu
0400	0500	Sat	USA, WHRI Cypress Creek SC			9825me
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	3185va		3215va
			5050va			
0400	0500		USA, WYFR/Family Radio Worldwide			5950am
			7455am	9505am	9680am	9715am
0400	0500		Zambia, CVC/1 Africa	9430af		
0430	0457		Czech Republic, Radio Prague			9855va
0430	0500	twhfas	Albania, Radio Tirana	6100na		
0430	0500		Australia, Radio Australia	15415as		
0430	0500	mtwhf	Swaziland, TWR Swaziland	3200af		4775af
0455	0500		Nigeria, Voice of Nigeria/External Service			
			15120eu			
0459	0500		New Zealand, Radio NZ International			11725pa
0459	0500	DRM	New Zealand, Radio NZ International			11675pa

0500 UTC - 12AM EST / 11PM CST / 9PM PST

0500	0507	twhfas	Canada, CBC NQ SW Service			9625na
0500	0520		Vatican City State, Vatican Radio			4005eu
			5965eu	7250eu	9660af	11625af
			13765af			
0500	0527		Germany, Deutsche Welle	9755af		
0500	0530		China, CNR-11/Holy Tibet	9530do		11685do
			15570do			
0500	0530	mtwhf	France, Radio France Internationale			11995af
			13680af			
0500	0530		Germany, Deutsche Welle	6130af		6155af
			6180af	12045af		
0500	0530		Japan, NHK World/Radio Japan			5975eu
			6110na	9770af	15205as	17810as
0500	0555		Sri Lanka, SLBC	6005as	9770as	15745as
0500	0600		Anguilla, Worldwide Univ Network			6090am
0500	0600		Australia, ABC NT Alice Springs			4835do
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek			4910do
0500	0600		Australia, Radio Australia	9590pa		12080pa
			13630as	15160pa	15240pa	17750as
0500	0600		Bahrain, Radio Bahrain	6010me		
0500	0600		Bhutan, Bhutan Broadcasting Service			6035as
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St Johns NF	6160na		
0500	0600		Canada, CKZU Vancouver BC			6160na
0500	0600		China, China Radio International			6020na
			6190na	11710me	11895as	15350as
			15465as	17505af	17540as	17730af
			17855af			
0500	0600		Cuba, Radio Havana Cuba	6000na		6010na
			6050na	6060na	6150na	
0500	0600	mtwhf	Equatorial Guinea, Radio African Network/Radio Africa # 2	15190af		
0500	0600	Sat/Sun	Equatorial Guinea, Radio African Network/Radio East Africa	15190af		
0500	0600	vl	Guyana, Voice of Guyana	3290va		
0500	0600		Kuwait, Radio Kuwait	15110as		
0500	0600		Liberia, Star Radio	3960do		4025al
0500	0600		Malaysia, RTM/Traxx FM	7295do		
0500	0600		New Zealand, Radio NZ International			11725pa
0500	0600	DRM	New Zealand, Radio NZ International			11675pa
0500	0600		Nigeria, Voice of Nigeria/External Service			
			15120eu			
0500	0600	DRM	Russia, Voice of Russia	15735as		
0500	0600		Slovakia, NEXUS/IRRS SW	9670af		
0500	0600		South Africa, Channel Africa	7230af		
0500	0600		Swaziland, TWR Swaziland	4775af		9500af
0500	0600		Taiwan, Radio Taiwan International			6875na
0500	0600		Uganda, UBC Radio	4975do		
0500	0600		UK, BBC World Service	3255af		3955eu
			5875eu	6005af	6190af	7255af
			9410as	11770af	11860af	
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, WBCQ Monticello ME	5110na		7415am
			9330am			
0500	0600	Sun	USA, WHRI Cypress Creek SC			11565pa
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/1 Africa	9430af		
0500	0600		Zambia, Radio Christian Voice			6065af
0502	0600		Swaziland, TWR Swaziland	6120af		
0515	0530		Rwanda, Radio Rwanda	6055do		
0530	0600		Thailand, Radio Thailand World Service			11730va

0600 UTC - 1AM EST / 12AM CST / 10PM PST

0600	0629		Germany, Deutsche Welle	5945af		7240af
			15205af			
0600	0630	Sat/Sun	Australia, Radio Australia	15290pa		15415as
0600	0630		China, Xizang PBS/Holy Tibet	4905do		4920do
			6200do	6200do		
0600	0630	mtwhf	France, Radio France Internationale			11615af
			15160af	17800af		
0600	0645	mtwhf	South Africa, TWR Africa	11640af		
0600	0658		New Zealand, Radio NZ International			11725pa
0600	0658	DRM	New Zealand, Radio NZ International			11675pa
0600	0700		Anguilla, Worldwide Univ Network			6090am
0600	0700		Australia, ABC NT Alice Springs			4835do
0600	0700		Australia, ABC NT Katherine	5025do		
0600	0700		Australia, ABC NT Tennant Creek			4910do
0600	0700		Australia, Radio Australia	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		China, China Radio International			11710me
			11870af	11895as	13660as	15140af
			15350as	15465as	17505af	17540as
0600	0700		Cuba, Radio Havana Cuba	6000na		6010na
			6050na	6060na	6150na	
0600	0700	mtwhf	Equatorial Guinea, Radio African Network/Radio Africa # 2	15190af		
0600	0700	Sat/Sun	Equatorial Guinea, Radio African Network/Radio East Africa	15190af		
0600	0700		Greece, Voice of Greece	11645eu		
0600	0700	vl	Guyana, Voice of Guyana	3290va		
0600	0700		Kuwait, Radio Kuwait	15110as		
0600	0700		Liberia, Star Radio	3960do		4025al
0600	0700		Malaysia, RTM/Traxx FM	7295do		
0600	0700		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0600	0700		Nigeria, Voice of Nigeria/External Service			
			15120eu			
0600	0700		Papua New Guinea, Radio Wantok Light			
			7325do			
0600	0700		South Africa, Channel Africa	7230af		15255af
0600	0700		Swaziland, TWR Swaziland	4775af		6120af
			9500af			
0600	0700		Uganda, UBC Radio	4975do		
0600	0700		UK, BBC World Service	3995eu		5875eu
			6005af	6190af	9410af	9860af
			11760as	11770af		
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, WBCQ Monticello ME	5110na		7415am
0600	0700	Sun	USA, WHRI Cypress Creek SC			7365eu
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/1 Africa	13590af		
0600	0700		Zambia, Radio Christian Voice			6065af
0600	615	Sat/Sun	South Africa, TWR Africa	11640af		
0630	0645		Vatican City State, Vatican Radio			4005eu
			5965eu	7250eu	9645af	11740eu
			15595eu			
0630	0700		Australia, Radio Australia	15415as		
0630	0700		Romania, Radio Romania International			7370eu
			17780pa	21600pa		
0630	0700	DRM	Romania, Radio Romania International			6020eu
0630	0700		Vatican City State, Vatican Radio			11625af
			13765af	15570af		
0659	0700		New Zealand, Radio NZ International			9765pa
0659	0700	DRM	New Zealand, Radio NZ International			11675pa

0700 UTC - 2AM EST / 1AM CST / 11PM PST

0700	0730	mtwhf	France, Radio France Internationale			13675af
0700	0730		Myanmar, Myanmar Radio	9730do		
0700	0730		Slovakia, Radio Slovakia International			13715va
			15460va			
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		China, China Radio International	11895as			
			13660as	13710eu	15125me	15350as	
			17710as				
0700	0800	mtwhf	Equatorial Guinea, Radio African Network/Radio Africa # 2	15190af			
0700	0800	Sat/Sun	Equatorial Guinea, Radio African Network/Radio East Africa	15190af			
0700	0800	vl	Guyana, Voice of Guyana	3290va			
0700	0800		Kuwait, Radio Kuwait	15110as			
0700	0800		Liberia, Star Radio	3960do	4025al		
0700	0800		Malaysia, RTM/Traxx FM	7295do			
0700	0800		Malaysia, RTM/Voice of Malaysia	6175as			
			9750as	15295as			
0700	0800		Myanmar, Myanmar Radio	9730do			
0700	0800		Papua New Guinea, Radio Wantok Light 7325do				
0700	0800		Russia, Voice of Russia	17665pa	17805pa		
0700	0800	DRM	Russia, Voice of Russia	11635eu			
0700	0800		Swaziland, TWR Swaziland	4775af	6120af	9500af	
0700	0800		Uganda, UBC Radio	4975do			
0700	0800		UK, BBC World Service	3955eu	6190af	9860af	11760me
			11770af				
0700	0800	DRM	UK, BBC World Service	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, WBCQ Monticello ME	5110na	7415am		
0700	0800	Sun	USA, WHRI Cypress Creek SC	11565pa			
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/1 Africa	13590af			
0700	0800		Zambia, Radio Christian Voice	6065af			
0730	0800		Australia, HCJB Global Australia	11750as			
0730	0800		Bulgaria, Radio Bulgaria	5900eu	7400eu		
0730	0800		Clandestine, Cotton Tree News	15220af			
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 - 3AM EST / 2AM CST / 12AM PST

0800	0827		Czech Republic, Radio Prague	7345eu			
0800	0830		Australia, ABC NT Alice Springs	4835do			
0800	0830		Australia, ABC NT Katherine	5025do			
0800	0830		Australia, ABC NT Tennant Creek	4910do			
0800	0830		Myanmar, Myanmar Radio	9730do			
0800	0830	Sun	UK, Bible Voice Broadcasting Network	7220eu			
0800	0845	Sat	UK, Bible Voice Broadcasting Network	7220eu			
0800	0850	mtwhf	Germany, TWR Europe	6105eu			
0800	0850	mtwhf	Monaco, TWR Europe	9800eu			
0800	0900		Anguilla, Worldwide Univ Network	6090am			
0800	0900		Australia, HCJB Global 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		Bhutan, Bhutan Broadcasting Service	6035as			
0800	0900		Canada, CFRX Toronto ON	6070na			
0800	0900		Canada, CFVP Calgary AB	6030na			
0800	0900		Canada, CKZN St Johns NF	6160na			
0800	0900		Canada, CKZU Vancouver BC	6160na			
0800	0900		China, China Radio International	11620as			
			11895as	13710eu	15350as	15465as	
			15625me	17540as			
0800	0900	mtwhf	Equatorial Guinea, Radio African Network/Radio Africa # 2	15190af			
0800	0900	Sat/Sun	Equatorial Guinea, Radio African Network/Radio East Africa	15190af			
0800	0900		Greece, Voice of Greece	11645eu			
0800	0900	vl	Guyana, Voice of Guyana	3290va			
0800	0900		Liberia, Star Radio	3960do	4025al		
0800	0900		Malaysia, RTM/Traxx FM	7295do			
0800	0900		Malaysia, RTM/Voice of Malaysia	6175as			
			9750as	15295as			
0800	0900		New Zealand, Radio NZ International	9765pa			
0800	0900	DRM	New Zealand, Radio NZ International	9870pa			
0800	0900		Papua New Guinea, Radio Wantok Light 7325do				
0800	0900		Russia, Voice of Russia	17650va	17665pa	17805pa	
0800	0900	DRM	Russia, Voice of Russia	11635eu			
0800	0900	Sun	South Africa, SA Radio League	7205af			
			17570af				
0800	0900		South Korea, KBS World Radio	9570as			
0800	0900		Uganda, UBC Radio	4975do			
0800	0900		UK, BBC World Service	5875eu	6190af	9860af	11760me
0800	0900	DRM	UK, BBC World Service	9610eu			
0800	0900		Ukraine, Radio Ukraine International	9410eu			
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, WBCQ Monticello ME	5110na	7415am		
0800	0900	smtwhf	USA, WHRI Cypress Creek SC	11565pa			
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/1 Africa	13590af			
0800	0900		Zambia, Radio Christian Voice	6065af			
0815	0825		Nepal, Radio Nepal	5005as			
0815	0850	Sat	Germany, TWR Europe	6105eu			
0815	0850	Sat	Monaco, TWR Europe	9800eu			
0820	0900	smtwhf	Guam, KTWR/TWR	15170as			
0830	0900		Australia, ABC NT Alice Springs	2310do			
0830	0900		Australia, ABC NT Katherine	2485do			
0830	0900		Australia, ABC NT Tennant Creek	2325do			
0830	0900	mtwhfa	Guam, KTWR/TWR	11840pa			
0845	0900	mtwhf	Palau, T8WH/WHRI/Sound of Hope Radio 9930as				

0900 UTC - 4AM EST / 3AM CST / 1AM PST

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa			
0900	0915	mtwhf	Palau, T8WH/WHRI/Sound of Hope Radio 9930as				
0900	0930		Australia, HCJB Global Australia	11750pa			
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		China, China Radio International	11620as			
			13790pa	15210as	15270eu	15350as	
			17490eu	17570eu	17750as		
0900	1000	2nd Sun	Germany, Blue Star Radio	6140eu			
0900	1000		Germany, Deutsche Welle	17710as			
0900	1000	vl	Guyana, Voice of Guyana	3290va			
0900	1000		Malaysia, RTM/Traxx FM	7295do			
0900	1000		Malaysia, RTM/Voice of Malaysia	6175as			
			9750as	15295as			
0900	1000		New Zealand, Radio NZ International	9765pa			
0900	1000	DRM	New Zealand, Radio NZ International	9870pa			
0900	1000		Nigeria, Voice of Nigeria/External Service 9690af				
0900	1000		Papua New Guinea, Radio Wantok Light 7325do				

0900 1000 Russia, Voice of Russia 17650va 17665pa 17805pa
0900 1000 3rd Sat Slovakia, NEXUS/IRRS SW 9510va
0900 1000 Tajikistan, Voice of Tajik/External Service 7245va
0900 1000 Uganda, UBC Radio 4975do
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, WBCQ Monticello ME 5110na 7415am
0900 1000 Sun USA, WHRI Cypress Creek SC 11565pa
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/1 Africa 13590af
0900 1000 Zambia, Radio Christian Voice 6065af
0930 1000 Saudi Arabia, BSKSA/Saudi Radio 15250af

1000 UTC - 5AM EST / 4AM CST / 2AM PST

1000 1029 Czech Republic, Radio Prague 21745af
1000 1030 Sat/Sun/DRM Bulgaria, Radio Bulgaria/Euranet 11900eu
1000 1030 Japan, NHK World/Radio Japan 9605as 9625pa 9840pa 11780as
1000 1030 fa Philippines, FEBC 15325as
1000 1030 Vietnam, Voice of Vietnam 9840as 12020as
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 9475pa 9485pa 9580va 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 China, China Radio International 6040na 11610as 11635eu 13590as 13620as 13720as 13790pa 15190as 15350as 17490eu
1000 1100 3rd Sun Germany, European Music Radio 6140eu
1000 1100 4th Sun Germany, Radio Gloria International 6140eu
1000 1100 India, All India Radio 7270as 13695pa 15020as 15260as 15410pa 17800pa 17895pa
1000 1100 Indonesia, Voice of Indonesia 9526va 11785al
1000 1100 Malaysia, RTM/Traxx FM 7295do
1000 1100 Nigeria, Voice of Nigeria/External Service 9690af
1000 1100 mt Palau, T8WH/WHRI/Sound of Hope Radio 9930as 15725as
1000 1100 hfa Palau, T8WH/WHRI/Sound of Hope Radio 9930as
1000 1100 Papua New Guinea, Radio Wantok Light 7325do
1000 1100 Russia, Voice of Russia 7205as 17650va 17665pa 17805pa
1000 1100 Saudi Arabia, BSKSA/Saudi Radio 15250af 15470af
1000 1100 Uganda, UBC Radio 4975do
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, WBCQ Monticello ME 5110na 7415am
1000 1100 USA, WINB Red Lion PA 9265am
1000 1100 USA, WRNO New Orleans LA 7505am
1000 1100 USA, WTWW Lebanon TN 5080va 5855va
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 9460af 9465as
1000 1100 Zambia, CVC/1 Africa 13590af
1000 1100 Zambia, Radio Christian Voice 6065af
1030 1100 Iran, VOIRI/IRIB 15460as 17630as
1030 1100 Mongolia, Voice of Mongolia 12085as
1030 1100 Sun Slovakia, NEXUS/IRRS SW 9510va
1059 1100 New Zealand, Radio NZ International 13660pa
1059 1100 DRM New Zealand, Radio NZ International 9870pa

1100 UTC - 6AM EST / 5AM CST / 3AM PST

1100 1127 Iran, VOIRI/IRIB 15460as 17630as
1100 1130 Sat/DRM South Korea, KBS World Radio 9760eu
1100 1130 Vietnam, Voice of Vietnam 7280as
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 9965as 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 NQ SW Service 9625na
1100 1200 Canada, CFRX Toronto ON 6070na
1100 1200 Canada, CFVP Calgary AB 6030na
1100 1200 Canada, CKZN St Johns NF 6160na
1100 1200 Canada, CKZU Vancouver BC 6160na
1100 1200 China, China Radio International 5955as 6040na 11650as 11660as 11750na 11795as 13590as 13645as 13650eu 13720as 17490eu
1100 1200 Malaysia, RTM/Traxx FM 7295do
1100 1200 New Zealand, Radio NZ International 13660pa
1100 1200 Nigeria, Voice of Nigeria/External Service 9690af
1100 1200 Papua New Guinea, Radio Wantok Light 7325do
1100 1200 Russia, Voice of Russia 7205as
1100 1200 Saudi Arabia, BSKSA/Saudi Radio 15250af 15470af
1100 1200 Sun Slovakia, NEXUS/IRRS SW 9510va
1100 1200 Taiwan, Radio Taiwan International 7445as 11715as
1100 1200 Uganda, UBC Radio 4975do
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, WBCQ Monticello ME 5110na 7415am
1100 1200 USA, WINB Red Lion PA 9265am
1100 1200 USA, WRNO New Orleans LA 7505am
1100 1200 USA, WTWW Lebanon TN 5080va 5755va 9480va 9990va
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/1 Africa 13590af
1100 12000 Zambia, Radio Christian Voice 6065af
1130 1150 f Vatican City State, Vatican Radio 15595as 17765as
1130 1157 Czech Republic, Radio Prague 9880na
1130 1200 f Vatican City State, Vatican Radio/Mass 15595me 17765me
1130 1200 Vietnam, Voice of Vietnam 9840as 12020as

1200 UTC - 7AM EST / 6AM CST / 4AM PST

1200	1215		Nepal, Radio Nepal	5005as			
1200	1230	mtwhf	France, Radio France Internationale	21620af			
1200	1230		Germany, AWR Europe	15495as			
1200	1230		Japan, NHK World/Radio Japan	6120na	9625pa	9790eu	
1200	1230		Saudi Arabia, BSKSA/Saudi Radio	15250af	15470af		
1200	1230	mtwhfa	Vatican City State, Vatican Radio	9830am			
1200	1258		New Zealand, Radio NZ International	13660pa			
1200	1259		Poland, Polskie Radio Warsaw	11675eu	11980eu		
1200	1300		Anguilla, Worldwide Univ Network	11775am			
1200	1300		Australia, ABC NT Alice Springs	2310do			
1200	1300		Australia, ABC NT Katherine	2485do			
1200	1300		Australia, ABC NT Tennant Creek	2325do			
1200	1300		Australia, Radio Australia	6020pa	6140as	9475pa	9485pa
			9560va	9580va	9590pa	9965as	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 NQ SW Service	9625na			
1200	1300		Canada, CFRX Toronto ON	6070na			
1200	1300		Canada, CFVP Calgary AB	6030na			
1200	1300		Canada, CKZN St Johns NF	6160na			
1200	1300		Canada, CKZU Vancouver BC	6160na			
1200	1300		China, China Radio International	5955as	9460as	9660as	9730as
			9760pa	11650as	11660as	11690me	11760pa
			11980as	13645as	13650eu	13790eu	17490eu
1200	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service	5990do	7110do	9705do	
1200	1300		Japan, NHK World/Radio Japan	9695as			
1200	1300		Malaysia, RTM/Traxx FM	7295do			
1200	1300		Nigeria, Voice of Nigeria/External Service	9690af			
1200	1300		Papua New Guinea, Radio Wantok Light	7325do			
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	Sun	Slovakia, NEXUS/IRRS SW	9510va			
1200	1300		South Korea, KBS World Radio	9650na			
1200	1300		Uganda, UBC Radio	4975do			
1200	1300		UK, BBC World Service	5875as	6190af	6195as	9605as
			9740as	9860af	11760me		
1200	1300		United States, Overcomer Ministries	15320af			
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, Voice of America	7575va	9640va	11705va	11750va
1200	1300		USA, WBCQ Monticello ME	5110na	7415am	9330am	15420am
			17495am				
1200	1300		USA, WHRI Cypress Creek SC	7315na			
1200	1300	Sun	USA, WHRI Cypress Creek SC	9410na			
1200	1300		USA, WINB Red Lion PA	9265am			
1200	1300		USA, WRNO New Orleans LA	7505am			
1200	1300		USA, WTWW Lebanon TN	5080va	5755va	9480va	9990va
1200	1300		USA, WWCR Nashville TN	4840af	5935na	9980na	15825na
1200	1300		USA, WWRB Manchester TN	9385va			
1200	1300		USA, WYFR/Family Radio Worldwide	6890am	7455am	11530ca	11970am
			17545ca				
1200	1300		Zambia, CVC/1 Africa	13590af			
1200	1300		Zambia, Radio Christian Voice	6065af			
1215	1300		Egypt, Radio Cairo	17870as			
1215	1300	mtwhf	UK, BBC World Service	9410ca	11860sa		
1230	1300	smtwhf	Australia, HCJB Global Australia	15400as			
1230	1300		Bangladesh, Bangladesh Betar	7250as			
1230	1300		Saudi Arabia, BSKSA/Saudi Radio	15470af			
1230	1300		Thailand, Radio Thailand World Service	9720va			
1230	1300		Vietnam, Voice of Vietnam	9840as	12020as		
1259	1300		New Zealand, Radio NZ International	5950pa			

1300 UTC - 8AM EST / 7AM CST / 5AM PST

1300	1330		Australia, HCJB Global Australia	15400as			
1300	1330		Egypt, Radio Cairo	17870as			
1300	1330		Japan, NHK World/Radio Japan	9875as			
1300	1330		Laos, Lao National Radio	7145as			
1300	1330	Sat/Sun	USA, WHRI Cypress Creek SC	9840na			
1300	1357		North Korea, Voice of Korea	7570eu	9335na	11710na	12015eu
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 NQ SW Service	9625na			
1300	1400		Canada, CFRX Toronto ON	6070na			
1300	1400		Canada, CFVP Calgary AB	6030na			
1300	1400		Canada, CKZN St Johns NF	6160na			
1300	1400		Canada, CKZU Vancouver BC	6160na			
1300	1400		China, China Radio International	5995as	9570na	9650na	9730as
			9765as	9870as	11660as	11760me	11980as
			13610eu	13755as	15260na		
1300	1400		Indonesia, Voice of Indonesia	9526va	11785al		
1300	1400		Malaysia, RTM/Traxx FM	7295do			
1300	1400		New Zealand, Radio NZ International	5950pa			
1300	1400		Nigeria, Voice of Nigeria/External Service	9690af			
1300	1400		Palau, T8WH/WHRI/Sound of Hope Radio	9930as			
1300	1400		Papua New Guinea, Radio Wantok Light	7325do			
1300	1400		Russia, Voice of Russia	7205as			
1300	1400		South Korea, KBS World Radio	9570as			
1300	1400		Tajikistan, Voice of Tajik/External Service	7245va			
1300	1400		Uganda, UBC Radio	4975do			
1300	1400		UK, BBC World Service	5875as	6190af	6195as	9410as
			9740as	9860af	11760me	11805as	
1300	1400		United States, Overcomer Ministries	15320af			
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, KJES Vado NM	11715na			
1300	1400	Sat/Sun	USA, Voice of America	7575va	9640va	9760va	11705va
1300	1400		USA, WBCQ Monticello ME	5110na	7415am	9330am	15420am
			17495am				
1300	1400		USA, WINB Red Lion PA	9265am			
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	9385va			
1300	1400		USA, WYFR/Family Radio Worldwide	7455am	11830am	11520as	11560as
			11855am	11970am			
1300	1400		Zambia, CVC/1 Africa	13590af			
1300	1400		Zambia, Radio Christian Voice	6065af			
1330	1400	st	Guam, KSDA/AWR	11935as			
1330	1400	mtw	Guam, KSDA/AWR	15660as			
1330	1400		India, All India Radio	9690as	11620as	13710as	
1330	1400		Turkey, Voice of Turkey	11735as	12035eu		
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as		
1345	1400	Sun	UK, Bible Voice Broadcasting Network	13365as			

1400 UTC - 9AM EST / 8AM CST / 6AM PST

1400	1415	Sun	Germany, Pan American Broadcasting	15205as			
1400	1425	mh	Guam, KTWR/TWR	9975as			
1400	1425		Turkey, Voice of Turkey	11735as	12035eu		
1400	1429		Czech Republic, Radio Prague	11600as			
1400	1430		China, CNR-11/Holy Tibet	6010do	7350do	9480do	
1400	1430	`	Japan, NHK World/Radio Japan	5955as	9875as	21560af	
1400	1430		Thailand, Radio Thailand World Service	9725va			
1400	1430	Sun	United Arab Emirates, FEBA Radio	12045as			
1400	1435	twfas	Guam, KTWR/TWR	9975as			

1400	1500		Anguilla, Worldwide Univ Network	11775am
1400	1500		Australia, ABC NT Alice Springs	2310do
1400	1500		Australia, ABC NT Katherine	2485do
1400	1500		Australia, ABC NT Tennant Creek	2325do
1400	1500		Australia, Radio Australia 5995pa 6080pa 7240pa 9590pa	
1400	1500		Bahrain, Radio Bahrain 6010me	
1400	1500	DRM	Belgium, TDP Radio/Disco Palace	6015eu
1400	1500		Bhutan, Bhutan Broadcasting Service	6035as
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na
1400	1500		Canada, CFRX Toronto ON 6070na	
1400	1500		Canada, CFVP Calgary AB 6030na	
1400	1500		Canada, CKZN St Johns NF 6160na	
1400	1500		Canada, CKZU Vancouver BC	6160na
1400	1500		China, China Radio International 5955as 9765as 9870as 11665as 11675as 11765eu 13710as 13740na 13790eu 17630as	
1400	1500		Equatorial Guinea, Radio African Network/Radio East Africa 15190af	
1400	1500		Equatorial Guinea, Radio African Network/Radio East Africa 15190af	
1400	1500		India, All India Radio 9690as 11620as 13710as	
1400	1500		Libya, LJBC Voice of Africa 17725af 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/External Service 9690af	
1400	1500		Palau, T8WH/WHRI/Sound of Hope Radio 9930as	
1400	1500		Papua New Guinea, Radio Wantok Light 7325do	
1400	1500		Russia, Voice of Russia 7205as	11660as
1400	1500	DRM	Russia, Voice of Russia	7340as
1400	1500		Slovakia, NEXUS/IRRS SW	15710va
1400	1500		Uganda, UBC Radio	4975do
1400	1500		UK, BBC World Service 5845as 5875as 6190af 6195as 9410as 9740as 9860af 9915as 11760as	
1400	1500		United States, Overcomer Ministries 9460eu 13810me	
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, Voice of America 6080af 15580af 17650af 17715af	
1400	1500	mtwhf	USA, Voice of America 7575va 9760va 12150va	
1400	1500		USA, WBCQ Monticello ME 5110na 7415am 9330am 15420am 17495am	
1400	1500	Sat	USA, WHRI Cypress Creek SC	9840na
1400	1500		USA, WINB Red Lion PA 9265am	
1400	1500		USA, WJHR International Milton FL	15550na
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 9385va	
1400	1500		USA, WYFR/Family Radio Worldwide 9485as 11560as 11565am 11855am 13695am 17760am	
1400	1500		Zambia, CVC/1 Africa 13590af	
1400	1500		Zambia, Radio Christian Voice	6065af
1405	1435	Sat/Sun	UK, Bible Voice Broadcasting Network	6225as
1415	1430		Germany, Pan American Broadcasting	15205as
1415	1430		Nepal, Radio Nepal 5005as	
1415	1500	Sun	UK, Bible Voice Broadcasting Network	13365as
1425	1455		Swaziland, TWR Swaziland 6025af	
1430	1445	Sun	Germany, Pan American Broadcasting	15205as
1430	1459		China, CNR-2/Business Radio 6055do 6155do 7245as 7315as 7335as 7375as 9820as	
1430	1500		Australia, Radio Australia 9475pa	11825as
1430	1500		China, China Radio International 7325as 11695as 12110as	
1430	1500	Sat	UK, Bible Voice Broadcasting Network	13365as
1445	1500		Australia, HCJB Global Australia	15340as

1500 UTC - 10AM EST / 9AM CST / 7AM PST

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi	5015eu
1500	1515	Sun	UK, Bible Voice Broadcasting Network	12035as
1500	1530		Australia, HCJB Global Australia	15340as
1500	1530	Sun	China, Voice of the Strait 4940do	9505do
1500	1530		Clandestine, Sudan Radio Service/ SRS	17745af
1500	1530		Guam, KSDA/AWR 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		Libya, LJBC Voice of Africa 17725af	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	Sat/Sun	Canada, CBC NQ SW Service	9625na
1500	1600		Canada, CFRX Toronto ON 6070na	
1500	1600		Canada, CFVP Calgary AB 6030na	
1500	1600		Canada, CKZN St Johns NF 6160na	
1500	1600		Canada, CKZU Vancouver BC	6160na
1500	1600		China, China Radio International 5955as 6095me 7325as 7410as 9720me 9870as 9800as 11965eu 13640eu 13740na 17630as	
1500	1600		Equatorial Guinea, Radio African Network/Radio East Africa 15190af	
1500	1600		Equatorial Guinea, Radio African Network/Radio East Africa 15190af	
1500	1600		Malaysia, RTM/Traxx FM 7295do	
1500	1600		Myanmar, Myanmar Radio 5985as	
1500	1600		Nigeria, Voice of Nigeria/External Service 15120af	
1500	1600		Papua New Guinea, Radio Wantok Light 7325do	
1500	1600		Russia, Voice of Russia 4975va 7260as 9660as	
1500	1600	DRM	Russia, Voice of Russia 5905eu	9675eu
1500	1600		Slovakia, NEXUS/IRRS SW	15710va
1500	1600	vl	Uganda, Dunamis Shortwave	4750af
1500	1600		Uganda, UBC Radio	4975do
1500	1600		UK, BBC World Service 5845as 5875as 5975as 6190af 6195as 7395as 9485as 9740as 9860af	
1500	1600		United States, Overcomer Ministries 9460eu 13810me 17485af	
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, 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 5110na 7415am 9330am 15420am 17495am	
1500	1600	Sat	USA, WHRI Cypress Creek SC	17510af
1500	1600	Sun	USA, WHRI Cypress Creek SC 9840na 15195eu	
1500	1600		USA, WINB Red Lion PA 9265am	
1500	1600	smtwhf	USA, WINB Red Lion PA	13570am
1500	1600		USA, WJHR International Milton FL	15550na
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 9385va	
1500	1600		USA, WYFR/Family Radio Worldwide 6280va 9495af 11565am 11855am 12015af 15210sa 15795am 17760am 21840af	
1500	1600		Zambia, CVC/1 Africa 13590af	
1500	1600		Zambia, Radio Christian Voice	6065af
1504	1600	DRM	Canada, Radio Canada International	9800na

SHORTWAVE GUIDE

1504	1600		Canada, Radio Canada International			9610na
1515	1530		Vatican City State, Vatican Radio			11850as
			13765as	15235as		
1515	1545	Sat	UK, Bible Voice Broadcasting Network			13670as
1530	1545		India, All India Radio	7255do		9820do
			9910do			
1530	1555	Sun	China, Voice of the Strait	4940do		
1530	1558	Sat	Vatican City State, Vatican Radio			11850as
			13765as	15235as		
1530	1600	mtwhfa	Albania, Radio Tirana	13640na		
1530	1600		China, Xizang PBS/Holy Tibet	4905do		4920do
			6200do	6200do		
1530	1600		Germany, AWR Europe	11675as		
1530	1600		Iran, VOIRI/IRIB	9915as	11655as	
1530	1600		Mongolia, Voice of Mongolia	9665as		12085as
1530	1600	Sat	UK, BBC World Service	9410af		11860af
1530	1600	h	UK, Bible Voice Broadcasting Network			13670as
1551	1600		New Zealand, Radio NZ International			7440pa
1551	1600	DRM	New Zealand, Radio NZ International			5950pa

1600 UTC - 11AM EST / 10AM CST / 8AM PST

1600	1605	Sun	Croatia, Croatian Radio	6165eu		
1600	1615	mtwhfa	Croatia, Croatian Radio	6165eu		
1600	1615		Pakistan, PBC/Radio Pakistan	7510va		11575va
1600	1627		Iran, VOIRI/IRIB	9915as	11655as	
1600	1630		Guam, KSDA/AWR	9585as		11690as
1600	1630		Myanmar, Myanmar Radio	9730do		
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		North Korea, Voice of Korea	9990va		11545va
1600	1658		Germany, Deutsche Welle	5965as		9560as
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 NQ SW 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		China, China Radio International			6060as
			7235as	7420af	9570af	11900af
			11940eu	11965eu	13760eu	
1600	1700		Egypt, Radio Cairo	12170af		
1600	1700		Equatorial Guinea, Radio African Network/Radio East Africa	15190af		
1600	1700		Equatorial Guinea, Radio African Network/Radio East Africa	15190af		
1600	1700		Ethiopia, Radio Ethiopia/External Service			
			7165va	9560af		
1600	1700	mtwhf	France, Radio France Internationale			15605af
			17605af			
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		Papua New Guinea, Radio Wantok Light			
			7325do			
1600	1700		Russia, Voice of Russia	4975me		7305as
			7330as	9470va	9880as	11630as
1600	1700	DRM	Russia, Voice of Russia	7340as		
1600	1700		Slovakia, NEXUS/IRRS SW	15710va		
1600	1700		South Korea, KBS World Radio			9640as
			9515eu			
1600	1700		Taiwan, Radio Taiwan International			11550as
			12055as			
1600	1700	vl	Uganda, Dunamis Shortwave	4750af		
1600	1700		Uganda, UBC Radio	4975do		
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	5110na		7415am
			9330am	15420am	17495am	
1600	1700	Sun	USA, WHRI Cypress Creek SC			9840na
1600	1700	has	USA, WHRI Cypress Creek SC			17520af
1600	1700	Sat	USA, WINB Red Lion PA	9265am		
1600	1700	smtwhf	USA, WINB Red Lion PA	13570am		
1600	1700		USA, WJHR International Milton FL			15550na
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	9385va		
1600	1700		USA, WYFR/Family Radio Worldwide			6085ca
			11565am	11740af	11830am	13695am
			17540af	17690af	17760am	18980va
1600	1700		Zambia, CVC/1 Africa	13590af		
1600	1700		Zambia, Radio Christian Voice			6065af
1604	1700		Canada, Radio Canada International			9610na
1604	1700	DRM	Canada, Radio Canada International			9800na
1615	1630		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	15595eu	
1615	1700	Sun	UK, BBC World Service	9410af		11860af
1630	1700		Guam, KSDA/AWR	9790as		
1630	1700		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1630	1700	mtwhf	UK, BBC World Service	9410af		
1630	1700	Sun	UK, Bible Voice Broadcasting Network			9460me
1630	1700	mtwhf	USA, Voice of America	9785af		11905af
			13635af			
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi			4930eu
1645	1700	mf	UK, Bible Voice Broadcasting Network			9460me
1645	1700	twhfa	UK, Bible Voice Broadcasting Network			9460me
1651	1700		New Zealand, Radio NZ International			9765pa
1651	1700	DRM	New Zealand, Radio NZ International			9890pa

1700 UTC - 12PM EST / 11AM CST / 9AM PST

1700	1715	f	UK, Bible Voice Broadcasting Network			9460me
1700	1720	t	UK, Bible Voice Broadcasting Network			9460me
1700	1727		Czech Republic, Radio Prague			5930eu
1700	1745	h	UK, Bible Voice Broadcasting Network			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	1759		Poland, Polskie Radio Warsaw			9770eu
1700	1800		Anguilla, Worldwide Univ Network			11775am
1700	1800		Australia, ABC NT Alice Springs			2310do
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, Radio Australia	5995pa		6080pa
			9475pa	9580pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me		
1700	1800	Sat	Canada, CBC NQ SW Service			9625na
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St 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		China, China Radio International			6090as
			6140as	6145eu	6165me	7235as
			7265af	7410as	7420as	9570af
			9695eu	11900af	13760eu	
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio African Network/Radio Africa 7190af			
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		Nigeria, Voice of Nigeria/External Service			
			15120af			
1700	1800		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1700	1800		Papua New Guinea, Radio Wantok Light			
			7325do			
1700	1800	DRM	Poland, Polskie Radio Warsaw			7265eu
1700	1800		Russia, Voice of Russia	4975va		7240as
			7330as	9470va	9880as	
1700	1800		South Africa, Channel Africa	15235af		
1700	1800		Swaziland, TWR Swaziland	3200af		
1700	1800		Taiwan, Radio Taiwan International			11850af
1700	1800		Tajikistan, Voice of Tajik/External Service			7245va
1700	1800	vl	Uganda, Dunamis Shortwave	4750af		
1700	1800		Uganda, UBC Radio	4975do		
1700	1800		UK, BBC World Service	3255af		5975as
			6190af	9740as		

1700	1800	Sun	UK, Bible Voice Broadcasting Network			9460me
1700	1800	Sat	UK, Bible Voice Broadcasting Network			9460me
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	5110na		7415am
			9330am	15420am	17495am	
1700	1800	Sat	USA, WINB Red Lion PA	9265am		
1700	1800		USA, WJHR International Milton FL			15550na
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	9385va		
1700	1800		USA, WYFR/Family Radio Worldwide			7230af
			7385af	13695am	15795am	17555am
			18980va	21680af		
1700	1800		Zambia, CVC/1 Africa	4965af		13590as
1720	1740	fas	USA, Voice of America	4930af		12080af
			15775af			
1730	1800		Clandestine, Sudan Radio Service/ SRS			9590af
1730	1800		Slovakia, Radio Slovakia International			5915eu
			6055eu			
1730	1800	mtwhf	USA, Voice of America	4930af		12080af
			15775af			
1730	1800		Vatican City State, Vatican Radio			11625af
			13765af	15570af		
1745	1800		Bangladesh, Bangladesh Betar			7250as
1745	1800	DRM	India, All India Radio	9950eu		
1745	1800		India, All India Radio	6120eu		6280eu
			7400af	7410af	7550eu	9415af
			9445af	9940eu	11935af	
1751	1800		New Zealand, Radio NZ International			11725pa
1751	1800	DRM	New Zealand, Radio NZ International			11675pa

1800 UTC - 1PM EST / 12PM CST / 10AM PST

1800	1804		Canada, Radio Canada International			9610na
1800	1804	DRM	Canada, Radio Canada International			9800na
1800	1815		UK, Bible Voice Broadcasting Network			9460me
1800	1827		Czech Republic, Radio Prague			5930eu
1800	1830	w	Austria, AWR Europe	9515af		
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	Sat	UK, Bible Voice Broadcasting Network			9460me
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	1850		New Zealand, Radio NZ International			11725pa
1800	1850	DRM	New Zealand, Radio NZ International			11675pa
1800	1857		Netherlands, R Netherlands Worldwide			6020af
			11655af			
1800	1857		North Korea, Voice of Korea	7570eu		12015eu
1800	1859		Canada, Radio Canada International			9740va
			11845af	15365af	17790af	
1800	1900		Anguilla, Worldwide Univ Network			11775am
1800	1900	mtwhf	Argentina, Radio Nacional 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			7250eu
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St Johns NF	6160na		
1800	1900		Canada, CKZU Vancouver BC			6160na
1800	1900		China, China Radio International			9600eu
			13760eu			
1800	1900		Equatorial Guinea, Radio African Network/Radio Africa 7190af			
1800	1900	DRM	India, All India Radio	9950eu		
1800	1900		India, All India Radio	6120af		6280eu
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1800	1900		Kuwait, Radio Kuwait	15540va		
1800	1900		Liberia, Star Radio	3960do		4025al
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Nigeria, Voice of Nigeria/External Service			
			15120af			
1800	1900		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va	9955as		
1800	1900		Papua New Guinea, Radio Wantok Light			
			7325do			
1800	1900	DRM	Romania, Radio Romania International			6065eu
			7415eu			
1800	1900		Russia, Voice of Russia	4975va		7240as
			7330va	9880as	12060af	
1800	1900		South Korea, KBS World Radio			7275eu
1800	1900		Swaziland, TWR Swaziland	3200af		
1800	1900		Taiwan, Radio Taiwan International			3965eu
1800	1900	vl	Uganda, Dunamis Shortwave	4750af		
1800	1900		Uganda, UBC Radio	4975do		
1800	1900		UK, BBC World Service	3255af		5875eu
			5945as	5955as	6005af	6190af
			7225eu	9615af	11810af	
1800	1900	Sat	UK, Bible Voice Broadcasting Network			6110me
1800	1900	Sun	UK, Bible Voice Broadcasting Network			6110me
			9460me	mt0111		
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, KJES Vado NM	15385pa		
1800	1900		USA, WBCQ Monticello ME	5110na		7415am
			9330am	15420am	17495am	
1800	1900	Sun	USA, WHRI Cypress Creek SC			17520af
1800	1900	hfas	USA, WHRI Cypress Creek SC			9840na
1800	1900	smtwhf	USA, WINB Red Lion PA	13570ca		
1800	1900	Sat	USA, WINB Red Lion PA	9265am		
1800	1900		USA, WJHR International Milton FL			15550na
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	9385va		
1800	1900		USA, WYFR/Family Radio Worldwide			6045af
			6915va	7240af	7395af	9895af
			11665af	13695af	15115af	1755am
			17535am			
1800	1900		Yemen, Republic of Yemen Radio/Radio Sana'a			
			6005me	9780me		
1800	1900		Zambia, CVC/1 Africa	4965af		13590as
1805	1810	Sat	Croatia, Croatian Radio	6165eu		
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu		
1830	1845		Rwanda, Radio Rwanda	6055do		
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		
1851	1900		New Zealand, Radio NZ International			11725pa
1851	1900	DRM	New Zealand, Radio NZ International			15720pa

1900 UTC - 2PM EST / 1PM CST / 11AM PST

1900	1902	vl	Uganda, Dunamis Shortwave	4750af		
1900	1915	Sun	UK, Bible Voice Broadcasting Network			9460me
1900	1928		Germany, Deutsche Welle	15275af		
1900	1930		Germany, Deutsche Welle	9735af		13780af
1900	1930		Vietnam, Voice of Vietnam	7280eu		9730eu
1900	1945	DRM	India, All India Radio	9950eu		
1900	1945		India, All India Radio	6120af		6280eu
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1900	1945	Sun	UK, Bible Voice Broadcasting Network			9470me
1900	1950	DRM	New Zealand, Radio NZ International			15720pa
1900	1950		New Zealand, Radio NZ International			11725pa
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		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St Johns NF	6160na		
1900	2000		Canada, CKZU Vancouver BC		6160na	
1900	2000		China, China Radio International		7295af	
			9435af			
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000		Equatorial Guinea, Radio African Network/Radio Africa 7190af			
1900	2000		Kuwait, Radio Kuwait	15540va	17550va	
1900	2000		Liberia, Star Radio	3960do	4025al	
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Nigeria, Voice of Nigeria/External Service			
			9690af	7255al		
1900	2000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1900	2000		Papua New Guinea, Radio Wantok Light			
			7325do			
1900	2000		Russia, Voice of Russia	4975va	12060af	
1900	2000	smtwhf	Slovakia, NEXUS/IRRS SW	6090va		
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		Uganda, UBC Radio	4975do		
1900	2000		UK, BBC World Service	3255af	5875eu	
			5945as	5955as	6005af	6190af
			7225eu	9410af	9615af	11810af
1900	2000	Sat	UK, Bible Voice Broadcasting Network		9470me	
1900	2000	Sun	UK, Bible Voice Broadcasting Network		6030eu	
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	5110na	7415am	
			9330am	15420am	17495am	
1900	2000	mtwhfa	USA, WHRI Cypress Creek SC		9840na	
1900	2000	Sun	USA, WHRI Cypress Creek SC		15665af	
1900	2000	Sat	USA, WINB Red Lion PA	9265am		
1900	2000	smtwhf	USA, WINB Red Lion PA	13570am		
1900	2000		USA, WJHR International Milton FL		15550na	
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	9385va		
1900	2000		USA, WYFR/Family Radio Worldwide		3230af	
			6020af	6085ca	6915va	7395af
			9480af	9705af	9885af	15115af
			15565va			
1900	2000		Zambia, CVC/1 Africa	4965af	13590as	
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1915	1945	Sat	UK, Bible Voice Broadcasting Network		6030eu	
1930	2000	Sun	Germany, Pan American Broadcasting		6175af	
1930	2000		Iran, VOIRI/IRIB	6010eu	6040eu	7320eu
			11695af	11860af		
1930	2000		Serbia, International Radio of Serbia		6100eu	
1930	2000		Slovakia, Radio Slovakia International		5915eu	
			7345eu			
1930	2000		South Africa, RTE Radio Worldwide		6225af	
1930	2000		Turkey, Voice of Turkey	6050eu		
1945	2000	mtwhfa	Albania, Radio Tirana	7465eu	11635na	
1945	2000	DRM	Vatican City State, Vatican Radio		9800am	
1950	2000		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu	9645eu	
1951	2000		New Zealand, Radio NZ International		11725pa	
1951	2000	DRM	New Zealand, Radio NZ International		17675pa	

2000 UTC - 3PM EST / 2PM CST / 12PM PST

2000	2015	Sun	Germany, Pan American Broadcasting		6175af	
2000	2020		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu	9645eu	
2000	2025		Turkey, Voice of Turkey	6050eu		
2000	2027		Iran, VOIRI/IRIB	6010eu	6040eu	7320eu
			11695af	11860af		
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030	Sat	Germany, Pan American Broadcasting		6175af	
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	2030	DRM	Vatican City State, Vatican Radio		9800am	
2000	2050		New Zealand, Radio NZ International		11725pa	
2000	2050	DRM	New Zealand, Radio NZ International		17675pa	
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		15755am	
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		China, China Radio International		5960eu	
			5985af	7285eu	7295af	7415eu
			9440af	9600eu		
2000	2100		Cuba, Radio Havana Cuba	11760am		
2000	2100		Equatorial Guinea, Radio African Network/Radio Africa 7190af			
2000	2100		Indonesia, Voice of Indonesia	9526va	11785al	
2000	2100		Kuwait, Radio Kuwait	15540va	17550va	
2000	2100		Liberia, Star Radio	3960do	4025al	
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		Nigeria, Voice of Nigeria/External Service			
			15120af			
2000	2100		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2000	2100		Syria, Radio Damascus	9330eu	12085al	
2000	2100		Uganda, UBC Radio	4975do		
2000	2100		Uganda, UBC Radio	4975do		
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	9420va	9490va	
2000	2100		USA, WBCQ Monticello ME	5110na	7415am	
			9330am	15420am	17495am	
2000	2100	Sat	USA, WHRI Cypress Creek SC		15665af	
2000	2100	Sun	USA, WHRI Cypress Creek SC		13660af	
2000	2100	Sat	USA, WINB Red Lion PA	9265am		
2000	2100	smtwhf	USA, WINB Red Lion PA	13750am		
2000	2100		USA, WJHR International Milton FL		15550na	
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	9385va		
2000	2100		USA, WYFR/Family Radio Worldwide		5745va	
			6915va	9480af	11615af	15115af
			15195af	15520af	17535am	17555am
			17575sa			
2000	2100		Zambia, CVC/1 Africa	4965af	9505af	
2005	2100	m	South Africa, SA Radio League		3215af	
2030	2045		Thailand, Radio Thailand World Service		9535eu	
2030	2100		Laos, Lao National Radio	7145as		
2030	2100	mtwhf	Moldova, (Transnistria) Radio PMR		6240eu	
2030	2100		USA, Voice of America	4930af	6080af	
			7405as	15580af		
2030	2100	Sat/Sun	USA, Voice of America	4940af		

2030	2100		Vietnam, Voice of Vietnam	7220me	7280eu	
			9550me	9730eu		
2045	2100		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2045	2100	DRM	India, All India Radio	9950eu		
2051	2100		New Zealand, Radio NZ International		11725pa	
2051	2100	DRM	New Zealand, Radio NZ International		15720pa	

2100 UTC - 4PM EST / 3PM CST / 1PM PST

2100	2105	m	South Africa, SA Radio League		3215af	
2100	2127		Czech Republic, Radio Prague		5930eu	
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 NQ SW Service		9625na	
2100	2150		New Zealand, Radio NZ International		11725pa	
2100	2150	DRM	New Zealand, Radio NZ International		15720pa	
2100	2157		Germany, Deutsche Welle	11865af	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 Belarus	6155eu	7360eu	
			7390eu			
2100	2200	DRM	Belgium, TDP Radio	15755eu		
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		China, China Radio International		5960eu	
			7205af	7285eu	7325af	7415eu
			9600eu			
2100	2200		Equatorial Guinea, Radio African Network/Radio Africa 7190af			
2100	2200		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2100	2200	DRM	India, All India Radio	9950eu		
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2100	2200		Syria, Radio Damascus	9330va	12085al	
2100	2200		Uganda, UBC Radio	4975do		
2100	2200		UK, BBC World Service	3255af	3915as	
			5875as	5910af	5965as	6190af
			6195as	7465af	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, WBCQ Monticello ME	5110na	7415am	
			9330am	15420am	17495am	
2100	2200	Sun	USA, WHRI Cypress Creek SC		9690na	
2100	2200	Sat	USA, WHRI Cypress Creek SC		13660af	
2100	2200		USA, WINB Red Lion PA	9265am		
2100	2200	smtwhf	USA, WINB Red Lion PA	13750am		
2100	2200		USA, WJHR International Milton FL		15550na	
2100	2200		USA, WRNO New Orleans LA		7505am	
			15590al			
2100	2200		USA, WTWW Lebanon TN	9480va	9990va	
2100	2200		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2100	2200		USA, WWRB Manchester TN	3215na	5050va	
			5745va	9385va		
2100	2200		USA, WYFR/Family Radio Worldwide		5950am	
			6915va	7510va	15195af	17535am
			17555am			
2100	2200		Zambia, CVC/1 Africa	4965af	9505af	
2115	2145		Egypt, Radio Cairo	6270eu		
2130	2200		Australia, ABC NT Alice Springs		4835do	
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC NQ SW Service		9625na	
2130	2200		China, China Radio International		7365eu	
2130	2200		Romania, Radio Romania International		6030na	
			6115na	7310eu	7380eu	
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 - 5PM EST / 4PM CST / 2PM PST

2200	2210		Uganda, UBC Radio	4975do		
2200	2225		Turkey, Voice of Turkey	9610va		
2200	2230		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2200	2230	DRM	India, All India Radio	9950eu		
2200	2230		Serbia, International Radio of Serbia		6100eu	
2200	2230		South Korea, KBS World Radio		3955eu	
2200	2245		Egypt, Radio Cairo	6270eu		
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	
			13590va	13630pa	15230as	15240pa
			15360pa	15415as	15515va	15560pa
2200	2300		Bahrain, Radio Bahrain	6010me		
2200	2300		Belarus, Radio Belarus	6155eu	7360eu	
			7390eu			
2200	2300		Bulgaria, Radio Bulgaria	6200eu	7400eu	
2200	2300	smtwhf	Canada, CBC NQ SW Service		9625na	
2200	2300		Canada, CFRX Toronto ON	6070na		
2200	2300		Canada, CFVP Calgary AB	6030na		
2200	2300		Canada, CKZN St Johns NF	6160na		
2200	2300		Canada, CKZU Vancouver BC		6160na	
2200	2300		China, China Radio International		9590as	
2200	2300		Equatorial Guinea, Radio African Network/Radio Africa 7190af			
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300		New Zealand, Radio NZ International		15720pa	
2200	2300	DRM	New Zealand, Radio NZ International		17675pa	
2200	2300	Sat/Sun	Spain, Radio Exterior de Espana		6125eu	
2200	2300		Syria, Radio Damascus	9330va	12085al	
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	7220va	
			7425va	7570va	9490va	
2200	2300		USA, WBCQ Monticello ME	5110na	7415am	
			9330am	15420am	17495am	
2200	2300	f	USA, WHRI Cypress Creek SC		11785na	
2200	2300	Sun	USA, WHRI Cypress Creek SC		9785af	
2200	2300		USA, WINB Red Lion PA	9265am		
2200	2300		USA, WJHR International Milton FL		15550na	
2200	2300		USA, WTWW Lebanon TN	5080va	5755va	
			9990va			
2200	2300		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2200	2300		USA, WWRB Manchester TN	3215na	5050va	
			5745va	9385va		
2200	2300		USA, WYFR/Family Radio Worldwide		5950am	
			15440am	11740am	17690af	
2215	2230		Croatia, Croatian Radio	3985eu	7375ca	
2230	2257		Czech Republic, Radio Prague		7355af	
2230	2300		China, Xizang PBS/Holy Tibet	4905do	4920do	
			6200do	6200do		
2230	2300		Guam, KSDA/AWR	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	6055as	7305as	
			9705as	9950as	11645as	13605as

2300 UTC - 6PM EST / 5PM CST / 3PM PST

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 NQ SW Service		9625na	
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		

SHORTWAVE GUIDE

2300	0000		Canada, CKZN St Johns NF	6160na	
2300	0000		Canada, CKZU Vancouver BC	6160na	
2300	0000		China, China Radio International	5915as	
			5990ca	6145na	7350eu 7410as
			9610as	11690pa	11790as 11840na
2300	0000		Cuba, Radio Havana Cuba	5040am	
2300	0000		Egypt, Radio Cairo	11590na	
2300	0000	vl	Guyana, Voice of Guyana	3290va	
2300	0000		India, All India Radio	6055as	7305as
			9705as	9950as	11645as 13605as
2300	0000		Malaysia, RTM/Traxx FM	7295do	
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		UK, BBC World Service	3915as	5875as
			6135as	6195as	7385as 9740as
2300	0000		Ukraine, Radio Ukraine International	7440na	
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	7220va
			7480va	7570va	9490va
2300	0000		USA, WBCQ Monticello ME	5110na	7415am
			9330am		
2300	0000	smtwhf	USA, WHRI Cypress Creek SC	5920ca	
2300	0000	Sat	USA, WHRI Cypress Creek SC	9690na	
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	5050va
			5745va	9385va	
2300	0000		USA, WYFR/Family Radio Worldwide	9430ca	
			15400ca		
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	9755am	
2300	2345		USA, WYFR/Family Radio Worldwide	11740na	
2300	2355		Turkey, Voice of Turkey	5960va	
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
2330	2357		Czech Republic, Radio Prague	5930na	

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana .....**http://rtsh.sil.at/**
Anguilla, Worldwide Univ Network .....**www.worldwideuniversitynetwork.com/**
Argentina, Radio Nacional RAE.....**www.radionacional.com.ar/**
Australia, ABC NT Alice Springs.....**www.abc.net.au/radio/**
Australia, ABC NT Katherine.....**www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek .....**www.abc.net.au/radio/**
Australia, HCJB Global Australia .....**www.hcjb.org/**
Australia, Radio Australia .....**www.abc.net.au/ra/**
Austria, AWR Europe **www.awr2.org/**
Bahrain, Radio Bahrain .....**www.radiobahrain.fm/**
Bangladesh, Bangladesh Betar .....**www.betar.org.bd/**
Belarus, Radio Belarus .....**www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio .....**www.airtime.be/schedule.html**
Belgium, TDP Radio/Disco Palace .....**www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service .....**www.bbs.com.bt/**
Bulgaria, Radio Bulgaria .....**www.bnr.bg/**
Bulgaria, Radio Bulgaria/Euranet.....**www.bnr.bg/**
Canada, CBC NQ SW Service.....**www.cbc.ca/north/**
Canada, CFRX Toronto ON .....**www.cfrb.com**
Canada, CFVP Calgary AB.....**www.classiccountryam1060.com**
Canada, CKZN St 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.....**www.vos.com.cn**
Clandestine, Cotton Tree News.....**www.cottontreenews.org/**
Clandestine, Sudan Radio Service/ SRS ....**www.sudanradio.org/**
Croatia, Croatian Radio .....**www.hrt.hr/**
Cuba, Radio Havana Cuba .....**www.radiohc.cu/**
Czech Republic, Radio Prague .....**www.radio.cz/**
Egypt, Radio Cairo.....**www.ertu.org**
Equatorial Guinea, Radio African Network/Radio Africa....**www.panambc.com**
Equatorial Guinea, Radio African Network/Radio Africa # 2.**www.panambc.com**
Equatorial Guinea, Radio African Network/Radio East Africa.**www.panambc.com**
Ethiopia, Radio Ethiopia/External Service..**www.erta.gov.et**
France, Radio France Internationale.....**http://rfienglish.com**
Germany, AWR Europe.....**www.awr2.org/**
Germany, Blue Star Radio .....**www.mvbalticradio.de**
Germany, Deutsche Welle .....**www.dw-world.de/**
Germany, European Music Radio.....**www.emr.org.uk/**
Germany, Pan American Broadcasting .....**www.radiopanam.com/**
Germany, Radio Gloria International .....**www.radiopanam.com/**
Germany, TWR Europe.....**www.twr.org**
Greece, Voice of Greece .....**www.voiceofgreece.gr/**
Guam, KSDA/AWR **www.awr2.org/**
Guam, KTWR/TWR.....**www.twr.org/**
Guyana, Voice of Guyana .....**www.voiceofguyana.com/**
India, All India Radio .....**www.allindiaradio.org/**
Indonesia, Voice of Indonesia .....**www.voi.co.id**
Iran, VOIRI/IRIB .....**www.irib.ir/English/**
Japan, NHK World/Radio Japan.....**www.nhk.or.jp/english/**
Kuwait, Radio Kuwait.....**www.media.gov.kw/**
Laos, Lao National Radio .....**www.lnr.org.la**
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, ORTM Du Mali .....**www.ortm.ml**
Monaco, TWR Europe .....**www.twr.org/**
Mongolia, Voice of Mongolia.....**www.mnb.mn**
Nepal, Radio Nepal .....**www.radionepal.org/**
Netherlands, R Netherlands Worldwide ....**www.radionetherlands.nl/**
New Zealand, Radio NZ International .....**www.rnzi.com**
Nigeria, Voice of Nigeria/External Service **www.voiceofnigeria.org**
Oman, Radio Sultanate of Oman .....**www.oman-tv.gov.om**
Pakistan, PBC/Radio Pakistan.....**www.radio.gov.pk**
Palau, T8WH/WHRI/Sound of Hope Radio**www.whr.org/**
Philippines, FEBC.....**www.febc.ph**
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 .....**www.ruvr.ru/**
Rwanda, Radio Rwanda .....**www.orinfor.gov.rw/radiorwanda.eng.html**
Saudi Arabia, BSKSA/Saudi Radio.....**www.saudiradio.net/**
Serbia, International Radio of Serbia.....**www.glassrbije.org**
Slovakia, NEXUS/IRRS SW .....**www.nexus.org**
Slovakia, Radio Slovakia International.....**www.rsi.sk**
South Africa, AWR Africa **www.awr2.org/**
South Africa, Channel Africa.....**www.channelafrica.org**
South Africa, RTE Radio Worldwide **www.rte.ie/radio1/**
South Africa, SA Radio League.....**www.sarl.org.za**
South Africa, TWR Africa.....**www.twr.org/**
South Korea, KBS World Radio .....**http://rki.kbs.co.kr/english/**
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.com/**
Turkey, Voice of Turkey.....**www.trt.net.tr**
Uganda, Dunamis Shortwave .....**www.biblevoice.org/stations/east-africa**
Uganda, UBC Radio .....**www.ubconline.co.ug**
UK, BBC World Service.....**www.bbc.co.uk/worldservice/**
UK, Bible Voice Broadcasting Network .....**www.biblevoice.org/**
Ukraine, Radio Ukraine International .....**www.nrcu.gov.ua/**
United Arab Emirates, FEBA Radio .....**www.febaradio.info**
United States, Overcomer Ministries.....**www.overcomerministry.org/**
USA, American Forces Network .....**http://myafn.dodmedia.osd.mil/**
USA, EWTN/WEWN Irondale, AL .....**www.ewtn.com**
USA, FBN/WTJC Newport NC .....**www.fbnradio.com/**
USA, KNLS Anchor Point AK.....**www.knls.org/**
USA, Voice of America .....**www.voanews.com/**
USA, Voice of America/Special English.....**www.voanews.com/**
USA, WBCQ Monticello ME.....**www.wbcq.com/**
USA, WHRI Cypress Creek SC .....**www.whr.org/**
USA, WINB Red Lion PA .....**www.winb.com/**
USA, WRNO New Orleans LA .....**www.wrnoworldwide.org/**
USA, WTWW Lebanon TN.....**www.wtww.us**
USA, WWCR Nashville TN.....**www.wwcr.com**
USA, WWRB Manchester TN.....**www.wwrb.org/**
USA, WYFR/Family Radio Worldwide .....**www.familyradio.com/**
Vatican City State, Vatican Radio.....**www.vaticanradio.org**
Vatican City State, Vatican Radio/Mass.....**www.vaticanradio.org**
Vietnam, Voice of Vietnam.....**www.vov.org.vn**
Yemen, Republic of Yemen Radio/Radio Sana'a..**www.yemenradio.net**
Zambia, CVC/1 Africa **www.1africa.tv**
Zambia, Radio Christian Voice.....**www.1africa.tv**

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

QSLing Comes to Your Smartphone

Facebook fans may recall that a few months ago Radio Free Asia began a new social network service, where DXers and others can access the latest RFA broadcast schedules, station information, and QSL cards.

Recently, RFA began an automated reception report system using your smartphone. If you have a smartphone, you can use the QR tag to access the automated reception report system and submit your reception report to the Radio Free Asia website. Director of Productions, A.J. Janitschek explains, many smartphones already come with a QR code reader, but if you need a code scanner/reader, go to: **www.mobile-barcodes.com/qr-code-software/** You also have the option of using the following Microsoft Tag from your smartphone. The free mobile app for your smartphone is available at **http://gettag.mobi.** (requires phone connection)

RFA encourages all listeners to submit reception reports, which are used to evaluate the signal strength and quality of transmissions. Reception report details may be submitted at **www.techweb.rfa.org** (Follow the QSL Report link) or to *qsl@rfa.org.* Postal address: Reception Reports, Radio Free Asia, 2025 M. Street NW, Suite 300, Washington, DC 20036 USA. RFA encourages everyone with a Facebook account to join them online at RFA QSL.

WINB picks up new programming

Hans Johnson, Frequency Manager of WINB, reminds *MT* readers that the station is carrying Radio 2:11 Network and is looking for listeners to send in their reception reports. The Radio 2:1 Network website is **www.thestreamtv.com/welcome_003.htm.** Reports may be sent to *info@winb.com* or P.O. Box 88, Red Lion, PA 17356 USA.

QSL bits and bytes

Just prior to editorial deadline, it was reported in *DX Window* newsletter that Radio Mauritanie from Nouakchott replaced 4845 kHz with 7245 kHz for the morning and afternoon broadcasts. Monitoring shows those times to be 0600-0715; 1130-1150 and 1625-1640 UTC. Send program details to *rm@mauritania.mr* or via post with return mint postage to: Av. Gamal Nasser387, Boite Postal 200, Nouakchott, Mauritania.

Have you noticed that American Forces Radio is now using a Secretary QSL Manager to confirm reception reports? Alvaro Lopez reported (via playdx) receiving a card in 13 days for 4319 kHz (USB) from Diego Garcia, confirmed by Mrs. Cynthia Harris. Send your details to *qsl@dodmedia.osd.mil.* AF Radio also relays programming in upper side-band from Guam and Key West. Florida. Their 24-hour English schedule is contained in the center SW Guide.

Tonga has been inactive on shortwave for decades, but if you're an amateur radio operator, it's time to fire up the rig. A3 (IOTA Op) Akira, JaiNLX will be active as A35AY from Fafa Island near Tongatapu Island (OC-049) between February 4-9, 2011. Activity will be on 80-10 meters, including 30/17/12 meters, using Morse code and RTTY. Suggested frequencies include: CW - 3505, 7015, 10115, 14035, 18075, 21035, 24895 and 28035 kHz; RTTY - 10140, 14085, 18110, 21085, 24920 and 28085 kHz. QSL via JA1NLX, direct, by the Bureau (ARRL) or LoTW (Logbook of the World). For more details visit: **www.ne.jp/asahi/ja1nlx/ham/A35_2011.html**

A quick reminder

I've been QSLing for many years, but on occasion I'm reminded to pass along simple tips that work. When corresponding via postal mail, consider enclosing an addressed return envelope. This method has worked countless times for me, and in today's era of station cutbacks, that little extra could make a big difference.

BRAZIL

Radio Senado, 5990 kHz. Full data QSL card unsigned. Received in 126 days. Station address: Senado Federal, Praça dos Tres Poderes, Brasília DF - CEP 70165-900 (Christian Ghibaudo, France/playdx) Website: **www.senado.gov.br**

GERMANY

Bayerischer Rundfunk, 6085 kHz DRM. Full data antenna card. Received in 63 days for an English report and $2.00 US (returned). Station address: 80300 München, Germany. (Al Muick, Kabul, Afghanistan). Website with streaming, on-demand and podcast **www.br-online.de**

Missionswerk Friedensstimme 11695 via Wertachtal. Full data QSL card, signed by N. Beog. Received in two weeks for $1.00 US. Station address: Postfach 100638, 51606 Gummersbach, Germany. (Artur Fernandez Llorella, Catalonia, Spain/HCDX)

LITHUANIA

RMRC 6130 kHz via Sitkunai. Full data email verification from Lutz Winkler of RMRC. Attached was a colored drawing from Christiane Winkler of three birds with headphones and station logo. Received in nine days for an email report to *mail@rmrc.de* (John Wilkins, Wheat Ridge, CO)

MEDIUM WAVE

WCBS 880 kHz AM. *News Radio 880.* Station info letter only, signed by Rob Bertrand-Engineer, plus vintage 1961 QSL card featuring transmitter site on High Island. Received in 210 days. Station address: 524 West 57th Street, New York, NY 10019 USA. Station is part of the CBC New York Network. Streaming audio at **http://newyork.cbslocal.com** (Norman Hill, Arlington, VA)

MOLDOVA

Radio Pridnestrovie 9665 kHz via Grigoriopol. Full color station sheet with logo, map and antennas from Anatoly Kirsa. Received in two months for an English report and an addressed envelope (not used for reply). Frequency was incorrectly listed as 6240 kHz. QSL address: ul. Pravda 31, MD 3300 Tirasapol, Pridnestrovie, Moldova. (Wendel Craighead, Prairie Village, KS). Full data e-QSL from A. Kirsa in 24 hours for report to: *radiopmr@inbox.ru* (Wikins).

NEW ZEALAND

Radio New Zealand International, 9655 kHz. Full data rugby radio card and thank you note, plus selection of station stickers. Received in 37 days for an English report and $ 5.00 US. Station address: P.O. Box 123, Wellington, New Zealand. Email: *info@rnzi.com* Website with streaming, on-demand and podcast **www.rnzi.com** (Muick).

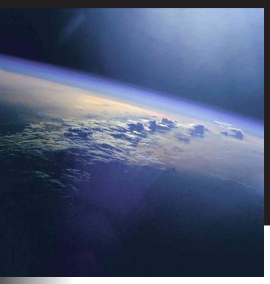
SOUTH AFRICA

RTÉ relay 6225 kHz via Meyerton. Full data QSL. Received in 16 weeks for English report to: *freqdept@wrn.org* (Llorella)

USA

WTWW 9480 kHz Lebanon, Tennessee. Full data color card of George McClintock, President of WTWW, in front of the 100,000 watt transmitter, signed by Dan Dixon-Manager. Received in five months for a report via Scriptures for America contact form at: **www.scripturesforamerica.org/media_contact.php**

QSL address: 1784 West Northfield Blvd., # 305, Murfreesboro, TN 37129 USA. Return address on card is: Scriptures for America Ministry, P.O. Box 766, LaPorte, CO 80535 USA. Return address on envelope: Nashville Engineering Consortium, 6611 Ormond Drive, Nashville, TN 37205 USA. (Craighead). Received in 265 days for one IRC, card signed by Dan Dixon. (Roberto Pavanello, Italy/playdx)



MTXtra
Shortwave Broadcast Guide

GERMAN / ARABIC

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.

1800 UTC - 1PM EST / 12PM CST / 10AM PST

1800	1827		Iran, VOIRI/IRIB	3955eu	6105eu	6205eu 7380eu
1800	1857		North Korea, Voice of Korea	6285eu	9325eu	
1800	1858		Germany, Deutsche Welle	13780af		
1800	1900		China, China Radio International	7395eu	11650eu	11775eu
1800	1900		Germany, Deutsche Welle	3995eu	6075eu	9545af 11725af 12070af 15640af
1800	1900		Germany, Deutschlandfunk	6190eu		
1800	1900		Indonesia, Voice of Indonesia	9526va		
1800	1900		Russia, Voice of Russia	12010eu		
1800	1900		Syria, Radio Damascus	9330eu	12085al	
1800	1900		Ukraine, Radio Ukraine International	6030eu		
1800	1900		USA, WYFR/Family Radio Worldwide	7490va	15795va	21455va
1820	1840		Vatican City State, Vatican Radio	4005eu	5885eu	7250eu 9645eu
1830	1900		Turkey, Voice of Turkey	7205eu		

1900 UTC - 2PM EST / 1PM CST / 11AM PST

1900	1925		Turkey, Voice of Turkey	7205eu		
1900	1930		Slovakia, Radio Slovakia International	5915eu	7345eu	
1900	1955		Germany, Deutsche Welle	15640af		
1900	1957		Germany, Deutsche Welle	11725af		
1900	1957		North Korea, Voice of Korea	6285eu	9325eu	
1900	1959		Germany, Deutsche Welle	6075eu	9545af	12070af
1900	2000		Belarus, Radio Belarus	6155eu	7360eu	7390eu
1900	2000		China, China Radio International	7395eu	11650eu	11775eu
1900	2000		Egypt, Radio Cairo	6270eu		
1900	2000		Germany, Deutsche Welle	3995eu		
1900	2000		Germany, Deutschlandfunk	6190eu		
1900	2000		Romania, Radio Romania International	7370eu		
1900	2000	DRM	Romania, Radio Romania International	9805eu		
1900	2000		Taiwan, Radio Taiwan International	3955eu		
1900	2000		USA, WYFR/Family Radio Worldwide	7490va		
1930	1959		Poland, Polskie Radio Warsaw	6035eu		
1930	1959	DRM	Poland, Polskie Radio Warsaw	6135eu		
1930	2000	mtwhf	Moldova, (Transnistria) Radio PMR	6240eu		
1930	2000		Vietnam, Voice of Vietnam/Overseas Service	9430eu		

2000 UTC - 3PM EST / 2PM CST / 12PM PST

2000	2015		Thailand, Radio Thailand World Service	9535eu		
2000	2030		Vietnam, Voice of Vietnam/Overseas Service	9430eu		
2000	2055		Germany, Deutsche Welle	12070eu		
2000	2100		Belarus, Radio Belarus	6155eu	7360eu	7390eu
2000	2100		Bulgaria, Radio Bulgaria	6200eu	7400eu	
2000	2100		Germany, Deutsche Welle	3995eu	6075eu	9510va 11605va
2000	2100		Germany, Deutschlandfunk	6190eu		
2000	2100		South Korea, KBS World Radio	3955eu		
2000	2100		USA, WYFR/Family Radio Worldwide	11565va		
2031	2100	mtwhfa	Albania, Radio Tirana	7465eu		

2100 UTC - 4PM EST / 3PM CST / 1PM PST

2100	2130	smtwhf	Serbia, International Radio of Serbia	6100eu		
2100	2155		Germany, Deutsche Welle	11605va		
2100	2158		Germany, Deutsche Welle	9510va		
2100	2200	mtwhf	Argentina, Radio Nacional RAE	15345eu		
2100	2200		Germany, Deutsche Welle	3995eu	6075eu	
2100	2200		Germany, Deutschlandfunk	6190eu		
2100	2200		Taiwan, Radio Taiwan International	3965eu		
2100	2200		Ukraine, Radio Ukraine International	6140eu		
2130	2200	mtwhf	Moldova, (Transnistria) Radio PMR	6240eu		

2200 UTC - 5PM EST / 4PM CST / 2PM PST

2200	2300		Germany, Deutsche Welle	6075eu	11865sa	11875as 12025ca 15640sa
2200	2300		Germany, Deutschlandfunk	6190eu		

2300 UTC - 6PM EST / 5PM CST / 3PM PST

2300	0000		Germany, Deutsche Welle	6075eu	11875as	12025ca 15640sa
2300	0000		Germany, Deutschlandfunk	6190eu		
2300	2355		Germany, Deutsche Welle	11865sa		
2300	2358		Germany, Deutsche Welle	6050as		
2330	0000	mtwhf	Moldova, (Transnistria) Radio PMR	6240eu		

ARABIC LANGUAGE GUIDE

0000 UTC - 7PM EST / 6PM CST / 4PM PST

0000	0100	Bahrain, Radio Bahrain	9745me	
0000	0030	Clandestine, Radio Nacional De La R.A.S.D.	6248af	
0000	0045	Egypt, Radio Cairo	9250ca	9360sa
0000	0100	Egypt, Radio Cairo/ General Program	9305va	
0000	0030	Egypt, Radio Cairo/ Voice of the Arabs	9295af	
0000	0100	Iran, VOIRI/IRIB	3985as	6025as
0000	0010	Tunisia, RDTV Tunisienne	7345af	
0030	0100	Egypt, Radio Cairo	11590na	

0100 UTC - 8PM EST/ 7PM CST / 5PM PST

0100	0200	Bahrain, Radio Bahrain	9745me	
0100	0200	Egypt, Radio Cairo	11590na	
0100	0200	Egypt, Radio Cairo/ General Program	9305va	
0100	0200	Iran, VOIRI/IRIB	3985as	6025as
0100	0130	USA, FBN/WTJC Newport NC	9370na	

0200 UTC - 9PM EST / 8PM CST / 6PM PST

0200	0300	Bahrain, Radio Bahrain	9745me	
0200	0300	Egypt, Radio Cairo	11590na	
0200	0300	Egypt, Radio Cairo/ General Program	9305va	
0200	0300	Iran, VOIRI/IRIB	3985as	6025as
0200	0300	Kuwait, Radio Kuwait	5960me	
0200	0300	Oman, Radio Sultanate of Oman	15355af	
0230	0300	Iran, VOIRI/IRIB	7350as	9895as
0230	0300	Sudan, Sudan RDTV Corp/Sudanese Radio	7200do	

0300 UTC - 10PM EST / 9PM CST / 7PM PST

0300	0400	Bahrain, Radio Bahrain	9745me	
0300	0359	Canada, Radio Canada International	6025va	
0300	0400	Egypt, Radio Cairo	11590na	
0300	0400	Egypt, Radio Cairo/ General Program	9305va	
0300	0327	Iran, VOIRI/IRIB	3985as	
0300	0400	Iran, VOIRI/IRIB	7350as	9895as
0300	0400	Kuwait, Radio Kuwait	5960me	
0300	0400	Saudi Arabia, BSKSA/General Program	9675me	
0300	0400	Saudi Arabia, BSKSA/Program 2	9580va	

SHORTWAVE GUIDE

0300	0400		Saudi Arabia, BSKSA/Qu'ran Program	15170as	17895af
0300	0400		Sudan, Sudan RDTV Corp/Sudanese Radio	7200do	
0300	0400		UK, BBC World Service	5905me	5790me 6040me 9465me
0300	0400		Yemen, Republic of Yemen Radio/Radio Sana'a	9780me	
0330	0400		Clandestine, Saut Falestin/VO Islamic Palestinian Revol.	9610as	11875as
0330	0400		Iran, VOIRI/IRIB/Saut Falestin	5915as	6165al
0345	0400		Jordan, Radio Jordan	11810va	11960al

0400 UTC - 11PM EST / 10PM CST / 8PM PST

0400	0500		Algeria, Radio Algerienne	5865af	
0400	0500		Bahrain, Radio Bahrain	9745me	
0400	0459		Canada, Radio Canada International	5955va	7265va
0400	0427		Clandestine, Saut Falestin/VO Islamic Palestinian Revol.	9610as	11875as
0400	0430		Egypt, Radio Cairo	11590na	
0400	0500		Egypt, Radio Cairo/ General Program	9305va	
0400	0500		Iran, VOIRI/IRIB	7350as	9895as
0400	0427		Iran, VOIRI/IRIB/Saut Falestin	5915as	6165al
0400	0430		Japan, NHK World/Radio Japan	6035va	
0400	0500		Jordan, Radio Jordan	11810va	11960al
0400	0500		Kuwait, Radio Kuwait	5960me	
0400	0500		Libya, LJBC Voice of Africa	9870af	9880af
0400	0500		Oman, Radio Sultanate of Oman	7405af	
0400	0500		Saudi Arabia, BSKSA/General Program	9675me	
0400	0500		Saudi Arabia, BSKSA/Program 2	9580va	
0400	0500		Saudi Arabia, BSKSA/Qu'ran Program	15170as	17895af
0400	0430		Sudan, Sudan RDTV Corp/Sudanese Radio	7200do	
0400	0500		Tunisia, RDTV Tunisienne	9725me	12005me
0400	0500		UK, BBC World Service	5905me	5790af 6155af 7325af 11740me 11820me 13660me
0400	0430		Vatican City State, Vatican Radio	9645me	11715me
0400	0500		Yemen, Republic of Yemen Radio/Radio Sana'a	9780me	
0430	0500		Clandestine, Radio Dabanga	7315af	13590af
0430	0500		India, All India Radio	11730me	15770me 17845me
0430	0500	th	UK, Bible Voice Broadcasting Network	9735me	

0500 UTC - 12AM EST / 11PM CST / 9PM PST

0500	0600		Algeria, Radio Algerienne	5865af	7295af
0500	0600		Bahrain, Radio Bahrain	9745me	
0500	0600		China, China Radio International	9515af	9590me 11775af 17485me
0500	0530		Clandestine, Darfur Salaam	12015af	13650af
0500	0557		Clandestine, Radio Dabanga	7315af	13590af
0500	0600		Egypt, Radio Cairo/ General Program	9305va	
0500	0530		India, All India Radio	11730me	15770me 17845me
0500	0527		Iran, VOIRI/IRIB	6065as	7350as 9895as
0500	0600		Jordan, Radio Jordan	11810va	11960al
0500	0600		Kuwait, Radio Kuwait	5960me	15515as
0500	0600		Libya, LJBC Voice of Africa	9870af	9880af
0500	0600		Oman, Radio Sultanate of Oman	7405af	
0500	0600		Saudi Arabia, BSKSA/General Program	9675me	
0500	0600		Saudi Arabia, BSKSA/Program 2	9580va	
0500	0600		Saudi Arabia, BSKSA/Qu'ran Program	15170as	17895af
0500	0600		Tajikistan, Voice of Tajik/External Service	7245me	
0500	0600		Tunisia, RDTV Tunisienne	7275eu	7335me 9725me 12005me
0500	0600		UK, BBC World Service	5905me	7325af 9915af 11740me 11820me 13660me
0500	0515	f	UK, Bible Voice Broadcasting Network	9735me	
0500	0600		USA, WYFR/Family Radio Worldwide	7520eu	11580af
0500	0600		Yemen, Republic of Yemen Radio/Radio Sana'a	6135me	9780me
0530	0600		Iran, VOIRI/IRIB	13790as	13800as 15550as

0600 UTC - 1AM EST / 12AM CST / 10PM PST

0600	0700		Algeria, Radio Algerienne	7295af	9535af
0600	0700		Bahrain, Radio Bahrain	9745me	
0600	0700		China, China Radio International	9515af	9590me 11775af 17485me
0600	0700		Clandestine, Radio Nacional De La R.A.S.D.	6248af	
0600	0700		Egypt, Radio Cairo/ General Program	9305va	
0600	0700		Iran, VOIRI/IRIB	13790as	13800as 15550as
0600	0700		Jordan, Radio Jordan	11810va	11960al
0600	0700		Kuwait, Radio Kuwait	5960me	15515as
0600	0657		Libya, LJBC Voice of Africa	9870af	9880af
0600	0700		Oman, Radio Sultanate of Oman	7405af	
0600	0700		Saudi Arabia, BSKSA/General Program	9455me	9675me 11880eu 17730eu 17740eu
0600	0700		Saudi Arabia, BSKSA/Program 2	11855va	
0600	0700		Saudi Arabia, BSKSA/Qu'ran Program	15380me	17895af
0600	0610		Tunisia, RDTV Tunisienne	9725eu	12005me
0600	0700		Tunisia, RDTV Tunisienne	7275af	
0600	0700		UK, BBC World Service	5905me	9915af 11680af 11820me 13660me 15630me
0600	0700		Yemen, Republic of Yemen Radio/Radio Sana'a	6135me	
0645	0700	mtwhfa	Vatican City State, Vatican Radio	5965eu	7250eu 11740af 15595va

0700 UTC - 2AM EST / 1AM CST / 11PM PST

0700	0800		Bahrain, Radio Bahrain	9745me	
0700	0800		Clandestine, Radio Nacional De La R.A.S.D.	6248af	
0700	0800		Egypt, Radio Cairo/ General Program	15800af	
0700	0800		Germany, AWR Europe	11975af	
0700	0800		Iran, VOIRI/IRIB	13790as	13800as 15550as
0700	0730		Japan, NHK World/Radio Japan	11905va	
0700	0715		Jordan, Radio Jordan	11810va	11960al
0700	0800		Kuwait, Radio Kuwait	5960me	15515as
0700	0800		Libya, LJBC Voice of Africa	11630af	11650af
0700	0800		Oman, Radio Sultanate of Oman	7405af	
0700	0800		Saudi Arabia, BSKSA/General Program	9455me	9675me 11880eu 17730eu 17740eu
0700	0800		Saudi Arabia, BSKSA/Program 2	11855va	
0700	0800		Saudi Arabia, BSKSA/Qu'ran Program	15380me	17895af
0700	0730		Tunisia, RDTV Tunisienne	7275eu	
0700	0800		Tunisia, RDTV Tunisienne	7335af	
0700	0800		UK, BBC World Service	5905me	11680af 11820me 13660me 15150af 15360me
0700	0800		USA, WYFR/Family Radio Worldwide	9985af	
0700	0705	mtwhfa	Vatican City State, Vatican Radio	5965eu	7250eu 11740af 15595va
0700	0800		Yemen, Republic of Yemen Radio/Radio Sana'a	6135me	
0730	0800		Romania, Radio Romania International	11710af	11905af 15155af 15330af

0800 UTC - 3AM EST / 2AM CST / 12AM PST

0800	0900		Bahrain, Radio Bahrain	9745me	
0800	0900		Clandestine, Radio Nacional De La R.A.S.D.	6300af	
0800	0900		Egypt, Radio Cairo/ General Program	15800af	
0800	0900		Iran, VOIRI/IRIB	13790as	13800as 15550as
0800	0900		Kuwait, Radio Kuwait	5960me	15515as
0800	0900		Kuwait, Radio Kuwait/Second Program	21540af	
0800	0857		Libya, LJBC Voice of Africa	11630af	11650af
0800	0900		Oman, Radio Sultanate of Oman	7405af	
0800	0900		Saudi Arabia, BSKSA/General Program	9455me	9675me 11880eu 17730eu 17740eu
0800	0900		Saudi Arabia, BSKSA/Program 2	11855va	
0800	0900		Saudi Arabia, BSKSA/Qu'ran Program	15380me	
0800	0830		Tunisia, RDTV Tunisienne	7335af	
0800	0900		UK, BBC World Service	5905me	15180af 17505af
0800	0830		UK, FEBA Radio	15220me	
0800	0900		Yemen, Republic of Yemen Radio/Radio Sana'a	6135me	
0830	0900		Iran, VOIRI/IRIB	9885as	

0900 UTC - 4AM EST / 3AM CST / 1AM PST

0900	1000		Bahrain, Radio Bahrain	9745me	
0900	1000		Egypt, Radio Cairo/ General Program	15800af	
0900	1000		Iran, VOIRI/IRIB	13790as	13800as 15550as
0900	1000		Kuwait, Radio Kuwait	5960me	15515as
0900	1000		Kuwait, Radio Kuwait/Second Program	21540af	

0900	1000	Libya, LJBC Voice of Africa	17735af 17740af
0900	1000	Morocco, Radiodiffusion TV Marocaine	15341va
0900	1000	Oman, Radio Sultanate of Oman	7405af
0900	1000	Saudi Arabia, BSKSA/General Program	9675me 11730af 15490af 15790eu 17805af 21555af 21705af
0900	1000	Saudi Arabia, BSKSA/Program 2	11855va
0900	1000	Saudi Arabia, BSKSA/Qu'ran Program	11935me 17520as 17570as 17615as 21495as
0900	1000	UK, BBC World Service	5905me 15180af 17505af
0900	1000 f	UK, Bible Voice Broadcasting Network	17535af
0900	1000	Yemen, Republic of Yemen Radio/Radio Sana'a	6135me
0930	1000	Kuwait, Radio Kuwait/Qu'ran Program	11630af

1000 UTC - 5AM EST / 4AM CST / 2AM PST

1000	1100	Bahrain, Radio Bahrain	9745me
1000	1100	Egypt, Radio Cairo/ General Program	15800af
1000	1027	Iran, VOIRI/IRIB	9885as
1000	1100	Iran, VOIRI/IRIB	13790as 13800as 15550as
1000	1100	Kuwait, Radio Kuwait/Qu'ran Program	11630af
1000	1100	Kuwait, Radio Kuwait/Second Program	21540af
1000	1100	Libya, LJBC Voice of Africa	17735af 17740af
1000	1100	Morocco, Radiodiffusion TV Marocaine	15341va
1000	1100	Saudi Arabia, BSKSA/General Program	9675me 11730af 15490af 15790eu 17805af 21555af 21705af
1000	1100	Saudi Arabia, BSKSA/Program 2	11855va
1000	1100	Saudi Arabia, BSKSA/Qu'ran Program	11935me 17520as 17570as 17615as 21495as
1000	1055	Turkey, Voice of Turkey	11955va 15245va
1000	1100	UK, BBC World Service	5905me
1000	1100	Yemen, Republic of Yemen Radio/Radio Sana'a	6135me
1015	1100	Egypt, Radio Cairo	15060me
1030	1100	Jordan, Radio Jordan	15290va

1100 UTC - 6AM EST / 5AM CST / 3AM PST

1100	1200	Bahrain, Radio Bahrain	9745me
1100	1200	Egypt, Radio Cairo	15060me
1100	1200	Iran, VOIRI/IRIB	13790as 13800as 15550as
1100	1130	Jordan, Radio Jordan	15290va
1100	1200	Jordan, Radio Jordan	11810va
1100	1200	Kuwait, Radio Kuwait/Qu'ran Program	9750af 11630af
1100	1200	Kuwait, Radio Kuwait/Second Program	21540af
1100	1157	Libya, LJBC Voice of Africa	17735af 17740af
1100	1200	Morocco, Radiodiffusion TV Marocaine	15341va
1100	1200	Saudi Arabia, BSKSA/General Program	9675me 11730af 15490af 15790eu 17805af 21555af 21705af
1100	1200	Saudi Arabia, BSKSA/Program 2	11855va
1100	1200	Saudi Arabia, BSKSA/Qu'ran Program	11935me 17520as 17570as 17615as 21495as
1100	1200	UK, BBC World Service	5905me
1100	1200	Yemen, Republic of Yemen Radio/Radio Sana'a	6135me

1200 UTC - 7AM EST / 6AM CST / 4AM PST

1200	1300	Bahrain, Radio Bahrain	9745me
1200	1215	Egypt, Radio Cairo	15060me
1200	1300	Iran, VOIRI/IRIB	13790as 13800as 15550as
1200	1300	Jordan, Radio Jordan	11810va
1200	1300	Kuwait, Radio Kuwait/Qu'ran Program	9750af 11630af
1200	1300	Kuwait, Radio Kuwait/Second Program	21540af
1200	1300	Morocco, Radiodiffusion TV Marocaine	15341va
1200	1300	Saudi Arabia, BSKSA/General Program	9675me 9860eu 17705eu 21505af 21640af
1200	1300	Saudi Arabia, BSKSA/Program 2	11855va
1200	1300	Saudi Arabia, BSKSA/Qu'ran Program	15380me 17535me 17625as 17885af 17895af 21600af 21640af
1200	1300	UK, BBC World Service	5905me
1200	1300	Yemen, Republic of Yemen Radio/Radio Sana'a	6135me 9780me
1204	1300	Canada, Radio Canada International	7325na

1300 UTC - 8AM EST / 7AM CST / 5AM PST

1300	1400	Bahrain, Radio Bahrain	9745me
1300	1304	Canada, Radio Canada International	7325na
1300	1400	Egypt, Radio Cairo	15080af
1300	1400	Iran, VOIRI/IRIB	13790as 13800as 15550as
1300	1400	Jordan, Radio Jordan	11810va
1300	1400	Kuwait, Radio Kuwait/Qu'ran Program	9750af 11630af
1300	1400	Kuwait, Radio Kuwait/Second Program	21540af
1300	1400	Morocco, Radiodiffusion TV Marocaine	15341va
1300	1400	Saudi Arabia, BSKSA/General Program	9675me 9860eu 17705eu 21505af 21640af
1300	1400	Saudi Arabia, BSKSA/Program 2	11855va
1300	1400	Saudi Arabia, BSKSA/Qu'ran Program	15380me 17500af 17535me 17635me 17885af 17895af 21600af 21460af
1300	1400	UK, BBC World Service	5905me
1300	1400	Yemen, Republic of Yemen Radio/Radio Sana'a	6135me 9780me

1400 UTC - 9AM EST / 8AM CST / 6AM PST

1400	1500	Bahrain, Radio Bahrain	9745me
1400	1500	Egypt, Radio Cairo	15080af
1400	1500	Ethiopia, Radio Ethiopia/External Service	7165va 9560va
1400	1427	Iran, VOIRI/IRIB	13790as 13800as 15550as
1400	1500	Kuwait, Radio Kuwait/Qu'ran Program	9750af 11630af
1400	1500	Kuwait, Radio Kuwait/Second Program	21540af
1400	1500	Morocco, Radiodiffusion TV Marocaine	15340va
1400	1500	Oman, Radio Sultanate of Oman	15140va
1400	1500	Saudi Arabia, BSKSA/General Program	9675me 9860eu 17705eu 21505af 21640af
1400	1500	Saudi Arabia, BSKSA/Program 2	11855va
1400	1500	Saudi Arabia, BSKSA/Qu'ran Program	21460af
1400	1500	UK, BBC World Service	5905me 6155me 11820me 15790me
1400	1500	Yemen, Republic of Yemen Radio/Radio Sana'a	6135me 9780me
1430	1500	Iran, VOIRI/IRIB	9830me 15550as

1500 UTC - 10AM EST / 9AM CST / 7AM PST

1500	1600	Bahrain, Radio Bahrain	9745me
1500	1530 mwfs	Clandestine, Voice of Democratic Alliance	7165af 9560af
1500	1600	Egypt, Radio Cairo	15080af
1500	1600	Iran, VOIRI/IRIB	9830me 15550as
1500	1600	Kuwait, Radio Kuwait/Qu'ran Program	11630af
1500	1600	Morocco, Radiodiffusion TV Marocaine	15345va
1500	1557	North Korea, Voice of Korea	9990va 11545va
1500	1600	Oman, Radio Sultanate of Oman	15140va
1500	1600	Romania, Radio Romania International	9655af 11730af 15290af 17540af
1500	1600	Russia, Voice of Russia	9540va
1500	1600	Saudi Arabia, BSKSA/Call of Islam	15225af 15435eu
1500	1600	Saudi Arabia, BSKSA/General Program	15225af 15435eu
1500	1600	Saudi Arabia, BSKSA/Program 2	11855va
1500	1600	Saudi Arabia, BSKSA/Qu'ran Program	13710af 17500af 21460af
1500	1600	Sudan, Sudan RDTV Corp/Sudanese Radio	7200do
1500	1555	Turkey, Voice of Turkey	9665va 15200af
1500	1600	UK, BBC World Service	5905me 6155me 11820me 13660af 15790me
1500	1600	Yemen, Republic of Yemen Radio/Radio Sana'a	6005me 9780me
1530	1600	Clandestine, Radio Dabanga	13740af
1530	1600	Vatican City State, Vatican Radio	11935me 15595me

1600 UTC - 11AM EST / 10AM CST / 8AM PST

1600	1700	Bahrain, Radio Bahrain	9745me
1600	1630	Bangladesh, Bangladesh Betar	7250me
1600	1700	China, China Radio International	9555af 11725af 12065me 13790me 15125af
1600	1630	Clandestine, Radio Dabanga	13740af
1600	1630asmtwh	Clandestine, Sudan Radio Service/ SRS	11770af 17700af

1600	1630	Sun	Germany, Pan American Broadcasting	11900me
1600	1700		Indonesia, Voice of Indonesia	9526va
1600	1627		Iran, VOIRI/IRIB 9830me	15550as
1600	1700		Kuwait, Radio Kuwait 6080me	13650af
1600	1700		Kuwait, Radio Kuwait/Qu'ran Program	11630af
1600	1700		Morocco, Radiodiffusion TV Marocaine	15345va
1600	1700		Oman, Radio Sultanate of Oman	15140va
1600	1700		Russia, Voice of Russia 7435va	11795va
1600	1700		Saudi Arabia, BSKSA/Call of Islam 15435eu	15225af
1600	1700		Saudi Arabia, BSKSA/General Program 15435eu	15225af
1600	1700		Saudi Arabia, BSKSA/Program 2	11855va
1600	1700		Saudi Arabia, BSKSA/Qu'ran Program 15205eu 17560af	13710af
1600	1700		Sudan, Sudan RDTV Corp/Sudanese Radio 7200do	
1600	1700		UK, BBC World Service 5905me 11820me 13660af 15790me	6155me
1600	1700	w	UK, Bible Voice Broadcasting Network	11645me
1600	1645		USA, WYFR/Family Radio Worldwide	15250eu
1615	1630	f	UK, Bible Voice Broadcasting Network	11645me
1615	1700	mw	UK, Bible Voice Broadcasting Network	11645me
1630	1700		Clandestine, Radio Dabanga	11615af
1630	1700		Iran, VOIRI/IRIB 3985me 6065as	9830as
1655	1700	mtwhf	UK, Bible Voice Broadcasting Network	13580me

1700 UTC - 12PM EST / 11AM CST / 9AM PST

1700	1800		Bahrain, Radio Bahrain 9745me	
1700	1800		China, China Radio International 11725af 12065me 13790me	9555af 15125af
1700	1730		Clandestine, Darfur Salaam	15790af 17585af
1700	1730		Clandestine, Radio Dabanga	11615af
1700	1800		Clandestine, Radio Nacional De La R.A.S.D. 6300af	
1700	1800		Egypt, Radio Cairo/ Waadi El Nile	9250af
1700	1727		Iran, VOIRI/IRIB 3985me 6065as	9830as
1700	1800		Iran, VOIRI/IRIB 3985me 6065as	
1700	1800		Kuwait, Radio Kuwait 6080me	13650af
1700	1800		Kuwait, Radio Kuwait/Qu'ran Program	11630af
1700	1800		Morocco, Radiodiffusion TV Marocaine	15345va
1700	1757		North Korea, Voice of Korea 9990va	11545va
1700	1800		Oman, Radio Sultanate of Oman	15140va
1700	1800		Russia, Voice of Russia 7305va 9360va 11795af 12065af	7435va
1700	1800		Saudi Arabia, BSKSA/General Program 15435eu	15225af
1700	1800		Saudi Arabia, BSKSA/Program 2	9580va
1700	1800		Saudi Arabia, BSKSA/Qu'ran Program 15205eu 17560af	13710af
1700	1800		Spain, Radio Exterior de Espana	11765me
1700	1800		Sudan, Sudan RDTV Corp/Sudanese Radio 7200do	
1700	1800		Sweden, IBRA Radio 11655me	
1700	1800		Tunisia, RDTV Tunisienne 9725me	12005me
1700	1800		UK, BBC World Service 6195me 11680af 11820af 13660me	7375me
1700	1715	mthf	UK, Bible Voice Broadcasting Network	13580me
1700	1735	w	UK, Bible Voice Broadcasting Network	13580me
1700	1800		Yemen, Republic of Yemen Radio/Radio Sana'a 6005me 9780me	
1730	1800	h	Clandestine, Ethiopian Liberation Front/Voice of Dem Eritrea 13820af	
1730	1800		India, All India Radio 6180me 11585me	9905me
1730	1800		Nigeria, Voice of Nigeria/External Service 15120me	
1730	1800		UK, Bible Voice Broadcasting Network	11860as
1745	1800		Jordan, Radio Jordan 9830eu	

1800 UTC - 1PM EST / 12PM CST / 10AM PST

1800	1900		Algeria, Radio Algerienne	11775af
1800	1900		Bahrain, Radio Bahrain 9745me	
1800	1900		Clandestine, Radio Nacional De La R.A.S.D. 6300af	
1800	1900		Egypt, Radio Cairo/ Waadi El Nile	9250af
1800	1900		India, All India Radio 6180me 11585me	9905me
1800	1900		Iran, VOIRI/IRIB 3985me 6065as	
1800	1900		Jordan, Radio Jordan 9830eu	
1800	1900		Kuwait, Radio Kuwait 6080me	13650af
1800	1900		Morocco, Radiodiffusion TV Marocaine	15345va
1800	1900		Oman, Radio Sultanate of Oman	15140va
1800	1900		Russia, Voice of Russia 7305va 9360va 11795af 12060af	7435va
1800	1900		Saudi Arabia, BSKSA/General Program 9870eu	9555af
1800	1900		Saudi Arabia, BSKSA/Qu'ran Program 11820eu 11915af 11930af	9580eu
1800	1900		Spain, Radio Exterior de Espana	11765me
1800	1900		Sudan, Sudan RDTV Corp/Sudanese Radio 7200do	
1800	1830		Sweden, IBRA Radio 11690me	
1800	1900		Tunisia, RDTV Tunisienne 7225eu 12005me	9725me
1800	1900		UK, BBC World Service 6195me 9915af 11680af 13660me	7375me
1830	1900		Austria, AWR Europe 9605af	
1830	1900		China, China Radio International	11640af

1900 UTC - 2PM EST / 1PM CST / 11AM PST

1900	2000		Algeria, Radio Algerienne 9375af	11775af
1900	1930		Armenia, Public Radio of Armenia	4810me
1900	2000		Bahrain, Radio Bahrain 9745me	
1900	1930		China, China Radio International 11640af	11640af
1900	2000		Clandestine, Radio Nacional De La R.A.S.D. 6300af	
1900	2000		Egypt, Radio Cairo/ General Program	9305va
1900	2000		Egypt, Radio Cairo/ Voice of the Arabs	9295af
1900	2000		Egypt, Radio Cairo/ Waadi El Nile	9250af
1900	1930		Germany, AWR Europe 11760af	
1900	2000		Germany, AWR Europe 9535af	
1900	1945		India, All India Radio 6180me 11585me	9905me
1900	2000		Iran, VOIRI/IRIB 3985me 6025as	
1900	2000		Jordan, Radio Jordan 9830eu	
1900	2000		Kuwait, Radio Kuwait 6080me	13650af
1900	2000		Morocco, Radiodiffusion TV Marocaine	15345va
1900	2000		Oman, Radio Sultanate of Oman	15140va
1900	2000		Russia, Voice of Russia 7315va	9360va
1900	2000		Saudi Arabia, BSKSA/General Program 9870eu	9555af
1900	2000		Saudi Arabia, BSKSA/Qu'ran Program 11820eu 11915af 11930af	9580eu
1900	2000		South Africa, AWR Africa 11800va	15155me
1900	2000	mtwhf	Spain, Radio Exterior de Espana 12030me	7265af
1900	2000		Sudan, Sudan RDTV Corp/Sudanese Radio 7200do	
1900	1930		Sweden, IBRA Radio 12070af	
1900	2000		Tunisia, RDTV Tunisienne 7225eu 12005me	9725me
1900	2000		UK, BBC World Service 6195me 9915af 11680me 13660af	7375me
1900	1930		UK, FEBA Radio 7235me	
1900	2000		UK, FEBA Radio 9550me	
1900	2000		USA, WYFR/Family Radio Worldwide	5745eu
1900	2000		Yemen, Republic of Yemen Radio/Radio Sana'a 6005me 9780me	
1930	2000	Sat/Sun	Germany, Pan American Broadcasting	6020af

2000 UTC - 3PM EST / 2PM CST / 12PM PST

2000	2100		Algeria, Radio Algerienne	7495af
2000	2100		Bahrain, Radio Bahrain 9745me	
2000	2059		Canada, Radio Canada International 13650af	11865af
2000	2100		China, China Radio International 6185va 7235va	6100va
2000	2100		Clandestine, Radio Nacional De La R.A.S.D. 6300af	
2000	2100		Egypt, Radio Cairo	6860pa
2000	2100		Egypt, Radio Cairo/ General Program	9305va
2000	2100		Egypt, Radio Cairo/ Voice of the Arabs	9295af

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MILCOM

MONITORING MILITARY COMMUNICATIONS

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Monitoring the Air Route Traffic Control Centers

One of the most common misconceptions most radio hobbyists have about the military monitoring hobby is that you have to live close to a military base in order to hear military aeronautical communications.

While it is true that if you live close to a base you will hear a lot of military air radio traffic, all is not lost if you are not within VHF/UHF range of a military installation. You can still hear a lot of military communications by monitoring the frequencies in use by any of the 22 Federal Aviation Administration's Air (FAA) Route Traffic Control Centers (ARTCC) nationwide.

Three ARTCCs – Oakland, New York and Anchorage – also control aircraft over the ocean. Outside of radar range, which extends only 175 to 225 miles offshore, controllers must rely on periodic radio communication of position reports to determine an aircraft's location.

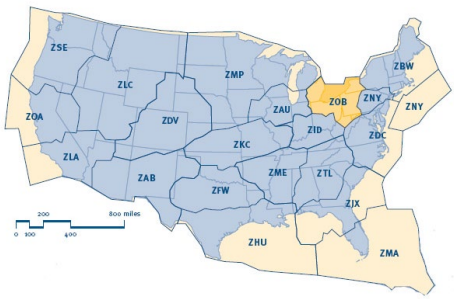

Figure 1 Continental US FAA ARTCC Boundaries

Figure 1 shows the boundaries of the 20 continental ARTCCs and the airspace each controls (the Anchorage and Honolulu ARTCCs are not shown). Each ARTCC is designated by a three-letter code that begins with Z; for example, the Cleveland center is designated ZOB. The list of all the U.S. Air Route Traffic Control Centers and their FAA/ICAO three letter Z identifiers follow.

ZAB Albuquerque NM ARTCC
ZAN Anchorage AK ARTCC
ZAU Chicago IL ARTCC (Aurora IL)
ZBW Boston MA ARTCC (Nashua NH)
ZDC Washington DC ARTCC (Leesburg VA)
ZDV Denver CO ARTCC (Longmont CA)
ZFW Fort Worth TX ARTCC
ZHN Honolulu HI ARTCC
ZHU Houston TX ARTCC
ZID Indianapolis IN ARTCC
ZJX Jacksonville FL ARTCC (Hilliard FL)
ZKC Kansas City KS ARTCC (Olathe KS)
ZLA Los Angeles CA ARTCC (Palmdale CA)
ZLC Salt Lake City UT ARTCC
ZMA Miami FL ARTCC
ZME Memphis TN ARTCC
ZMP Minneapolis MN ARTCC (Farmington MN)
ZNY New York NY ARTCC (Ronkonkoma NY)
ZOA Oakland CA ARTCC (Fremont CA)
ZOB Cleveland CA ARTCC (Oberlin OH)
ZSE Seattle WA ARTCC (Auburn WA)
ZTL Atlanta GA ARTCC (Hampton GA)

The size of the airspace managed by a center varies substantially, but typically it consists of tens of thousands of square miles extending over several states. For instance, the Cleveland ARTCC, which is physically located in Oberlin, Ohio just outside of Cleveland, controls approximately 70,000 square miles of airspace in six states and Canada. Figure 2 highlights the boundaries of the Cleveland ARTCC airspace.

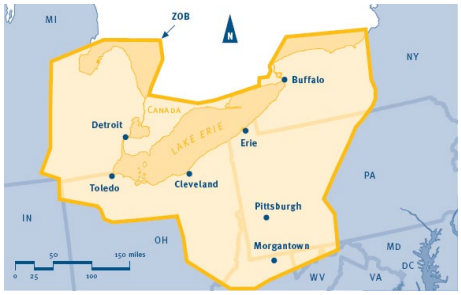

Figure 2 Cleveland ARTCC Boundaries

How does an ARTCC work?

Once an aircraft flying under instrument flight rules (IFR) clears an airport and the associated approach/departure control service, as they move across the country to their ultimate destination, they will fly under control of an Air Route Traffic Control Center.

Also known as "Center," these ARTCCs are responsible for controlling en route, instrument flight rules rated aircraft in a particular volume of airspace at high altitudes between airport approaches and departures. A Center typically accepts traffic from, and ultimately passes traffic to, the control of an approach/departure service or to another Center. When equipment and controller workload permit, certain advisory/assistance services may even be provided to aircraft flying under visual flight rules (VFR).

In the airspace controlled by a Center, it is administratively subdivided into areas that comprises between five and eight sectors. Each ARTCC area is staffed by a set of controllers trained to control aircraft traffic in all the sectors in that area.

An ARTCC's airspace is divided into sections of airspace called sectors. Sectors have vertical as well as horizontal boundaries. A few sectors extend from the ground up, but most are stratified, with the lowest sectors defined from the ground to 23,000 feet and another sector from 24,000 feet up (in some cases, a third sector may be defined for 37,000 feet and up).

Within an ARTCC there are typically between 21 and 65 sectors. Each of these sectors is equipped with one radar scope, one assistant controller position, and manned with between one and three air traffic controllers depending on the complexity and volume of traffic at a given time in that sector. Normally, controllers do not work sectors in other areas without extensive retraining.

Each sector usually uses a pair of distinct radio frequencies for communication with aircraft. Each sector also has secure landline communications with adjacent sectors, approach controls, areas, ARTCCs, flight service centers, and military aviation control facilities. These landline communications are shared among all sectors who need them and are available on a first-come, first-served basis. Aircraft passing from one sector to another will be handed off and requested to change frequencies to contact the next sector controller.

Special Use Airspace

One of the more interesting aspects of listening to ARTCC communications involves the monitoring of SUA or Special Use Airspace. Special use airspace is designed to segregate flight activity related to military and national security needs from other airspace users. Although most SUAs involve military activity, others involve civilian users such as the Department of Energy or the U.S. Secret Service.

Special Use Airspace is established by the FAA, usually at the request of the affected civilian agency or military branch. There are six different kinds of special use airspace: Prohibited Areas, Restricted Areas, Military Operations Areas, Alert Areas, Warning Areas, and Controlled Firing Areas.

Prohibited areas are established over sensitive ground facilities, such as the White House, presidential homes, and Camp David. All aircraft are prohibited from flight operations within a prohibited area unless specific prior approval is obtained from the FAA or the controlling agency.

Restricted areas are established in areas where ongoing or intermittent activities occur that create unusual hazards to aircraft, such as artillery firing, aerial firing, and missile testing. Restricted areas differ from prohibited areas in that most of them have specific hours of operation. Entry during those hours requires specific permission from the FAA or the controlling agency.

Military Operations Areas (MOA) are established to contain certain military activities, such as air combat maneuvers, intercepts, and acrobatics. Civilian flights are allowed within a MOA even when the area is in use by the military. Air traffic control will provide separation services to IFR traffic.

Alert Areas contain a high volume of pilot training or an unusual type of aerial activity, such as helicopter activity near oil rigs, which could present a hazard to other aircraft. There are no special requirements for operations within alert areas other than heightened vigilance.

Warning areas contain the same kind of hazardous flight activity as restricted areas (artillery firing, aerial gunnery, etc.), but are located over domestic and international waters. Warning areas generally begin three miles offshore.

Controlled firing areas contain civilian and military activities that could be hazardous to nonparticipating aircraft, such as rocket testing, ordinance disposal, and blasting. They are different from prohibited and restricted areas in that radar or a ground lookout is used to indicate when an aircraft is approaching the area, at which time all activities are suspended.

❖ ARTCC Update

It has been more than four years since we last updated any of the FAA Air Route Traffic Control Center (ARTCC) frequency lists in this column. So, to kick off the New Year, starting with this issue of *Milcom,* we will present the first of a new round of frequency profiles for each of the FAA ARTCCs. Be aware that we will not carry an ARTCC frequency list in this column if world events warrant or we have to cover other material. So please be patient and we will get around to the ARTCC covering your area as soon as space and events allow.

This month we start our tour Center with my home ARTCC: Atlanta located in Hampton, Georgia. This ARTCC serves the world's busiest airport – Hartsfield-Jackson International Airport in Atlanta.

Wrapped within the airspace supported by Atlanta Center is one of the five busiest en route air traffic corridors in the world – the Logen Sector. Formerly known as the Macey Two STAR arrival, Logen is the low altitude sector northeast of Atlanta, handling all arriving aircraft from the northeast United States flying between 11,000 and 23,000 feet. This corridor feeds this aircraft traffic into Hartsfield-Jackson International (KATL) Airport.

You can monitor the VHF audio stream (121.350 MHz) of this low altitude sector via the internet. A near realtime feed of the 121.350 MHz air-to-ground communications and current controller radar picture of aircraft traffic north, northeast and east of Atlanta is available at **http://airtrafficatlanta.com/**.

I do have to pass along one monitoring caveat. When monitoring ARTCC communications, you won't be able to monitor the ground side of the center air-to-ground communications unless you are close to one of the RCAGs listed in our list in Table One below. You will, however, be able to hear the aircraft side of the communications at a much further distance.

So, if you are within 200 to 300 miles of one the sites listed below, plug in the Remote Communications Air/Ground facilities (RCAG) VHF/UHF frequency pair for that site and get ready to monitor some of the most interesting civilian and military aircraft communications on your scanner – communications from the FAA ARTCCs.

Until next time, 73 and good hunting.

TABLE ONE: ATLANTA ARTCC RCAG FREQUENCY LIST

Note: All frequencies are in MHz and mode is AM

RCAG Freq	Sector/Altitude	Location (ICAO Identifier)
119.375/371.950	Sector 22 – High Altitude FL240-349	Hampton GA (ZTL)
120.425/327.150	Sector 34 – High Altitude FL300-349	Athens GA (AHN)
120.450/298.850	Sector 9 – Low Altitude FL000-230	Columbus GA (CSG)
120.725/353.575	Sector 42 – High Altitude FL300-349	Whitetop Mtn VA (TRI)
121.325/354.025	Sector 5 – Low Altitude FL110-230	Chattanooga TN (CHA)
121.350/377.050	Sector 49 – Low Altitude FL110-230	Mount Oglethorpe GA (QRP)
123.950/273.600	Sector 19 – Low Altitude FL101-239	Macon GA (MCN)
124.325/360.625	Sector 23 – Super High Altitude FL350-450	Sandersville GA (OKZ)
124.375/353.925	Sector 50 – High Altitude FL240-349	Young Harris GA (HRS)
124.425/284.750	Sector 33 – High Altitude FL240-350	Greensboro NC (GSO)
124.450/290.475	Sector 16 – Low Altitude FL100-240	Athens GA (AHN)
124.875/257.675	Sector 36 – High Altitude FL350-450	Chattanooga TN (CHA)
125.025/291.750	Sector 28 – Super High Altitude FL350-450	Jonesville SC (QJZ)
125.150/263.000	Sector 48 – Ultra Low Altitude FL000-105	Hickory NC (HKY)
125.575/353.950	Sector 10 – High Altitude FL240-349	Columbus GA (CSG)
125.625/269.100	Sector 32 – High Altitude FL240-299	Ownings SC (QMN)
125.825/290.375	Sector 27 – High Altitude FL350-450	Macon GA (MCN)
125.875/279.525	Sector 8 – Super High Altitude FL350-450	Prattville AL (MGM)
125.925/269.175	Sector 39 – High Altitude FL240-349	Hinch Mountain TN (HCH)
126.425/307.050	Sector 20 – High Altitude FL240-349	Sandersville GA (OKZ)
126.675/363.100	Sector 37 – High Altitude FL350-450	Chattanooga TN (CHA)
126.775/360.625	Sector 15 – Super High Altitude FL350-450	Whitetop Mtn VA (TRI)
126.825/354.050	Sector 2 – High Altitude FL350-450	Huntsville AL (HSV)
127.050/282.350	Sector 25 – Low Altitude FL000-100	Mount Oglethorpe GA (QRP)
127.300/317.550	Sector 12 – Low Altitude FL000-230	Birmingham AL (BHN)
127.500/316.050	Sector 17 – Low Altitude FL000-110	Athens GA (AHN(
127.525/257.725	Sector 13 – Low Altitude FL000-230	Uniontown AL (QRN)
127.775/338.325	Sector 61 – Low Altitude FL110-230	Mount Oglethorpe GA (QRP)
127.850/371.850	Sector 45 – High Altitude FL240-330	Whitetop Mountain VA (TRI) and Glade Springs VA (GZG)
128.025/	Sector 11 – High Altitude FL240-349	Prattville AL (MGM)
/307.150	Sector 11 – High Altitude FL240-349	Uniontown AL (QRN)
128.100/323.000	Sector 24 – Low Altitude FL000-240	Augusta GA (AGS)
128.725/350.325	Sector 3 – High Altitude FL240-340	Birmingham AL (BHN)
128.800/379.200	Sector 29 – Low Altitude FL121-239	Greensboro NC (GSO)
132.250/370.850	Sector 14 – Low Altitude FL000-230	Uniontown AL (QRN)
132.625/239.050	Sector 44 – Low Altitude FL101-239	Sugarloaf Mtn NC (SUG)
132.900/317.400	Sector 46 – Low Altitude FL000-240	Whitetop Mountain VA (TRI)
132.975/307.350	Sector 43 – High Altitude FL240-299	Hickory NC (HKY)
133.100/290.800	Sector 38 – Low Altitude FL101-239	Mount Oglethorpe GA (QRP)
133.150/251.100	Sector 30 – Low Altitude FL121-239	Albemarle NC (QRA)
133.175/292.175	Sector 6 – High Altitude FL240-340	Chattanooga TN (CHA)
133.600/254.300	Sector 41 – Low Altitude FL000-239	Hinch Mountain, TN (HCH)
134.075/236.500	Sector 40 – High Altitude FL350-450	Newport TN (QXF)
134.500/360.750	Sector 21 – Low Altitude FL101-239	Macon GA (MCN)
134.550/290.200	Sector 47 – Low Altitude FL101-239	Hickory NC (HKY)
134.800/307.900	Sector 18 – Low Altitude FL000-110	Mount Oglethorpe GA (QRP)
134.950/281.425	Sector 4 – Low Altitude FL110-230	Anniston AL (ANB)
135.175/353.700	Sector 1 – Ultra Low Altitude FL000-100	Gadsden AL (GAD)
135.350/319.250	Sector 31 – Low Altitude FL000-240	Ownings SC (QMN)

The following frequency pairs are used to handle periods of increased aircraft traffic in various sectors controlled by Atlanta. These are known as workload frequencies.

120.550/270.250	Low Altitude FL000-239	Prattville AL (MGM)	Supports Sector 13
123.725/327.000	High Altitude FL000-450	Ownings SC (QMN)	Supports Sectors 15 16 17 28 31 32 33 34 44 50
127.125/363.250	High Altitude FL000-450	Hampton GA (ZTL)	Supports Sectors 19 20 23 24
127.550/269.500	High Altitude FL000-450	Newport TN (QXF)	Supports Sectors 15 18 45 50
132.675/279.500	High Altitude FL000-450	Hinch Mountain TN (HCH)	Supports Sectors 36 37 38 39 40 41
134.600/350.250	High Altitude FL000-450	Prattville AL (MGM)	Supports Sectors 09 10 11 13
135.000/317.700	High Altitude FL000-450	Austell GA (ATL)	Supports Sectors 01 02 03 04 05 06 38
135.550/343.750	Low Altitude FL000-239	Millen GA (QMG)	Supports Sector 24

The following frequencies are used to support aircraft operations in the various Military Operating Areas (MOA) within the airspace controlled by Atlanta Center. None of the frequencies below have an equivalent or paired frequency in the civilian VHF aeronautical band.

257.650	Low Altitude FL000-230	Monroeville AL (MVC)	Grove Hill ATCAA / Montgomery FCF
263.075	High Altitude FL000-450	Macon GA (MCN)	Moody MOA
269.050	Low Altitude FL000-100	Uniontown AL (QRN)	Camden Ridge/Pine Hill MOA ATC
279.650	Low Altitude FL000-230	Uniontown AL (QRN)	Birmingham MOA
392.000	Low Altitude FL000-270	Prattville AL (MGM)	Camden Ridge/Pine Hill MOA

FED FILES

GOVERNMENT COMMUNICATIONS

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2011 Fed Files New Year

Welcome to 2011 and a Happy New Year to all of the *Monitoring Times* and *Fed Files* fans. I'm glad to be back for another year of federal monitoring information, and hope this column continues to provide items of interest. We have quite a few items this month, so let's get going!

❖ CBP Office of Air and Marine

One of the most popular monitoring targets of federal listeners has to be the activities of the Department of Homeland Security (DHS) Customs and Border Protection (CBP) Office of Air and Marine (OAM). This is the largest law enforcement aviation and maritime organization in the world, with over 200 vessels and nearly 300 aircraft of all types, including remotely operated aircraft. CBP OAM assets are based all around the United States and are often deployed to foreign countries as part of their counter-narcotics, interdiction and anti-terrorism missions.

Often you will hear CBP air assets doing aerial support work with not only DHS agencies, such as the Border Patrol and Immigrations and Customs Enforcement (ICE), but also Justice Department agencies, such as the DEA. OAM aircraft have also been utilized in support of VIP and Presidential security missions around the US, acting as airborne controllers for restricted airspace. You can read more about the CBP OAM at their web site: **www.cbp.gov/xp/cgov/border_security/air_marine/cbp_air_marine_overview.xml**

The CBP OAM aircraft and maritime vessels have numerous radio systems for their use, and can sometimes be heard on frequencies you never thought they might have access to, including your local police! CBP aircraft are often heard using the OMAHA call sign on whatever voice network they may be using.

Many of the CBP aircraft carry wide-band multi-mode radio gear on board, and have been heard using many local and state radio frequencies for assistance to local agencies. CBP aircraft not only participate in law enforcement operations, but also often assist in search and rescue and other emergency assistance.

Let's take a look at the frequencies on which you might hear some OAM activity, starting with the primary CBP Customs nationwide VHF radio network. I have published parts of these lists over the last 5 years, but finally, here are all the pieces in one place:

Name	Repeater Out	Repeater In
NET 1	165.2375, 100.0	166.4375, 100.0
NET 2	169.4500, 100.0	171.0750, 100.0
NET 3	165.2375, 100.0	166.5875, 100.0
NET 4	165.6875, 100.0	166.2250, 100.0
NET 5	164.6000, 100.0	166.4875, 100.0
NET 6	165.2375, 100.0	166.4875, 100.0
NET 7	165.4625, 100.0	166.5875, 100.0
NET 8	165.4875, 100.0	166.5625, 100.0
NET 9	165.6875, 100.0	166.4375, 100.0
NET 10	163.1250, 100.0	164.3250, 100.0
NET 11	165.7625, 100.0	166.5875, 100.0
NET 12	166.5875, 100.0	169.5500, 100.0
NET 13	165.4125, 100.0	166.2250, 100.0
NET 14	165.4375, 100.0	166.3000, 100.0
NET 15	162.0500, 100.0	164.5750, 100.0
NET 16	164.7750, 100.0	165.9750, 100.0
NET 17	165.2375, 100.0	166.5375, 100.0
NET 18	163.6250, 100.0	162.8500, 100.0
NET 19	163.6750, 100.0	162.9250, 100.0
NET 20	163.6250, 100.0	162.8250, 100.0
NET 21	163.6250, CSQ	162.8250, 100.0
NET 22	163.6750, CSQ	162.9250, 151.4
NET 23	163.6750, CSQ	166.5875, 123.0
NET 24	165.6875, 094.8	166.4375, 100.0
NET 25	165.4875, 100.0	166.9750, 100.0
NET 26	166.3000, 100.0	165.4125, 100.0
NET 27	166.2000, 100.0	168.0000, 100.0
NET 28	163.1750, 100.0	166.4875, 100.0
NET 29	169.5500, 100.0	166.1250, 100.0
NET 30	163.2250, 100.0	164.1000, 100.0
NET 31	170.1000, 100.0	166.4875, 100.0
NET 32	165.4125, 100.0	166.5875, 100.0
NET 33	169.5500, 100.0	170.1000, 100.0
NET 34	162.3000, 100.0	164.1000, 100.0
NET 35	163.1250, 131.8	166.5875, 131.8
NET 36	170.7250, 100.0	173.5000, 100.0
NET 37	165.6875, 100.0	170.1000, 100.0
NET 38	166.1250, 100.0	169.5500, 100.0
NET 39	165.2375, 100.0	166.4375, 100.0
NET 40	165.2375, 100.0	164.2500, 100.0
NET 41	165.6875, 100.0	170.1000, 167.9
NET 42	165.5125, 100.0	168.8000, 100.0
NET 43	165.2375, 094.8	166.4375, 100.0
NET 44	162.6625, 100.0	164.1000, 100.0
NET 45	165.4375, 156.7	166.3000, 100.0
NET 46	164.1000, 100.0	169.5500, 167.9
NET 47	165.2375, 100.0	172.3500, 100.0
NET 48	169.4125, 100.0	165.4125, 100.0
NET 49	165.6875, 100.0	166.5875, 100.0
NET 50	162.2500, 100.0	166.2000, 100.0
NET 51	163.3000, 100.0	169.4125, 100.0
NET 52	165.2375, 100.0	166.8750, 100.0

In addition to these repeater channels, there are simplex channels as well:

DHS COMMON	166.4625, 100.0
DHS INTEROP	166.4625, CSQ
TAC 1	165.2375, 100.0
TAC 2	169.4500, 100.0
TAC 4	164.6000, 100.0
TAC 7	163.1250, 100.0
TAC 10	165.4125, 100.0
TAC 19	169.5500, 100.0
TAC 21	164.9625, 100.0
TAC 26	165.7375, 100.0

With the move to new APCO P-25 digital radios, some of the CBP Nationwide network is changing. New NET channels called "D-NET" are starting to be heard. As with the analog NET channels, these are located all across the US and are apparently being used by other agencies, such as ICE, BATFE, and others. Note that some of the P-25 NAC's have not yet been confirmed on these channels:

Name	Repeater Out	Repeater In
DNET 1	165.2375, N301	166.4375, N325
DNET 2	169.4500, N301	171.0750, N325
DNET 7	165.4625, N301	166.5875, N325
DNET 9	165.6875, N301	166.4375, N325
DNET 33	169.5500, N301	170.1000, N325
DNET 36	170.7250, N301	173.5000, N325
DNET 47	165.2375, N301	172.3500, N325
DNET 52	165.2375, N301	166.8750, N325
DNET 53	168.0000, N001	170.0750, N001
DNET 54	164.6250	170.0250, N001
DNET 55	165.2375	166.4375, N324
DNET 56	163.4500	166.4375, N325
DNET 57	165.2375, N001	166.4375, N001
DNET 58	165.2375, N002	166.4375, N002
DNET 59	165.2375, N003	166.4375, N003
DNET 60	165.2375, N004	166.4375, N004
DNET 61	165.2375, N005	166.4375, N005
DNET 62	165.2375, N006	166.4375, N006
DNET 63	165.2375, N001	166.4375, N007
DNET 64	165.2375, N001	166.4375, N009
DNET 65	165.2375, N001	166.4375, N008
DNET 66	166.2000, N301	173.5000, N325
DNET171	173.8625, N003	166.4375, N001

In addition to the D-NET channels, there are simplex D-TAC channels:

DTAC 1	165.2375, N301
DTAC 2	169.4500, N301
DTAC 3	165.6875, N301
DTAC 4	164.6000, N301
DTAC 5	165.4625, N301
DTAC 6	165.4875, N301
DTAC 10	165.4125, N301

I have had some newer CBP OAM aviation frequencies in my files for a while now, but did not release them right away. Since I have now started to see these frequencies confirmed by listeners across the country, I think we can go ahead and put them out here. These are five allocated air-to-ground frequencies for use by the CBP Office of Air and Marine (OAM). They are all used in APCO P-25 digital and often in the clear:

CBP AIR 1	168.8375, N293
CBP AIR 2	168.9625, N293
CBP AIR 3	169.2625, N293
CPB AIR 4	169.1625, N293
CBP AIR 5	169.3875, N293

These frequencies appear to be "new" allocations, as they have not been previously known to be allocated to any particular agency. The frequencies also appear to be common to many of the DHS agencies and other agencies that might work with the CBP aircraft. Put them into your radios and keep an ear on them. You never know when they might become active.

In addition to these digital land-mobile channels, CBP aircraft often use VHF and UHF air band channels, so be sure and keep these channels in your scan list as well. These frequencies are exclusive allocations to the CBP aircraft for air-to air and air-to-ground communications. They utilize a number of remote transmitter sites across the country to communicate with the CBP OAM Interdiction Coordination Center at March Air Force Base in Riverside, CA. The March facility identifies by the call sign HAMMER:

CBP VHF	136.3750, AM
BLUE 1 or COMPANY	282.4250, AM
	308.3500, AM
	350.0250, AM
	376.0750, AM

These are the only officially allocated UHF air frequencies for CBP air operations; however, they may be heard using UHF air frequencies for communications with FAA air traffic control centers. These frequencies are sometimes "discrete" channels that are not listed in any FAA publications.

In addition to the VHF land-mobile and UHF aircraft channels, CBP Air and Marine assets are also users of the legacy Customs Over-The-Horizon Enforcement Network, or COTHEN. This is an HF (high-frequency) system that can reach over long distances from transmitters around the US. These shortwave frequencies are often heard using ALE or Automatic Link Establishment "sounding" data that helps users automatically choose the best frequency for their communications. And as with the VHF networks, other agencies such as the Coast Guard and DEA are often heard utilizing these frequencies. A wiki article about the COTHEN can be found on the Radio Reference web site: **http://wiki.radioreference.com/index.php/COTHEN.**

Here is a current list of active COTHEN radio frequencies:

SCAN 1	5732.0 kHz
SCAN 2	7527.0 kHz
SCAN 3	8912.0 kHz
SCAN 4	10242.0 kHz
SCAN 5	11494.0 kHz
SCAN 6	13907.0 kHz
SCAN 7	15867.0 kHz
SCAN 8	18594.0 kHz
SCAN 9	20890.0 kHz
SCAN 10	23214.0 kHz
SCAN 11	25350.0 kHz

The COTHEN radio network uses single-sideband mode for voice transmissions, so you will need a shortwave or wideband receiver that has SSB capabilities. For more on the COTHEN HF network, be sure to check out Larry Van Horn's MILCOM blog, **http://mt-milcom.blogspot.com/.**

❖ Federal Close-Up - Mt. Hood National Forest

Over the next few installments of the *Fed Files* I will be providing a detailed close-up of some federal agencies, installations and properties that I have been able to compile frequencies for. This month, I will focus on Mount Hood National Forest in Oregon.

The Mount Hood National Forest was established in 1892, but became Mt. Hood NF in 1924 after several name changes. The forest covers over 1.6 million acres and has its headquarters in Sandy, Oregon, just outside of Portland. You can find out more about Mt. Hood National Forest at the US Forest Service website, **www.fs.fed.us/r6/mthood/**

The US Forest Service maintains several radio systems to cover the vast areas of the national forest, with four separate radio nets. The nets have multiple radio repeaters located on different sides of the mountain (Mt. Hood) and can be heard for some distances in the area. Here is a rundown of the radio networks in use in Mt. Hood National Forest as of late 2010:

Location	*Repeater Out*	*Repeater In*
MHNF East Net		
Flag Point	169.9250, 114.8	168.1750, 114.8
Mill Creek	169.9250, 114.8	168.1750, 127.3
Mt Defiance	169.9250, 114.8	168.1750, 162.2
Clear Lake	169.9250, 114.8	168.1750, 192.8
MHNF West Net		
Whalehead	170.5250, 162.2	168.6750, 162.2
Mt Lowe	170.5250, 162.2	168.6750, 141.3
Tumala	170.5250, 162.2	168.6750, 192.8
Si Si Lookout	170.5250, 162.2	168.6750, 131.8
Bagby Hot Springs	170.5250, 162.2	168.6750, 107.2
Hickman Butte	170.5250, 114.8	168.6750, 114.8
Timberline	170.5250, 114.8	168.6750, 127.3
MHNF Gorge Net		
Mt Defiance	169.9500, 127.3	164.8750, 114.8
Stacker Butte	169.9500, 127.3	164.8750, 127.3
Biddle Butte	169.9500, 127.3	164.8750, 162.2
Indian Mountain	169.9500, 127.3	164.8750, 192.8
MHNF Work Net		
Work Channel	170.5000, 123.0, simplex	
As Needed	169.9250, 114.8	168.1750, 131.8
	169.9250, 114.8	168.1750, 146.2
	169.9250, 114.8	168.1750, 156.7
As Needed	170.5250, 162.2	168.6750, 131.8
	170.5250, 162.2	168.6750, 146.2
	170.5250, 162.2	168.6750, 156.7
As Needed	169.9500, 127.3	164.8750, 131.8
	169.9500, 127.3	164.8750, 146.2
	169.9500, 127.3	164.8750, 156.7

Air Guard - transmitters on Burley, and Barlow RD
168.6500, 110.9 - simplex
National Flight Following - transmitters on Burley, Mt. Defiance, and Timberline
168.6250, 110.9 - simplex
Mt. Hood Air-To-Ground (A/G)
168.2875, CSQ – simplex

Mt. Hood is undergoing some communications system upgrades, including a planned move to APCO P-25 digital in the future. Currently all of the VHF channels remain in the analog mode, but there are some UHF "link" frequencies that are running P-25 digital. In the next *Fed Files* column, we will take a look at these UHF channels and the adjacent Gifford-Pinchot National Forest.

❖ Charlotte, NC Federal Frequencies

I always enjoy reading emails and letters from *Fed Files* fans and often readers are kind enough to pass along active frequencies that they have monitored. I recently received some federal frequency loggings from a listener in the Charlotte, North Carolina. Christopher Harris kindly sent along what he has been hearing in the federal bands near where he lives. Here is what Christopher sent in:

162.8250, NAC 293	Very informal simplex chit chat, seems to be a CBP allocation.
162.9000, NAC 130	Seems to be an input, only logged once and it was one sided (I don't remember what was said)
163.1000, NAC 167	Not sure about this, NAC says FBI, but I can't tell if it's a repeater or simplex (full ENC)
163.2375, 261 DPL	Salisbury VA Hospital
163.4125, 123.0 PL	Army Corps of Engineers, W. Kerr Scott Reservoir, Wilkes County, NC
163.6750, 67.0 PL	Unknown. Got a consistent PL last year, so I don't think it was falsing...
163.6750, NAC 152	Unknown. Upon return to school this year, consistently decoded NAC 152, no more 67.0 PL
165.1375, CSQ	Very faint, only a few transmissions, didn't seem to have a tone.
165.2375, 100.0 PL	CBP NET ?? (More than likely NET 01, but haven't logged an input/tone to confirm it)
165.2875, NAC 650	BATFE NET ?? (Same as above, no input/tone to confirm which NET this is, also has random data bursts)
165.4375, 100.0 PL	CBP NET 14 (166.3000, 100.0 PL input confirms this NET #)
165.9500, NAC 003	IRS CID 1
166.4625	DHS Common (Logged NAC 167, 100.0 PL, NAC 001, & 103.5 PL, active weekly)
167.5375, NAC 167	FBI Repeater [ENC 99%]
167.5625, NAC 167	FBI Common [ENC 99%] (Seems to be a repeater.... can't confirm though)
167.5875, 167.9 PL	FBI Repeater [ENC 99%] (Lots of activity only one 1 Monday at 0900 sharp, maybe for roll call?)
168.1250, NAC 167	Maybe FBI? (Only logged a few times)
172.6000, NAC 167	Same as above
172.9000, NAC 001	TSA (99% sure it's at KCLT, but I can't confirm)
173.5875, NAC 130	Army Corps of Engineers, W. Kerr Scott Reservoir, Wilkes County, NC
407.7250, NAC 482	USPS [ENC 100%]
414.5625, NAC 168	Unknown

Thanks for the logs, Christopher! Just to offer some assistance, the frequencies 162.9000 and163.6750 are most likely Immigrations and Customs Enforcement (ICE), a bureau of the Department of Homeland Security.

One interesting frequency to note in Christopher's list is 414.5625 MHz. That frequency has been heard in use in the Houston, Texas area. In Houston, that channel is encrypted full-time, so no one has figured out who is using that frequency yet. Christopher's report is the first seen outside of Houston, and is using the same P-25 NAC, so whoever it is, they seem to have this frequency as a national assignment.

If you have any frequency lists, questions or requests for information on federal monitoring, please don't hesitate to write or email them to me at *Monitoring Times*. We will be back in March with more *Fed Files*!

BOATS, PLANES, AND TRAINS

BOATS

Ron Walsh VE3GO
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Listening as Winter Settles In

I am sad to start this column with a silent key. Ethel Williamson, VE3DTW, a long time radio amateur and former lighthouse keeper at Port Weller, Ontario (the eastern end of the Welland Canal), passed away at age 103. She was one of the first women in Canada to receive her radio license. She published a book titled *A Light on the Seaway* which detailed her family's life at the light. I am proud to have a signed copy of this book.

It was only fitting that in 1995 the new Canadian Coast Guard SAR Vessel *Cape Storm* was christened by Ethel at the Port Weller Coast Guard station, the site of her former home. I feel proud to have also been aboard this vessel. Both Ethel and her late husband Cy knew the late Chuck Millar, the former holder of my call, VE3GO.

❖ A Stormy Start

The fall of 2010 produced some exciting listening on the local VHF radio frequencies. We had some gale warnings and one storm warning which produced wind gusts over 50 miles per hour. This was actually a "weather bomb." The air pressure dropped so quickly it was similar to the low pressure in the eye of a hurricane.

Strong winds over a long period brought bad weather conditions on the Lakes. Many large freighters were anchored or tied up to wait out the weather. It was referred to as a stronger storm than the one which sank the famous *Edmund Fitzgerald*.

The Canadian and American Coast Guards conducted a two day search for a crew member who fell overboard from a freighter. We also had an accident in the American Narrows section of the Seaway in which two large barges filled with soybeans went aground. It took several days to free them and return the system to normal operations.

However, January has brought the usual weather here in southern Ontario. Snow is piled in banks along the walks and driveway. The sound of a snow blower can be heard above the wind blowing from the north. The bright sun shines off the frost coated wires of the antennas. The necessary maintenance and repairs have been done to the antennas before it got too cold. The cold temperatures have frozen the waterways in the area and shipping has come to a complete halt as the St. Lawrence Seaway has closed for the season.

My three trips as mate on the *Canadian Empress* are just a memory. The radio traffic was interesting while the ships hurried to leave the system in order not to be caught in the lakes for the winter. My AIS receiver was interesting to follow so I could dash out to photograph some ships I wanted for the collection.

Even the Coast Guard Cutter *Cape Hearne* has left station and is in Hamilton for winter maintenance. The last ships carrying cement on Lake Ontario have gone to lay up in Toronto. The local VHF radio has become quiet except for the occasional call from the local ferries which are kept operating by bubble systems. Pipes along the bottom are fed with compressed air from both ends of the system. Holes allow the air to escape and keep the water moving. This, along with the ferry traffic, keeps a track open all winter.

Bow of the Gordon C. Leitch and the bow of the Agawa Canyon in Montreal. These ships were not expected to sail again. The Agawa Canyon now is being scrapped in Aliaga Turkey, so the picture was unique. Her name and ship insignia have been painted out for the overseas tow.

VBR Prescott Radio still maintains a presence on the air and weather forecasts are still heard on their continuous marine broadcast on channel 83B. I also hear the traffic for the aircraft from RCC Trenton as they do some searches over the winter. Channel 82A is always in my scanner, along with channel 22A for the USCG. I always keep the main emergency channels in my radio, as it is surprising what can happen even in the winter season.

The main scanner now focuses on the Ontario Provincial Police, snowplows, and other public services as I listen for winter weather information to pass along to other radio operators and neighbors. The Frontenac County ARES often maintains a weather watch to assist in any way we can. Our local amateur repeater is a great source of information.

I am enjoying relaxing in the radio shack with my cup of hot chocolate. It is time to do some listening on the lower frequency HF bands as the shorter days bring longer hours of propagation.

❖ Amateur Radio Info

The Frontenac County ARES group had me do a marine radio license course for their members. In an emergency, it is good to know all forms of radio communications and be ready to use them.

Even if you are not a ham, do not forget that amateur radio is a great source of marine info. The Maritime Mobile Service Net on 14.300 MHz USB handles several maritime mobiles daily. For example, I heard KD5NEK from the vessel *Karina*, which was involved in the Caribbean 1500 Rally, along with 73 other vessels. The net also gives the weather forecasts and storm warnings on the half hour. There are many nets on this frequency, including the Intercon Net and the Pacific Seafarer's Net. 14.325 MHz USB was also active during the hurricane season.

Special Event Station

During November, I was also able to work special event station CG3MUG from Thunder Bay. This call sign was used by the amateurs at the Thunder Bay Marine Communications and Traffic Services Centre, Coast Guard radio Station VBA. Their normal call sign is VE3VBA.

In 1910, one hundred years ago, the Marconi station MUG was built at Port Arthur. (Port Arthur and Fort William joined to become Thunder Bay.) This was the only Marconi station built on the Great Lakes. Because of its success, the government built a chain of radio stations from Port Arthur to Kingston in 1913. In 1913, the MUG station was rebuilt and given its present call sign VBA.

Our call sign here in Kinston was VBH. We are hoping to operate from the VBH site in 2013 to commemorate the 100th anniversary of this station as well.

New Maritime Net

There is a new source of Great Lakes info on the amateur bands – the Great Lakes Maritime Mobile Net. KC9SGV, Bernerd Dekok, founded the net this year. There are three other

active net controllers, KG9B, VA3LKI and VE3REK.

Bernard says they are attempting to contact every Great Lakes vessel with an amateur station aboard. He says they will keep the net on all winter to establish a presence on the band. He acknowledged there are other maritime nets, but they find it is sometimes difficult to contact them from the Lakes.

The net meets on 3.932 to 3.937 MHz LSB at 0800 and 2100 Eastern Time. At 15 minutes past the hour they go to 7.261 to 7.268 MHz LSB. The range of frequencies is given so that interference (QRM) can be avoided.

Bernard says the times and frequencies are still in flux but will settle with time and use. You can get more information on this net at their web site **www.glmmnet.org**. I hope to be a regular check-in.

❖ NAVTEX

With the shorter days, propagation on the lower HF bands becomes better. I can see this on my 518 kHz USB Navtex signals. San Juan Puerto Rico and Bermuda can be heard here, among other eastern North American signals. Kook Islands Greenland (W) and Curacao Netherlands Antilles are my targets for this winter. 490 kHz is also used for Navtex in North America. However, the Canadian stations here broadcast in French (a good chance to log stations and also pick up a few words of the French language).

There are two stations in Iceland, Saudanes (E) and Grindavik (K) that would also be a good catch. Four stations in the United Kingdom which use 490 kHz as well. A good source of Navtex stations in operation is given by ICS Electronics. You can access this list on their website **www.icselectronics.net/support/kb/navtex-db.**

Navtex station transmitting schedules are indicated by the letter assigned to them. Any message identifier will begin with the letter of the transmitting station. Every navarea (Navigation Area) can have up to 24 stations assigned and indicated by the letters A to X. They broadcast at ten minute intervals during a 4 hour block in alphabetical order. The blocks start at 0000 UTC, 0400 UTC, etc. Thus, station A in any area broadcasts at 0000, 0400, etc, while station B will broadcast at 0010, 0410 and every 4 hours thereafter.

Every message begins with an identifier using two letters and two numbers. The first letter is the station identifier and the second indicates the type of message. Thus in our area, BA25 would indicate Bermuda is giving Navigation warning number 25. This and the Area indicated for this warning will assist you in identifying the sending station.

One of the warnings you may hear of interest to naturalists will be the Right Whale sighting reports, given so that mariners can avoid these endangered animals.

With the renewed interest in amateur radio operating in the 500 kHz area, 518 kHz should provide some interesting listening and also be a propagation aid for amateur transmissions.

In tropical areas, 4209.5 kHz has been allocated for Navtex. This is another good place to look this winter. There are few stations operating here, so you may hear some rare DX.

❖ Targets for Winter Monitoring

I have made a list of targets for my winter monitoring. Some are reasonable expectations and some will require some early morning monitoring to have any hope of reception.

I plan to look on the VLF frequencies here and see what beacons I can log. I also want to report to any amateur stations operating in the 500 kHz range. These stations operate under a special license to test transmissions in this band, and they appreciate all reports.

My main target (as in previous winters) is to hear the transmissions of KSM, the Marine Radio Historical Society's station at Point Reyes, California. I want to log them on 426 kHz CW. That may be a dream, but I keep trying.

KSM generally operates from 1700 to 2300 Z on Saturdays. KSM also uses 4350.5, 6474, 8438.3, 12993 and 16914 kHz. Their RTTY broadcasts are on 8433 and 12031. They use the Baudot mode with a 170 cps shift at 45 Baud and also use the FEC mode with 170 cps shift and 100 baud rate. It is time for me to have some QSL cards from KSM on the wall here!

5680 kHz has been listed for English and German rescue activities. I have seen reports for reception of VMC Charleville, Australia at 0210, so that would be a great catch as well. 5320 kHz has been listed as a major frequency for the USCG spotting oil slicks in the Gulf of Mexico. The US Navy has been reported on 8971 kHz. 7527 and 15,867 kHz have also been reported with maritime traffic and are worth listening for.

The Venezuelan navy uses 8380 and 8340 kHz. The Russian navy has a beacon, Morse letter D, on 5153.7 kHz. They also use 18,328 kHz CW. I would like to monitor ZLM New Zealand, and I have seen reports of ZLM reception on 6224 kHz. Cagliari, Italy on 2680 kHz will be a real DX catch for me here. SVO Olympia, Greece has been heard on 8776 kHz.

Looking at the November *Digital Digest* column, some good SITOR-B loggings can be achieved. The US Navy in San Francisco uses 8416.5 while the USCG in Boston uses 6314 and 12,579 kHz. I would love to log Istanbul, Turkey on 4209.5, 5460 or 12,054 kHz. Olympia Greece on 12,603.5or 22,387.5 is another target.

❖ Interference

I am still suffering interference from a nearby plasma TV. However, I did eliminate a source of interference in my own house. I had a computer given to me and installed it in my shack. When I was searching for the interference source, I shut the computer off, figuring this would eliminate any source there.

However, I failed to realize that, even shut off, some power remained on the computer. The source was every 60 kHz and really destroyed AM radio and VLF frequencies. When we had a power failure, the interference disappeared, so I knew it was an internal offender. Shutting off power circuits one at a time soon located the shack as the origin. I had to unplug the computer to remove the source. Even grounding the case did not solve the problem. A new power supply has now eliminated the interference.

I noted in the November *Communications* column that the USCG has been having problems with malfunctioning marine VHF radios causing interference on channel 16. This can be severe if there is a mayday call. If you're a boater, be sure to check the radio as you would any safety gear on your vessel.

❖ Dreaming of New Gear

I have studied the new Home Patrol scanner that also supports APCO 25 digital signals. That looks like a great radio for people who travel and check out various areas for radio signals. Hopefully one will find its way to my radio shack in the near future as it will serve my scanner needs very well.

I monitor a number of channels and have heard schedules and other information that were useful. Being a shipping enthusiast, I have been carefully watching the renewal of the fleets on the Great Lakes. The older ships are heading for the scrap yards and I have been using my radio to find opportunities to get pictures of them. I now have photographs that cannot be replaced. My mobile radios get quite a work out when I am travelling along the river.

I hope the holiday season was enjoyed by all the readers and that you received some new gear to put on the air.

GLOBALNET

Exploring the World of Internet Radio and Television

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What's Next for Internet Radio?

Happy New Year to each and every one of you: It is hard to believe that a new year is already upon us! But, here we are, on the threshold of what should be a very exciting year, especially for technology geeks like us!

It is a tradition in MT to look ahead to the future and try to figure out what is on the horizon at the beginning of the new year. With that in mind, what's in store for streaming radio and TV?

Last month, I talked about how radio was going to have to adapt in order to stay relevant in the face of a growing online-based radio industry. This month, I have some news that should put a little more fear in the hearts of broadcasters.

❖ Pandora Targets Drive-Time

On the surface, Pandora's CEO Tim Westergren announcing recently that he wants to make a more concerted effort to put his Pandora streaming service into vehicles doesn't come as much of a news statement. After all, Westergren was saying the same thing for the better part of 2010. What makes his most recent remarks noteworthy is the steps already being taken to make his dream a reality.

To begin with, Westergren laid out his reasoning for "attacking" the in-car radio dynamic: Westergren stated in a recent interview with the Los Angeles Times that half of all radio listening happens in vehicles. He said that people spend 20 hours a week listening to music: 17 of those hours come from radio, and about half of that time the radio is in a vehicle. Those 8.5 hours are what he and his staff at Pandora are after.

Pandora has already made an enormous impact on the listening habits of those with app-enabled smartphones like those made by HTC, Blackberry and Apple. Now, they want to put the controls of their service directly on the steering wheel, to minimize any safety concerns of users interacting with their product.

Pandora isn't the only one making the push. Auto manufacturers such as Ford, Mercedes and even after-market audio manufacturers such as Pioneer are all making a push for Internet-enabled radios in vehicles in 2011. Ford is making a greater push with their Ford Sync technology to include other applications that are voice controlled to allow users to have more streamlined access to information.

Pandora is not only going after listeners, but they are going after advertisers, too. Westergren touts that Pandora advertising can be directed towards certain zip codes, certain genres of music and even certain ages of listeners.

So far, that push for advertising hasn't translated to long commercial breaks. Westergen was careful to point out that Pandora only has 45 seconds of advertising announcements per hour, compared to the standard 12-14 minutes for traditional broadcasters. These ads are coming in the form of banner ads that pop up on the player.

If Pandora starts making inroads with advertisers or gains serious ground among in-car radio listeners this year, traditional radio could slowly start to lose its hold in the vehicle, which could be the final straw for many major broadcasters.

While I think it is safe to say that radio will never completely go away, radio as we know it today surely cannot continue to exist. Either way, 2011 is shaping up to be a pivotal year for both traditional broadcasters and Internet radio.

❖ One-stop Shop for Audio?

There is a new iOS app that streaming enthusiasts might want to check out, called AudioPress.

AudioPress (downloadable from the Apple App Store) allows users to create custom playlists of their favorite podcasts, audio articles (most at this time from the Associated Press) and streaming radio stations.

After first downloading the app, you are prompted to select three areas of interest. From these three areas, AudioPress selects podcasts that may interest you. You can always go back and change your areas of interest, add podcasts, remove them, or just customize your playlist as you want.

Admittedly, the selection of radio stations seems to be a bit limited in this fairly new app. However, there are a few good stations to choose from, and one can presume more will be added.

AudioPress is a free download from the App Store for those who have an iOS enabled device. My suggestion is to go ahead and download it now while it is free, and keep checking for updates and additional stations or features in the future.

I like the concept of having access to both podcasts and Internet radio streams in one application. Many currently available Internet radio apps don't have this feature. But until the amount of content increases, AudioPress is only going to be a viable option for a select few.

❖ Streaming Audio on your Mac

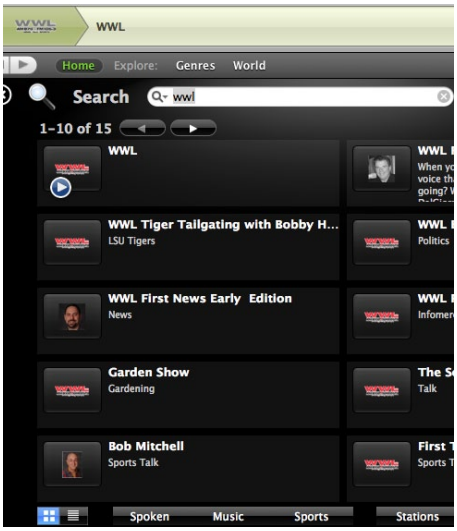
In addition to iTunes, Mac users also have another very viable option they can use to access online radio streams: it's called RadioShift.

RadioShift is a standalone application for Mac OS X users that allows for easy searching of stations, as well as additional content and programs that can be accessed in addition to the main stream. RadioShift claims to have more than 100,000 radio station streams that can be accessed from their service.

The interface is going to be very familiar to anyone that uses iTunes. The easiest way to get started is to search from streams in the search field. Or, you can search for stations by location. (TIP: look for the text entry box at the bottom of the RadioShift screen to manually type in the city name you are looking for.)

RadioShift is powered by RadioTime's streaming content, so if you are using other RadioTime enabled apps on your iOS devices (such as WunderRadio) or RadioTime enabled devices (such as Logitech's Squeezebox line), finding your favorite station should be a breeze.

The basic program is free, but comes in trial mode. During this trial mode, signal quality is degraded (pretty substantially) after 20 minutes of listening. To purchase a full version license costs $32 and can be done through the developer's Web site (check the GlobalNet Links box at the end of this column).



With the number of stations at your disposal, RadioShift is an excellent choice for Mac users wanting to experience a more comprehensive selection of Internet radio stations. The $32 price tag seems a bit steep, considering the number of free options that are out there that can handle a similar function. But if you don't mind a lower quality audio, or will only be listening for a short time, the free version should suit you just fine.

❖ Build the Next Streaming Radio App!

For those readers who are on the tech-savvy side and want to design their own iOS applications for the iPhone/iPad/iTouch, there is a handy new book that can help you get your ideas onto paper. Literally.

Mirko L. Cukich has put together a book that is essentially a book of blueprints for drawing out application designs on both iPad and iPhone/iTouch screens. The book, App Blanks, is a tool that developers can use for sketching out screen shot ideas, drafting concepts, and designing app logos.

This book does not teach you how to make apps for the iOS app store; it is simply a collection of blueprints (to scale of the actual screen surfaces) that will aid developers in designing new apps. This "portable canvas" would be a great tool for developers who are on the go and want "to-scale" design surfaces for sketching out their ideas while keeping them all in one place. In addition, it can provide a place for developers to write down key ideas or features, possible app store descriptions, and more.

If you are an app developer, this handy reference tool would undoubtedly make the transition from initial concept to finished product a little smoother and quicker.

App Blanks sells for $10 on Amazon or from Cukich's Web site for the book: appblanks. In addition to iOS, Cukich also has App Blanks books for other operating systems such as Windows Mobile, Android and Blackberry. Links to both places to purchase are included in our GlobalNet Links section at the conclusion of this column.

❖ GlobalNet Mailbag

As always, I love to receive feedback from my readers, and always make an effort to answer any questions in the column. You can email me at globalnetmt@gmail.com, or you can follow me on Twitter, @globalnetmt where you can post your questions or just get additional information that didn't make the column! Here is this month's contribution from Herb, WA3HGT.

Hello Loyd -

Just finished going through your article in the latest issue of MT. BEST OF WIFI RADIO caught my eye. Loyd, I have been in radio electronics since my days in the Navy almost 50 years ago, but all I know about computers is by trial and error. Just replaced my old Dell Computer with an HP Laptop. So of course I had to buy a wireless router, which I did. It is made by Cisco.

Now, it seems to have two channels, I guess that is what you would call them. One shows being secured – the one I always use – and the other comes up as Guest. So now my question: if I were to get, let's say, the CCRANE WIFI, would it use the Guest channel or how does that work? Am I able to use my computer any place in my house without a problem?

My problem is I don't know anything about WIFI Radio. Is it like plug and play, would it detect my router and go from there? Or do I have a lot of tech stuff I must go through to get it to work? Also use Comcast as my Internet provider.

If you know of a good basic book with info on WIFI, I would sure appreciate the name of it and also appreciate any info you can give me.

Thank you, regards. Herb, WA3HGT.

Herb – Based on what you have told me, it sounds like you should be good-to-go to start using a WiFi radio in your home with no trouble at all. The two channels you mentioned are just different ways that you can access your network. The 'secured' network uses encryption that prevents outside users from accessing your network or using your router to access the Internet.

The 'guest' channel basically does the same thing, but a little differently. Anyone can connect to your guest account, but they cannot access any information on your network or on the Internet. If you have someone come to your home and you want to allow them to access the Internet through your guest account, they would simply have to enter a password you provide them. This gives them access to the Internet, but not your files or other information on the network.

For your WiFi radio, you can use either of these options. However, if you are wanting to use your WiFi radio to play shared music files from your computer, you will need to access your network's 'secured' channel. Either way, all you would have to do is enter the password to access either channel. Your router should have come with documentation on how to set up your secured and guest channels.

Once you have logged your WiFi radio into your network, you should have no problems being able to access streaming content from anywhere in your home! That is the beauty of the WiFi radio: you don't have to have your computer to be able to access the streams, it does it on its own!

As far as books on WiFi radio, I don't know of any, but hopefully this column will continue to serve as a great primer until one hits the market!

Until next time, 73s and thanks for reading!

GLOBALNET LINKS

Pandora CEO going after in-car radio - **http://latimesblogs.latimes.com/music_blog/2010/10/pandora-goes-after-radio-where-it-matters-most-the-car.html**

Pandora expands advertising efforts - **www.radioworld.com/article/108100**

Manufacturers pushing for Internet radio in vehicles - **www.radio-info.com/news/internet-radio-begins-its-battle-for-in-car-radio-listeners**

App Blanks on Amazon.com - **www.amazon.com/App-Blanks-Mirko-L-Cukich/dp/1453809856**

App Blank's Web site – **www.appblanks.com**

RadioShift purchase - **http://rogueamoeba.com/radioshift/buy.php**

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
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Celebrating Beacons New and Old

Happy New Year to all readers, and welcome to another issue of *Below 500 kHz*! Our featured beacon from the November issue was **INE-521 kHz** from **Missoula, MT**. My thanks to Jim Moodie, KA7CIC (OR) for being the first of many to report reception of this station. Jim writes: "INE comes in nicely nearly every night here in Portland, Oregon. My distance to the beacon is 425 miles. The ID cycle is eight times per minute and I'm receiving it on my venerable old boat anchor, a Panasonic RF-4900."

This month's featured beacon is AVN, 344 kHz in Avon, NY. This beacon serves the Rochester International Airport and is a 25-watt station using a flat top wire antenna. The signal seems to get out well, but there is lots of competition on this frequency. Let's see who can hear it from the farthest distance away. The most distant reception will be recognized in the March issue.

Remember, when reporting, please indicate the number of complete IDs sent by the beacon in a 60-second period. This serves as the beacon's "fingerprint" and can be used to verify that you heard the proper station.

❖ Report from the (Pacific) Field

Kriss Larson, KR6ISS (CA), reported some news from a recent trip he took to Fresno, CA. He writes: "I went up to Fresno area for a music camp last weekend, and can tell you that the Visalia beacon (VI/220 kHz) is still intact but off-air, and the Tulare NDB (TLR/245 kHz) is off-air and physically dismantled.

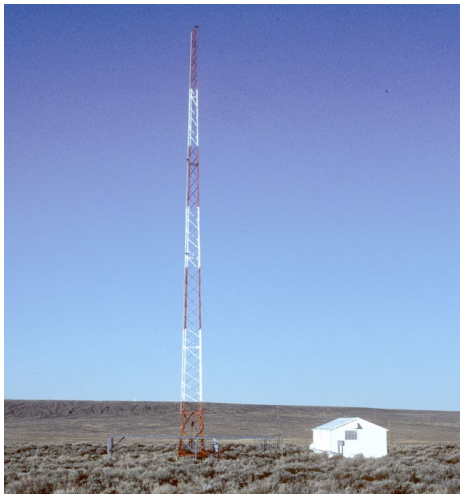
"Where I was (southeast of Fresno) turned out to be a terrible place for LF DXing – there were two 'barn-burner' 50 kW AM stations within 10 miles that were overloading my RF front end. One of them, KMJ at 580 kHz, is apparently one of the oldest stations in the country, and has to directionalize its 50 kW signal to the west at night to protect the rest of the country's 580 kHz stations. This results in a equivalent 250 kW signal being blasted out into the Pacific Ocean. From what I read, this station is a very easy catch in Japan."

❖ Gone, but not Forgotten

In other news, Kriss reported a rather sad happening in the world of radiobeacons. He reported that AOP/290 kHz in Rock Springs, WY has been permanently shut down. What makes this beacon special is that it was believed to be the oldest aerobeacon in the US, having served as part of the original radio range chain from 1930. AOP was also known by its name of the "Antelope" beacon, and had been operating on its original frequency, using its original tower since it was commissioned.

Kriss sent a picture of the beacon from a visit he made there in 2000. In his photo, you can still see the original tower foundations of the four outer towers in the sagebrush (radio ranges had four towers in a square, and one in the middle that sent the ID continuously).

Kriss makes the point that since this was the first time in history a continent had been bridged



with radio navigation, it would seem appropriate that there should at least be a plaque marking the significance of this "golden spike" site. At last word, Kriss was in touch with the Rock Springs Airport Manager about the historical significance of the beacon, and there were plans to contact the historical society about getting appropriate recognition for it. Keep us posted, Kriss!

Below 500 kHz gives a big tip of the hat to beacon AOP and the people who maintained her all of these years. The passing of this beacon is sadly recognized, not only for the signal we've lost, but for the critical role it played in cross-country navigation. To read more about the Radio Range system and NDBs, check out the website at **www.navfltsm.addr.com/ndb-nav-history.htm**.

Shown below is the official information for AOP as listed on AirNav.com:

AOP
ANTELOPE NDB, ROCK SPRINGS, WY
Location
Lat/Long: 41-36-15.024N / 109-00-05.933W
Elevation:
Variation: 13E (1995)
Operational Characteristics
Type: NDB
Class: HW
Z marker: no
Frequency: 290
TACAN channel:
Hours of operation: 24
Morse ID: .- --- .--.
NOTAM facility: RKS
FSS:
FSS hours of operation: 24
Technical Characteristics
Power: 100 watts
Accuracy: NOS
Monitoring: Internal monitoring plus status ind. at control point
Owner: FEDERAL AVIATION ADMIN
Operator: FEDERAL AVIATION ADMIN
Common system usage: yes
For public use: yes

❖ LF8A Mystery Solved

During the New Brunswick DX-pedition I attended in 2006, we intercepted a faint signal on 410 kHz with the ID of LF8A. No matter how hard we searched we could not positively identify this signal. It was the only one out of hundreds that we could not identify. Now, thanks to some detective work by Jacques d'Avignon, VE3VIA, the mystery has been solved. After reviewing his files, Jacques did an Internet search based on a hunch and determined that this beacon is on an oil rig stationed in the North Sea, which is located between Great Britain and Scandinavia. The online search for LF8A provided the following data:

ID: LF8A
Vessel: Eirik Raude
Oil Rig: North Sea

I located a picture of the Eirik Raude oil rig online at the BBC News site. Unfortunately, a copyright release could not be obtained due to bureaucratic issues involved with finding the original source of the image, BBC said, but you can see it online at **www.bbc.co.uk/news/10292693**. Note the helicopter pad in the

photo. The purpose of the beacon is to safely direct incoming helicopters to this pad.

By the way, mid-winter is a great time to listen to ice-breaker operations in the Great Lakes shipping lanes, and for temporary NDBs that may show up on various frequencies to guide helicopters to these ships. Last year several Canadian ships were heard operating LF beacons for this purpose. The Internet can be a great tool for IDing these stations when they appear.

❖ New Year Thoughts

Every new year brings with it the hope for starting anew at some goal or achievement, or to explore an entirely new area of interest. As for me, I'm working to learn basic Spanish, to improve my skills in the sport of motorcycle observed trials, and to finally get serious about a Jeep restoration project I've had on the back burner for far too long. How about you? What new plans do you have for 2011?

Why not make this the year that you learn more about longwave? I'll be the first to tell you that longwave should not be your only radio pursuit (it's certainly not my only RF interest), but I hope we've made the case here for checking out this part of the band, at least on an occasional basis. If you're already well versed in longwave, how about taking on some new challenges, such as exceeding 700 loggings, setting a distance record for daytime reception, or building a new receiving antenna. The possibilities are endless.

Keep us updated on what you are doing in the hobby, and keep those loggings and photos coming. I would especially like to see some shack photos, along with the operators in the picture! We'll run them here as space allows. *73, and best LW DX.*

ARIZONA HAM'S DXING ACHIEVEMENT

Mike Ports, NR5O (AZ) reported logging his 705th beacon as of October 2010. He uses an ICOM 756 PRO II and LF Engineering Active antenna mounted at a height of 35 feet. During his monitoring sessions, Mike has found that a good indicator of favorable conditions is to monitor the DST (Disturbance Storm Time) on the space weather website at **http://lasp.colorado.edu/space_weather/dsttemerin/dsttemerin.html**. When the Kyoto DST line drops rapidly below -20 then heads back up, he finds that the band seems to be very good during the falling period and stabilizes on the up tick.

Mike provides an extensive list of loggings this month, shown below. You will note that the table shows two columns we don't normally provide: Distance (in miles) and output power of the stations, when available.

Beacon Loggings from AZ

kHz	ID	Location	Dist.	Pwr
198	DIW	Dixon, NC	1983	2000
200	HXF	Hartford, WI	1445	25
200	YDL	Dease Lake, BC	1898	--
201	CZE	Clarksville, AR	1168	25
201	GV	Greenville, TX	935	--
209	MT	Chibougamau, QC	2207	500
212	YGX	Gillam, MB	1773	--
214	CHX	Choix, Mex.	532	1000
214	XA	Oshima, Japan	5825	500
216	CLB	Wilmington, NC	1936	--
217	EC	Cedar City, UT	286	49
217	HZD	Huntingdon, TN	1359	25
218	PR	Prince Rupert, BC	1652	500
218	RL	Red Lake. ON	1530	1000
220	HLE	Hailey, ID	675	49
222	CUW	Chihuahua, Mex.	508	400
223	YKA	Kamloops, BC	1245	500
227	MPR	Mc Pherson. KS	886	25
235	CN	Cochrane, ON	1913	100
236	YZA	Ashcroft,BC	1330	500
242	EL	El Paso, TX	367	400
242	XC	Cranbrook, BC	1120	400
245	CRR	Circle, MT	935	100
248	MO	Mobile, AL	1410	--
248	PQF	Mesquite, TX	910	25
248	WG	Winnipeg, MB	1350	50
251	AM	Amarillo, TX	602	400
251	MNZ	Hamilton, TX	830	25
251	OSE	Bethel, AK	2882	1000
251	YCD	Nanaimo, BC	1213	500
257	HCY	Cowley, WY	800	25
257	LW	Kelowna, BC	1186	50
257	SAZ	Staples, MN	1266	25
257	YXR	Earlton, ON	1937	400
258	ZSJ	Sandy Lake, ON	1626	500
260	AP	Denver, CO	576	100
263	QY	Sydney, NS	2847	500
264	HN	Shawnee, OK	878	25
266	ICK	Annette Island, AK	1749	--
266	SAA	Saratoga, WY	610	25
266	XD	Edmonton, AB	1379	--
269	CII	Choteau, MT	986	50
270	SRL	Santa Rosalia, Mex.	438	--
272	MLK	Malta, MT	1027	25
275	GUY	Guymon, OK	641	25
276	YEL	Elliot Lake, ON	1780	100
278	CEP	Ruidoso, NM	392	25
278	FD	Poplar Bluff, MO	1251	25
281	UVA	Uvalde, TX	798	25
283	DUT	Unalaska, AK	2959	1000
283	IML	Imperial, NE	750	25
284	MXR	Raton, NM	481	--
284	QD	The Pas, MB	1486	500
326	DC	Princeton, BC	1173	500
326	MA	Midland, TX	584	400
328	YTL	Big Trout Lake, ON	1775	1000
329	TAD	Trinidad, CO	511	150
332	POA	Pahoa, HI	2789	--
333	STI	Mountain Home, ID	680	--
334	P2	Wetaskiwin, AB	1331	--
335	CC	Concord, CA	626	25
335	CVP	Helena, MT	886	150
341	DB	Burwash, YT	2248	200
341	YYU	Kapuskasing, ON	1860	500
344	FCH	Fresno, CA	482	400
344	GNC	Seminole, TX	559	25
345	YC	Calgary, AB	1200	--
346	YXL	Sioux Lookout, ON	1545	1000
347	AIG	Antigo, WI	1458	25
347	HLR	Ft. Hood, TX	862	--
347	SBX	Shelby, MT	1020	25
350	NY	Enderby, BC	1220	500
350	RG	Oklahoma City, OK	850	--
350	SWU	Idaho Falls, ID	670	--
351	NO	Reno, NV		50
352	YKQ	Waskaganish, QC	2075	500
353	LI	Little Rock, AR	1139	400
353	LLD	Lanai, HI	2866	--
356	ODX	Ord, NE	907	25
356	ZF	Yellowknife, NWT	1983	1000
358	TNY	Fayetteville, TN		25
359	BO	Boise, ID	719	400
359	SDR	Snyder, TX	645	25
359	YQZ	Williams Lake, BC	1490	--
360	OX	Iwo Jima, Japan	6151	1250
362	RPX	Roundup, MT	901	25
365	HQG	Hugoton, KS	655	25
366	PNI	Pohnpei, Micronesia	5935	--
367	MO	Modesto, CA	554	25
368	AN	San Antonio, TX	848	--
368	SIR	Sinclair, WY	626	100
368	SX	Cranbrook, BC	1140	500
370	OUN	Norman, OK	850	25
371	ITU	Great Falls, MT	945	100
371	TVY	Tooele, UT	477	25
371	UK	Laughlin, CA	724	25
373	TF	Pueblo, CO	544	--
375	DS	Searcy, AR	1168	--
375	DW	(Owaso) Tulsa, OK	937	20
379	IWW	Kenai, AK	2544	1000
379	YBE	Uranium City, SK	1795	500
379	ZEG	Edmonton, AB	1361	50
380	GC	Gillette, WY	812	25
381	BBD	Brady, TX	780	25
382	GRN	Guerrero Negro, Mex.	404	--
382	YE	Fort Nelson, BC	1802	100
385	UWL	New Castle, IN	1545	25
385	WL	Williams Lake, BC	1365	500
394	RWO	Kodiak, AK	2591	50
397	SB	San Bernardino, CA	297	--
397	ZSS	Saskatoon, SK	1310	--
400	AI	Ardmore, OK	877	--
400	FN	Fort Collins, CO	610	--
400	QQ	Comox, BC	1290	--
403	AZC	Colorado City, AZ	231	40
404	MOG	Montague, CA	788	100
407	CO	Colorado Springs, CO	545	--
410	DAO	Fort Huachuca, AZ	180	25
414	ATS	Artesia, NM	452	25
414	RPB	Belleville, KS	912	--
428	SYW	Greenville, TX	935	25
434	SLB	Storm Lake, IA	1108	25

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

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A Philco and Magnavox Joint Restoration

Last month I mentioned that I had changed my mind about the restoration of the Philco 38-62 – a project that I had formally discontinued in the November issue. At the time I felt that it had too many strikes against it; the chassis top and aprons were very badly rusted from the ...err...byproducts of mouse occupancy and, almost equally discouraging, was the presence of the quite annoying Philco capacitor assemblies.

The latter are Bakelite housings containing wax-embedded capacitors and sometimes also a resistor. The leads of these components are brought out to terminal strips at the top of the housing that provide attachment points for other components in the radio. To change out the embedded capacitors means desoldering a jungle of leads from the terminal boards and melting out the wax with a heat gun.

Though it is a nice Philco model, I was wondering if restoring this radio would be worth the work. I was concerned that the progress in doing each step of the restoration would be quite slow without giving me much to write about. So I cancelled the project in November and began the Magnavox restoration that's now underway.

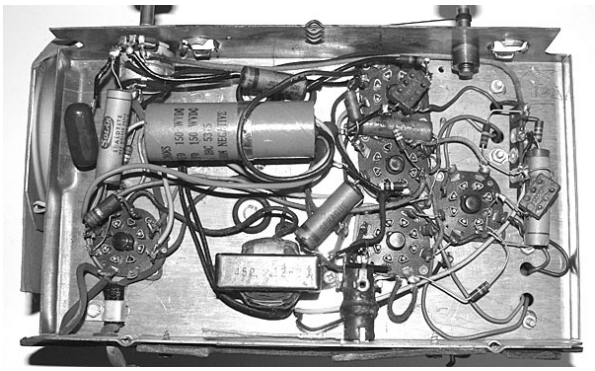
But I kept looking at the partially dismantled Philco and started to imagine how satisfying it would be if I could bring this set back to life in spite of its problems. Then it occurred to me that I wouldn't have to depend solely on the Philco progress to provide fodder for the column if I were to carry out its restoration in conjunction with another one – in this case the Magnavox "Zephyr" set.

With this column I'm beginning that experiment, and it seems to be working out even better than I had imagined. The reason is that the story opportunity in the Magnavox restoration is also limited – but for the opposite reason. The radio is relatively simple and already in very decent condition. And so, a joint restoration of both is making a lot of sense.

❖ An Unusual Decision

Last month I removed the Magnavox from its cabinet and took a first look inside. It turned out to be about the cleanest radio I have ever worked on. Quite a change from the Philco! Also all of the tubes tested good and there was no sign of failed components or previous repairs. The only obvious physical problems were a frozen station selector shaft (which, this month, yielded easily to a short spray of WD-40) and a deteriorating line cord that I haven't yet replaced.

I plugged in my soldering iron, turned the radio upside down, and prepared to change out all of the capacitors. I almost always recap every project radio as a first step in restoration. But now I began to hesitate. The radio looked so pristine under the chassis! Almost as if it had just left the factory. I don't know where it had spent its life prior to its long-time residence in my attic – but it obviously had been stored under decent environmental conditions.



Magnavox underchassis looks factory fresh.

Considering that this little radio would never see heavy usage, but would likely end up on someone's display shelf to be turned on only for an occasional demonstration, I thought that I might give it an opportunity to run with its original components. But when starting up a long-disused set with its original capacitors, it is prudent to run up the line voltage very slowly using a Variac while looking for any signs of smoke and metering the B plus line to make sure it is not shorted out.

This is particularly important for the health of the electrolytic capacitors – which, with disuse, experience shrinkage of their "electrolyte," or insulating membrane. These capacitors could easily short out and self destruct if full voltage is applied right away. Bringing up the voltage slowly will often allow the membrane to regenerate and recover its insulating properties.

❖ The Start-Up

As it happens, I don't have a functioning Variac power supply. I do have the Variac and all other parts to put together a nice metered supply, but haven't yet done the metalwork to mount all the components in a cabinet. When I finally get this done, I do plan to report on the project in an *MT* article.

What I do have is a little autotransformer that, when connected to the line, will produce switch-selectable output voltages of 40, 60, and 90. I plugged the radio into the autotransformer and connected the autotransformer to the line through a small isolation transformer.

When the primary of the isolation transformer is connected to the 120-volt a.c. line, it delivers 120 volts to a radio or other device connected to its secondary. So why do we need it? Its importance lies in the fact that, since it's a transformer, there is no electrical connection between input and output. (This is not true of the autotransformer being used for voltage adjustment, which is connected in series with one side of the line.)

The reason we need isolation from the line was fully discussed last month, but is worth repeating. The little Magnavox, like the majority of a.c.-d.c. sets of its era, follows the dangerous practice of having one side of the a.c. line connected to its chassis. The a.c. line itself has one side grounded and the other side "hot" (120 volts above ground).

Should the Magnavox's plug be inserted into the outlet in such a way that the a.c. ground is connected to the chassis ground, there is no problem. If inserted in the opposite orientation, however, the "hot" side of the line becomes connected to the chassis. Then anyone touching a metal part of the chassis while in contact with a grounded object – such as a water pipe or damp concrete basement floor – is in for a nasty shock.

Of course, service technicians know enough to use isolation transformers, or at least extreme care. But many innocent radio users over the years must have run afoul of this very poor safety practice by perhaps picking up a turned-on radio and coming in contact with a chassis mounting screw or by operating a bare control shaft that has lost its knob.

With autotransformer and isolation transformer hooked up and a d.c. voltmeter connected between the radio's B plus line and chassis ground, I turned on the set and started it off at 40 volts. The pilot light came on and I could see the tube heaters begin to glow. After maintaining 40 volts for a few minutes, I switched to 60 volts. I could then hear a hum from the speaker and see an indication of B plus voltage on the meter. Switching to 90 volts produced no additional sound from the set at first – but suddenly it blared into life, picking

up a station that happened to be tuned in. I was home free!

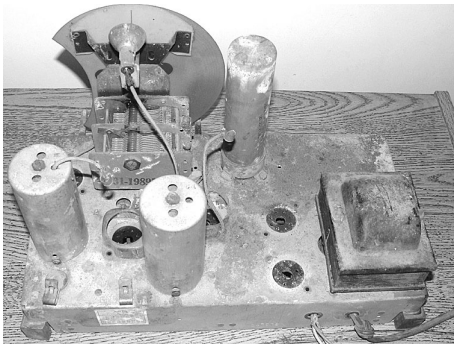
Next month, we'll install a replacement line cord for the receiver, realign it, and see what can be done about the cosmetics of the cabinet.

❖ Getting Back to the Philco

As mentioned, the two major problems immediately facing any restorer of this radio are the horribly rusted chassis top (luckily the underside is very clean – the mice never having found their way there) and those extremely inconvenient Philco capacitor assemblies. Just for reference, I'm including the picture of the chassis top I ran in the September 2010 issue, where I originally introduced the Philco project. Not exactly an inspiring sight!

First let's deal with the rust. If this were to be a "grand prix" type of restoration, there would be only one choice. That would be dropping all the parts out of the chassis and sending it out to be sandblasted and replated. Though this may be a nice old radio, it's not exactly rare and few would think it worth that kind of treatment.

The obvious next best plan would be to scrape and sand the rust as well as possible, then paint the chassis. Then I would have at least a decent-looking, if not original-looking, result, and wouldn't feel as if I needed to wash my hands every time I touched it.



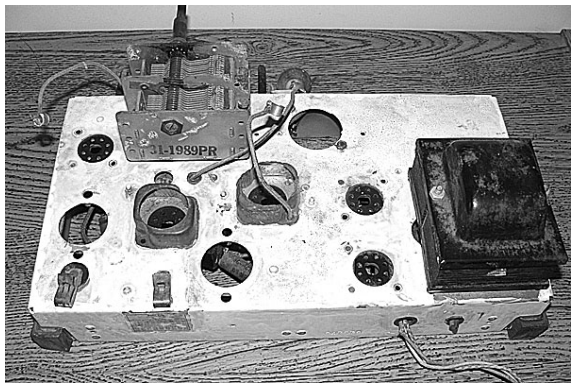
This repeat from the September column shows top of Philco chassis in its discouraging original condition.

As it happens, I have on hand a metallic paint that I've used on a previous chassis restoration. I think it might have been the Hallicrafters S-40 done on these pages a few years ago. It covers very well with a minimum of brush marks and is not a bad approximation of a metal chassis color.

The paint is manufactured by Modern Masters of N. Hollywood, CA (**www.modernmastersinc.com/**). It's from their metallic paint collection, Cat. # ME150 Silver. All of the Modern Master metallic paints are available in three different opacities: opaque, semi-opaque and sheer. I'm using the opaque version.

❖ Stripping the Chassis Top

The great thing about these products – which you wouldn't expect in a metallic paint – is that they are latex-based, which means easy water clean-up. But, before the painting or even the surface preparation can be done, the top of the chassis must be stripped of parts at least as much as practical.



The Philco chassis is now primed and ready for its final paint coat (see text).

I decided to leave the power transformer (easy to sand and paint around) and the tuning capacitor (a little less easy to work around, but difficult to remove without disturbing delicate r.f. components mounted underneath it). The remaining components (two i.f. transformers and the can-type multisection electrolytic capacitor) would be removed.

Of course, before these items could be freed up for removal, the wiring to them would need to be disconnected. In the case of the multisection electrolytic, this was no problem. It would be replaced with new, individual capacitors, so its wiring could simply be snipped at some convenient spot – leaving enough temporarily in place so we could read the color codes as a guide to installing the replacement caps.

The i.f. transformer wiring would present more of a problem. For one thing, the colors on all the leads are so faded that they couldn't be used for identification. For another, the leads couldn't be arbitrarily snipped; I'd need to maintain them as close to their original length as possible for later reconnection. So there would be very little lead left at the connection point for identification, even if the color could be read.

Obviously we were going to need some kind of guide for the later reconnection of the several leads from the two i.f. transformers. The answer was to take a photograph of the underside of the chassis and size it so it would print as large as possible on an 8-1/2" X 11" sheet. It was then "Photoshopped" to bring out as much detail as possible before printing it out.

As each lead was disconnected, it was given a numbered masking tape tab. Its connection point was then circled on the photo and the location marked with a matching number.

With these parts out of the way, we were now ready for at least the partial removal of the heavily encrusted corrosion.

❖ Surface Preparation

Working outside to avoid breathing in too much of the resulting "rust dust," the areas of corrosion on the chassis top and aprons were scoured first with a wire brush having fine brass bristles, then with a pad of coarse steel wool. This at least removed the loose rust and helped to flatten out the roughness of the corroded areas. Finally, the chassis top received an overall wipedown with a damp cloth to remove sanding dust and any remaining grime.

Before painting, Modern Masters recommends priming with a 100% latex primer such as Zinsser's "Bullseye 1-2-3." I happened to have a very similar latex product on hand, "Kilz 2" pigmented primer-sealer, and was impressed with its "stainblocking" characteristics as featured on the can. So I used it for the priming, applying with a 1" brush for the larger surfaces and a child's paint brush for the tight places.

After the primer coat dries thoroughly, we'll be ready for the finish coats (the manufacturer recommends two). Then the i.f. transformers and electrolytic cap can be cleaned and replaced (the electrolytic will remain disconnected but will be reinstalled for looks).

❖ Dealing with the Philco Caps

And so, you wonder, what am I going to do about those Philco capacitor assemblies that I dislike so much? Well, I do plan to recap the set, at least as far as the electrolytics and the individual paper capacitors are concerned. But I am going to ignore the special Philco assemblies. It looks as if I'd have to unsolder at least a third of all the wiring connections in the radio to remove them. That would be a tremendous amount of labor, not to mention the potential for making wiring mistakes on reconnection.

What I intend to do is assume that the caps are good. But if the set doesn't work after reassembly and diagnostic procedures pinpoint one of the encapsulated capacitors, I'll disconnect it at the terminal strip and wire in a replacement unit outside of the case.

See you next month, when we'll continue with both of our restoration projects.

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The Great Equalizer
How Tuners Make Life Easier

Welcome back! I trust that you all had a merry holiday season and didn't overindulge. Everybody get what they wanted for Christmas? Any new radios out there?

This month I'd like to take a look at one piece of technology that makes our hobby a lot easier to enjoy. Some of you may not use this device, but in radio rooms like mine, with nonresonant, ladder-line fed antennas, it's nothing short of essential. I've spoken of this "trusty" gadget in passing many times, and now I think we should take a deeper look. I speak, friends, of the *antenna tuner.*

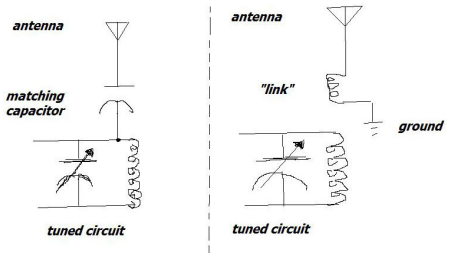
The antenna tuner has been with us in one form or another since radio began. Like every other circuit, system, or device pertaining to radio, it started out crudely and has constantly undergone improvement and refinement. The whole evolution of the tuner stems from a very basic issue: how do we interface the radio to the antenna?

❖ Early Tuners

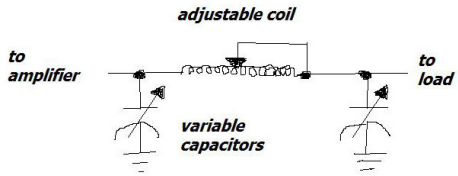
Two early methods involved a capacitor or a coil. A capacitor would be placed in series between the antenna and the ungrounded side of the tuned circuit – that circuit being the input of a receiver or the output of a transmitter. Adjusting the value of the capacitor gave some range for adjusting the antenna and tuned circuit to as close a match as possible.

Alternately, a small coil – a "link" – would be placed in series between the antenna and ground, and the coil coupled to the tuned circuit, often by winding the small coil onto the same form as the tuned circuit's coil. As with the capacitor, the value of the coil – usually its number of turns – could be varied experimentally until the best match was found. (See Figure 1.)

These comparatively crude methods worked fine for older radios, because they typically had



a wide range of impedance they could match. Transmitters, in particular, could match a wide range of loads, thanks to the discovery of the *pi network.* This circuit allowed the final amplifier of the transmitter to match to some really crazy loads. Thus, in a sense, the transmitter had its own antenna tuner. (See Figure 2.)



As a Novice in the early Seventies, I had an old Johnson Viking Ranger transmitter that had this pi network between the final amplifier and the antenna connector. I remember matching some really non-resonant antennas with this rig. We older hams used to say that the Ranger could match "a bobby pin on 80 meters, and a coat hanger on 160."

❖ Coaxial Cable and T-Circuits

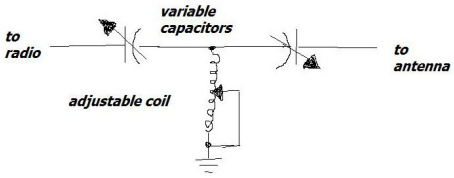
A major, long-term change in feedlines came after the Second World War, when a great deal of surplus *coaxial cable* became available to radio enthusiasts and immediately became very popular, because it is *shielded and flexible.* Suddenly the feedline could be routed anywhere, even right on metal structures or underground. In addition, the shielding and the jacket meant that feedline radiation was greatly reduced and that the feedline was not dangerous to touch. The feedline radiation issue became especially important as *television* began to appear in many homes not long after the War.

But, coaxial cable has a big liability that I've harped on many times – it has to be operated very near its characteristic impedance of 50 to 75 ohms, or losses from SWR begin to mount rapidly. Indeed, at high power levels, it is very easy to actually melt mismatched coax.

This had three important consequences at the time. First, radios began to have strictly 50 ohm antenna connections; second, resonant antennas with impedances in the 35 to 70 ohm range, like dipoles, quarter-wave verticals, and beams became *very* prevalent; and lastly, a separate, outboard tuner became essential to match any non-resonant antennas to the 50 ohm antenna circuit of the newer rigs.

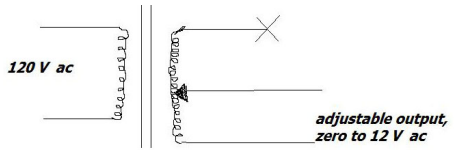
All of this didn't happen overnight. Nevertheless, the 50 ohm antenna connection long ago became the standard for radio equipment. Anyone wishing to use any sort of non-resonant antenna today – be it random wire, 100 foot dipole, or rain gutter – is going to need a tuner to match this "oddball" antenna to the radio's 50 ohm antenna jack.

Fortunately, a simple circuit was developed that only uses two variable capacitors and a variable coil, and easily enables matching a wide range of impedances to the radio's 50 ohm jack. With variations, this is essentially the circuit at the heart of every tuner today – the venerable *T network* (see Figure 3).

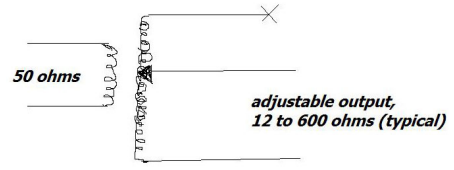


We could get ensnarled here in an arcane discussion of how this circuit works on a technical level, but that seems counterproductive. So here's a simplified way of looking at it: just think of the tuner as an adjustable transformer.

Remember electric trains, anyone? They were powered by an adjustable transformer. One side, the primary, was connected to 120V at the wall outlet. The other side, the secondary, could be adjusted from zero to 12 volts, controlling the engine's speed. (See Figure 4.)



The antenna tuner can be visualized in exactly the same way. One side is connected to the radio's 50 ohm antenna circuit. The other side can be adjusted to a wide range of impedances, typically 12 to 600 ohms, allowing us to match a great many non-resonant antennas to the radio. (See Figure 5.)



The only real restriction to all of this occurs if coaxial cable is used to run from the tuner to the antenna. Keep in mind that coax will not tolerate much of a mismatch (say 3 to 1 SWR or more) and the tuner cannot redeem this limitation. In other words, be aware that the tuner will be able to match a wide range of *random* (non-coax-fed) loads, but will only have a limited *useful* range of adjustment when feeding coaxial cable.

❖ Baluns

Many tuners also include a *balun* to enable the use of "balanced" feedlines such as ladder line, twin lead, open-wire feeders, etc. Ironically, these older feedlines, once thought to be made obsolete by coaxial cable, have enjoyed a huge resurgence with the wide availability of balun-equipped tuners.

A *balun*, is a special transformer configuration that allows a BALanced load to be connected to an UNbalanced circuit. Coaxial cable is an unbalanced device, since the outer shield is obviously ground and the inner conductor is the "hot" lead, whereas balanced feeders basically have two "hot" leads, neither of which is grounded. A typical balun configuration appears in Figure 6.

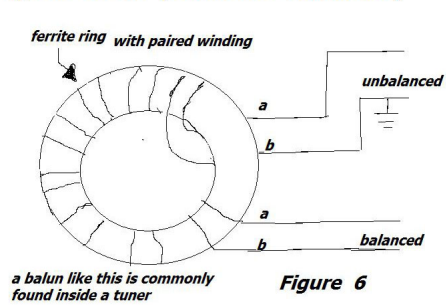


Figure 6

❖ Automatic Tuners

In recent years, a device called an *automatic antenna tuner* has appeared, making things even easier for the operator. Basically, a small onboard computer operates the tuner. When a given frequency is selected, the computer *very rapidly* tries a huge range of capacitor and coil settings until a match is found – typically in a couple of seconds! As a bonus, the data for a given frequency and antenna is stored, so the operator can return at any time to that frequency and have a match in milliseconds!

Some automatic tuners can actually be located remotely, that is, right at the antenna feedpoint (buried at the foot of a vertical, for example), allowing the operator to run coaxial cable all the way from the radio to the antenna location yet still enjoy wide-range matching capability, since the connection from the tuner to the antenna is very short, and therefore very low-loss.

Well, folks, that's our look at tuners. Hopefully I've clarified some things about them and made some of you want to try one to expand the capabilities of your setup, enable that new stealth antenna, or a random length dipole, with the great equalizer; the antenna tuner.

Tune in again next month, my friends, when we'll delve ever deeper into the world of antennas. Happy operating!

Automatic tuners, like this MFJ-998, provide virtually hands-off operation (Courtesy MFJ Enterprises)

The Amazing Little C.Crane WiFi Radio

A GlobalNet Review By Loyd Van Horn, W4LVH

Nearly every week, I receive email from readers of the *GlobalNet* column, many of them asking me where they can find a basic, easy-to-use and cost effective WiFi radio for their home or office.

I think I have found the answer.

There are many flashy WiFi radios on the market with lots of bells and whistles, but most of those fall flat on their face when it comes to combining those features with low cost and ease of use. Many of the WiFi radios on the market are either too expensive or too difficult to use for what you get.

So, when I received the mid-priced (under $150) C.Crane WiFi radio in the mail, I was admittedly a little skeptical that this unit would be any different. Especially since it seemed so minimalistic in its design and list of features.

Thankfully, I was wrong … very wrong.

Out of the Box

To be honest, I was even more skeptical when I opened the box and began to see what I had to work with. While the radio was packaged very well for shipment, with basic shock-support to keep the radio safe, it was the design of the radio that had me questioning what this radio could actually do.

The radio is a very basic, black plastic box with a few small buttons, a small speaker and a basic screen. It's one of the smaller WiFi radios I have examined, measuring 6.5 inches wide, just under 4 inches deep and 4 inches tall. This isn't a flashy, contemporarily designed WiFi radio that you are going to be using as a design element in your home. There was also a small "wall wart" AC adapter and a 28-button remote in the box.

On the unit's front panel, you will find one large rotary knob, which is used for scrolling through selections on the various menus, as well as controlling the volume level during use. Turn the knob to scroll through selections in each menu and press or click the knob in to make your selection. There is also a red power button, a back button for menu navigation, a reply button, and three preset station buttons (which also serve as play/pause/stop and seek buttons for playing files wirelessly from a PC).

There is a handy 47-page instruction manual, written entirely in English, which explains the functions of each of the buttons and how to navigate through the various menus and functions.

On the rear of the C.Crane WiFi radio, there is an ethernet jack for wired use, a headphone jack, a line out (for running audio from the radio to an external speaker system), and the jack for the AC adapter.

Curiously, there was no line in or auxiliary input on the C.Crane WiFi radio. This came as a pretty big surprise, since it seems to be almost standard on most other WiFi radios I have looked at, and many users run audio from their portable music device through their WiFi radio.

The inclusion of the remote control was a welcome addition, and during the course of using the C.Crane WiFi, I found myself using the remote control almost exclusively. The remote control has buttons to turn the radio on/off, control the volume, or mute the speaker, and provides one-button access to nine preset stations and easy access to up to 100, among other features.

As I was unpacking and setting up the radio, my skepticism was starting to be countered by the thought, "but maybe big things really do come in small packages?" Powering on this little WiFi wonder confirmed what I was already starting to suspect.

RATINGS

Audio Quality – 4 out of 5 stars
For the size of the speaker in this radio, the audio is surprisingly good and is adequate for nearly any bedside or home office. Let's face it, though, no walls will rattle as a result of your listening with this radio.

Performance – 4.5 out of 5 stars
It is a Reciva-based system, so navigation and finding stations is a breeze. The minimalistic design on the unit itself is compensated for by a full-function remote control, that is one of the better remotes of any WiFi radio on the market.

Features – 3 out of 5 stars
No color screen, no app support, no FM radio, no battery power for portable use – those would have been nice to include. Beyond that, this is a WiFi radio, pure and simple. You buy this because you want to listen to streaming radio stations without having to use your computer.

Design/Appearance – 3.5 out of 5 stars
I don't want to hit the C.Crane too hard on this portion, because there is something to praise about the simplicity of the basics. Next to your bed, or on a shelf in your office, you will actually appreciate the small footprint of this radio.

Overall Rating – 4 out of 5 stars
No auxiliary input, no FM radio and no battery power hurt the rating of this unit, but not much. If you want a flashy, app-driven WiFi radio experience, then look elsewhere. If you want a bulletproof WiFi radio that will reliably give you access to the world, the C.Crane WiFi radio is truly an amazing tool that comes in a small package.

Performance Test

Looks can be deceiving, and in this case, they are a page right out of Houdini's playbook.

Powering on the C.Crane WiFi radio, the unit instantly found my wireless network. The interface is through a green LCD screen. Though basic, like all of the features on the C.Crane WiFi radio, it just works. I entered my secure passkey (which was incredibly easy, compared to other WiFi radios I have tested) and after about 20-30 seconds, I was connected and ready to get started. The C.Crane handles both WEP and WPA encryption, and the instruction manual includes a very handy trouble-shooting section, should you need it. In my case, it was nearly plug and play, with no hiccups to speak of.

My first test of any WiFi radio is to tune in BBC Radio 1. This is a high-quality stream, with a 48 kbps .wma file stream. It took about 30 seconds for the buffering process to complete before I was listening to the latest hits from the U.K. With such a high-quality stream, it is a perfect test for the included speakers.

There are 28 stops as you turn the volume knob from dead silence to full volume. The first 10 seem to be adequate for basic low-volume listening. Beyond that, turning up the volume leads to little audible distortion until you get to about 25 or more on the volume knob.Still, the audio doesn't get terribly distorted, even listening to music with a lot of bass. The 1.5 watt, 2.5 inch speaker seems to handle just about anything you can throw at it. It isn't as good as a full-stereo system with large speakers, but it does what it needs to do: let you listen to audio content. It compares favorably with my Logitech Squeezebox or the Pure Evoke Flow I reviewed last month.

Tuning In

I then wanted to try some other stations out. The next station I usually tune in is WWL-870 AM in my old hometown of New Orleans, Louisiana. To get to another stream, all you have to do is hit the back button, push in the volume knob to select "Stations," and choose how you want to search for your station (Location, Genre, Search or Live365).

I usually use Location, as this seems to be the easiest for me. I first have to choose the geographic region of the station I am trying to find, in this case, Americas. Then I choose USA by State (Louisiana), and then WWL. This is a 32 kbps mp3 stream, so the audio quality isn't as good as BBC Radio 1, but it still sounds very good through the C.Crane WiFi radio.

From there, I usually try to pick stations in a variety of countries and continents, just to get a feel for how well the radio will perform at quickly finding and changing streams. The C.Crane WiFi radio handled it very well; stations were easy to find and quickly buffered for nearly instant listening.

A note as you begin using the C.Crane WiFi radio: The volume knob is sensitive to how forcefully you turn it. A quicker and deeper turn will result in a much quicker scroll through menus. If you want a more finely tuned scroll, a shorter and more shallow turn will help you to one-click through menu choices.

And Beyond

I quickly found out that Internet radio streams weren't the only features you could access on the C.Crane WiFi radio. Since the radio uses the Reciva streaming service to access streams, you can access many of the features you can add to your Reciva account. Services such as Pandora, My Aupeo, podcasts, and Live365 can be accessed through the C.Crane WiFi radio, as long as you have enabled these services on your Reciva account and added this radio to your account.

Unlike the Pure Evoke Flow I reviewed last month, you can have a completely satisfactory streaming experience without ever having to interact with a computer: the radio flies solo quite nicely. But I suggest you register an account with Reciva anyway, so you can set up favorite stations and take advantage of the additional features.

In addition, the C.Crane WiFi radio will allow users to stream audio files from their PC or Mac. Setting up your PC to share music folders is fairly simple: you must make sure the files you want to share are in your "shared music" folder and sharing is turned on. To share files on a Mac, you will need third party software to use your computer as a UpnP server. The manual explains this process in easy-to-understand details.

❖ A Keeper

This is the third WiFi radio to grace my home. My first was a large Sangean WFR-1 with big, booming speakers and a beautiful wooden case. The second is the ultra-modern Logitech Squeezebox Radio. With a color display and lots of features, it has made a nice addition next to my bedside.

So where does that leave the C.Crane WiFi radio? It lacks the big speakers or elegant style of the Sangean, and doesn't have all of the flashy features or pretty display of the Logitech. So what is it about this radio that blew me away and made me decide to make it a permanent addition to my WiFi radio collection?

❖ The Final Word

Overall, I found the performance of the C.Crane WiFi radio to be just what I was looking for. Sometimes, it is easy to get lost in all of the frills and design of today's ever-trendy gadgets and the basic functionality of what you are trying to do suffers as a result. You won't have to worry about that with the C.Crane WiFi radio. It just works. If you want to listen to Internet radio streams, the C.Crane WiFi radio handles that more than adequately. The audio is impressive for the speaker and cabinet size, the footprint is small which makes it perfect for office or bedside use, and the interface is intuitive.

If you have any experience with a WiFi radio, you will be flying through the menus in no time. For our newcomers to the technology, the learning curve is very small and the included documentation should get you going quickly.

I would have liked to have seen a few other features included, which wouldn't have distracted from the simplistic design of the unit. An FM radio would have been great for those times when the power goes out. A battery compartment or some sort of rechargeable pack would have been nice to make it easy to take the radio outside.

I really am stumped at the lack of an auxiliary jack; to me that would have been a no-brainer to include. But, again, I am not buying the C.Crane WiFi radio for playing my iPod, I am buying it to listen to Internet radio streams.

I am a huge fan of simplicity. I like having devices that, when you turn them on, they just work. I put the C.Crane WiFi radio in my home office, set it on a bookshelf and it just worked. In my office, if I want to listen to my iPod, I have speakers or my computer that let me do that. If I want to update my Twitter feed, I have my iPhone or my computer. If I want to listen to Internet Radio streams, I now have my C.Crane, and I couldn't be happier about it.

The small footprint was perfect in my cramped office. The speaker is just loud enough at reasonable volumes that it doesn't have to be right in front of me for the audio to be decipherable. It has no issues connecting with my WiFi network, which is separated by more than four walls and a lot of electrical equipment.

The bottom line: If you want a reliable, moderately-priced WiFi radio that doesn't require a doctorate in technology to operate, the C.Crane WiFi radio is a perfect choice for you.

Purchase Information

C Crane's WiFi radio is $139.95 from C. Crane Company, Inc, 1001 Main Street, Fortuna, CA 95540; 1-800-522-8863 or visit **www.ccrane.com/radios/wifi-radios/cc-wifi-radio.aspx**

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The Search for Extraterrestrial Intelligence

In the classic *Star Trek* episode, "Balance of Terror," Dr. McCoy tells Captain Kirk, "In this galaxy there's a mathematical probability of three million Earth-type planets. And in the universe, three million *million* galaxies like this. And in all that, and perhaps more...only *one* of each of us."

Latest estimates put the number of galaxies at more like 80-100 billion, not three. But it's a mighty big number. And it only takes one of us to do some amazing things, especially when teamed up with like-minded individuals all over the planet.

In this column, I normally discuss ways to connect your radio to your computer or to run some software that helps you interact with your radio. But what about connecting your computer to someone else's radio – specifically the giant radiotelescope at Arecibo in Puerto Rico (see Photo 1)? How cool would that be?

Well, for 11 years, there's been a way to do it, as a part of the program called the "Search for Extraterrestrial Intelligence (SETI)." It's called SETI@home, and it's a way for you to let scientists who are looking for signs of extraterrestrial life use your computer when it's idle to process a slice of the radio spectrum, looking for that elusive signal that proves there's life "out there."

While science fiction often uses the presumably faster-than-light "subspace radio" to communicate, we are stuck with ordinary radio. Our efforts to find others like us communicating using "slow" radio waves have so far proven fruitless. It could mean that there are no technically advanced civilizations out there, or that they have long ago moved beyond radio. But if we don't at least try to look and listen for them, we will certainly reduce our chances.

Photo 1. The giant radiotelescope at Arecibo in Puerto Rico.

In a recent article in The Planetary Society's magazine *The Planetary Report*, noted scientist Stephen Hawking said, "Our observations indicate that a significant fraction of stars have planets around them." (As of November 2, 2010, in fact, astronomers have located 495 such planets, mostly by detecting small changes in the Doppler shift as their stars orbit the center of mass of their system. At least one big planet has even been imaged directly.)

Hawking continued, "Some of these will lie in the 'Goldilocks zone,' where the distance from the star is in the right range for liquid water to exist on their surface. There are around a thousand stars within 30 light-years of Earth. If 1 percent of these have Earth-sized planets in the the Goldilocks zone, we have 10 candidate New Worlds." Of course, the fraction of those with life similar to ours, technically advanced enough to send radio waves, and that have not destroyed themselves may be very small, so it takes a lot of looking and listening to find the proverbial needle in the haystack.

I asked Dr. Eric Korpela, project scientist for SETI@home, if, with thousands of computers around the world processing the massive data flow from the Arecibo dish in Puerto Rico at the rate of 460 TeraFLOPs/sec (460 trillion floating point operations per second), we were any closer to finding ET phoning home. He replied, "I think we're always getting closer. The biggest problem is we don't know if we have an inch or a mile left to travel. Our methods are still pretty primitive. It's only in the last few years that we've started searches for pulsed emission rather than continuous wave. We still have to make trade-offs between a sensitive search of a narrow spectral band or a low sensitivity search of a wide band.

"SETI@home could record the entire 300MHz bandwidth of the seven Arecibo receivers, but we'd need a few million bucks a year for disks to store the data. Or, we could record power spectra, which would reduce our sensitivity. So we do what we can afford, which is to record about a percent of it. Maybe ET is in the part we don't record.... I typically put our chances at 1% a year. Maybe I'm an optimist."

I also asked Dr. Korpela if there have been any "Ellie Arroway moments," a reference to the book *Contact*, written by noted astronomer, the late Carl Sagan. In the book, Arroway discovers an obviously alien radio transmission while listening to a receiver connected to the giant dishes at the Very Large Array in New Mexico. I guessed that there might have been a few times when scientists saw a signal that they thought just *had* to be artificially generated, even though it would later prove to be natural.

He replied, "You might be surprised to hear that we haven't. I think the amount of terrestrial interference tempers our enthusiasm for any specific signal. In the 2.5 MHz band we record, in the center of the "protected band," where, in theory, nobody transmits, we've identified about 35,000 man-made signals that we see frequently. It's hard to get excited about a signal when there's a good chance that it's just the ignition circuit on the new maintenance truck. I think that when we do find something, it'll be weak, just barely above the noise, and won't appear interesting until we see it repeated from the same spot in the sky, and only from that spot in the sky."

So, the next time you find yourself lamenting the QRM or QRN from interfering signals on the shortwave bands, consider the plight of scientists who are looking for signals with power levels in the –173 to –217dBm range and encountering RFI in the 0 to +60dBm range! The blocking dynamic range of such a receiver would have to be huge.

❖ The Ultimate DX Contact

It is tempting to argue that we are essentially tuning around, trying to find another technically advanced civilization transmitting a fairly high-powered CQ, something that our own civilization has not attempted to do. Perhaps they are also listening and not getting "on the air," a problem not unknown on our amateur bands! Of course, at the speed of light, a typical QSO would take decades, and there's a real possibility that future faster-than-light starships could arrive at any alien world prior to the radio signal! But that doesn't mean we shouldn't try.

I was curious just how powerful an alien transmitter would have to be for us to hear it using present methods of detection. According to Dr. Korpela, "If ET were at the nearest star (Proxima Centauri, 4.22 light years away) and were broadcasting an omnidirectional signal, they would have to be broadcasting with a 4 gigawatt transmitter in order for us to see it. Since the power requirements go up as the square of the distance, at 42 light-years they would need 400 gigawatts. For that reason, we think it's more likely that extraterrestrials use directed beams, like radio dishes or arrays, in order to attempt signaling. If ET had an Arecibo-sized dish on Proxima Centauri, he would only need to use a 2-kilowatt transmitter for us to detect him. At 42 light years he would need 200 kilowatts." Of course, a directed beam that happens to be pointed away from us when we're listening wouldn't work too well.

❖ Want to help?

To date, 6.6 million people worldwide have participated in SETI@home. About 25% of the sky can be sampled with existing money and re-

sources (and as an enterprise funded by donations, they'd also be grateful for any contributions). Despite the massive number crunching possible by the networking of thousands of parallel computers, SETI@home remains hungry for even more computer resources. One new algorithm being contemplated would, according to Dr. Korpela, "easily require all of the compute cycles executed by all of the computers that have ever existed on Earth in order to examine a small fraction of our data. [But if] Moore's law continues to apply, perhaps this will be possible before we realize."

(Moore's law refers to the doubling of the number of transistors that can be placed on an integrated circuit every two years or so, and can therefore be used as an approximation of computing power.)

So, do you want to be a small part of the discovery of extraterrestrial life? The software that you install on your PC is actually a program called "BOINC," which stands for Berkeley Open Infrastructure for Network Computing. It currently allows you to select from a list of 39 projects, all of which require massive amounts of computer power. Here's a small sample of some of the other projects:

ABC@home - Tries to prove the ABC Conjecture, one of the greatest open problems in mathematics.
AQUA@home - Tries to predict the performance of supercomputing adiabatic quantum computers on a variety of problems
Chess960@home - Studies a variety of Chess in which the position of the men is set randomly prior to each game.
Climateprediction.net - Investigates the approximations that have to be made in state-of-the-art climate models.
Collatz Conjecture - Tries to prove another unsolved conjecture in mathematics
Einstein@home - Searches for spinning neutron stars using gravity wave detectors and the Arecibo dish.
Enigma - Attempts to decode three original Enigma messages from WWII, still unbroken.
Milkyway@home - Attempts to create a 3D map of the galaxy using data from the Sloan Digital Sky Survey.
Orbit@home - Studies the danger posed by near-Earth asteroids
POEM@home - Studies the diseases related to protein malfunction.
Rosetta@home - Tries to determine the 3D shape of proteins to help find cures for HIV, Malaria, Alzheimer's, and Cancer.

I installed the BOINC software in a few minutes on my PC from SETI@home's website (**http://setiathome.ssl.berkeley.edu/**) and selected SETI from the list of projects. Although the software uploads and downloads information constantly when running, you can control when it does it and how much disk space and memory it uses, so it doesn't bog down your computer when you are using it. When running, there's an impressive screen-saver that runs, showing you the processing that is occurring, when the data slice was created, and other interesting tidbits of information. (See Photo 2)

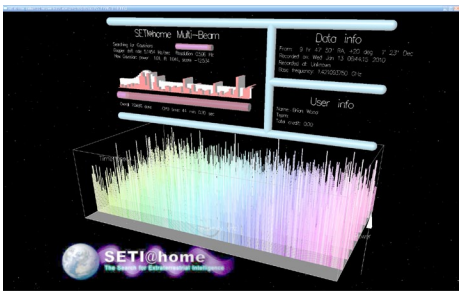


Photo 2. This is the screen-saver for SETI at Home.

What actually happens to the data?

SETI@home looks at 2.5 MHz of data, centered at 1420 MHz. This is still too broad a spectrum to send to your computer for analysis, so this spectrum space is divided into 256 pieces, each about 10 kHz wide. To record signals up to 10 kHz you have to record the bits at 20,000 bits per second (called the Nyquist frequency).

SETI computers send you about 107 seconds of this data. 100 seconds times 20,000 bits equals 2,000,000 bits, or about 0.25 megabytes. This chunk is called a work-unit. Additional info about the work-unit is also sent to your computer, so the total comes out to about 340 kbytes of data. See Figure 1.

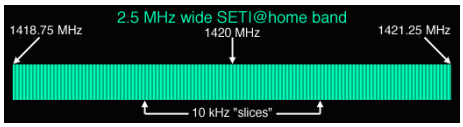


Figure 1. How the SETI data is broken up.

In *Contact*, Arroway is proud of herself for discovering the alien signal at the frequency "hydrogen times pi." This is a reference to the radio frequency generated by neutral hydrogen atoms when they change energy states, 1.420 GHz, times pi (3.14159), or 4.462332 GHz. So why is SETI@home using just the hydrogen frequency?

Dr. Korpela explained, "Most radio telescopes are built for astronomy, [so] they might not have receiver systems that can observe hydrogen * pi or hydrogen / e. New wide band receivers are being built, but in most cases the observers need to choose a smaller range of frequencies than the full band, due to what the data recording and analysis hardware can process. We're hoping the next Arecibo array will be able to cover the full range of the waterhole from the hydrogen transition to the hydroxyl transition. It still wouldn't get us to hydrogen * pi, but it's better than what we have."

In the book, *Searching for Extraterrestrial Intelligence*, The Frontiers Collection, edited by H. Paul Shuch, chapter 11, Dr. Korpela expands on this:

> *SETI@home uses ALFA, an array of seven receivers arranged in a hexagonal pattern with one in the middle, which is mounted in the enclosed dome-like structure seen suspended above the Arecibo telescope. SETI@home makes its observations in conjunction with other uses of the ALFA array. Currently this array is used to search for pulsars near the plane of the Galaxy, to map the distribution of hydrogen in all parts of the Galaxy visible from Arecibo, and to search for extragalactic hydrogen gas in isolated clouds or in nearby galaxies.*

The SETI@home system records a 2.5 MHz wide band from each of the two polarizations of the seven receivers (14 data streams in all) centered at the 1420 MHz Hydrogen line. Because the Hydrogen line would be of interest to astronomers of any species who were studying the Galaxy, this frequency is considered one of the most likely locations for deliberate extraterrestrial transmissions. These 2.5 MHz bands are recorded continuously onto hot-swappable serial ATA disk drives using 2bit complex samples. A 2TB drive holds the data for about 57 hours of observing. Data is accumulating at a rate of about 50TB per year and is archived at the National Energy Research Scientific Computing Center at the Lawrence Berkeley Laboratory.

What if your PC finds ET?

Candidate signals are sent back to the Berkeley SETI@home team for further analysis. The SETI@home team maintains a large database of known radio-frequency interference (RFI) sources. This database is constantly updated. 99.9999% of all the signals that your screen saver detects will be thrown out as RFI or test signals.

Remaining unresolved signals are then checked against another observation from the same part of the sky. This could take up to 6 months, since the SETI@home team does not have control of the telescope. If the signal is confirmed, the SETI@home team will request dedicated telescope time and will re-observe the most interesting candidates.

If a signal is observed two or more times, and it's not RFI or a test signal, the SETI@home team will ask another group to take a look. This other group will be using different telescopes, receivers, computers, etc. to hopefully rule out mundane causes. Together with the other team, SETI@home will do interferometry measurements (it takes two observations separated by a big distance). This can confirm that the source of the signal is at interstellar distances.

Once confirmed, SETI@home will make an announcement in the form of an International Astronomical Union telegram, a standard way of informing the astronomical community of important discoveries. The person(s) who found the signal with their screen saver would be named as one of the co-discoverers along with the others on the SETI@home team. At this point it would still be uncertain if the signal had been generated by an intelligent civilization or maybe some new astronomical phenomenon.

Because of this protocol, it is important that participants in the SETI@home project do not get excited when they see signals on their screen and go off on their own making announcements and calling the press. This could be very damaging to the project. Nonetheless, this is your chance to be a part of a global project with far-reaching implications.

Portions of the text in this article are from the SETI@home website, ***http://setiathome.ssl.berkeley.edu/****, and are used with permission.*

Budget DX Crystal Radio, Conclusion Components and Construction

By Dave Schmarder, N2DS

Last month we began a construction project to build an inexpensive, but effective crystal radio. Part 1 presented the circuit instructions and details on winding two coils: the "contra coil" and the antenna tuning unit. Now we get into components and assembly.

A parts list is shown below. No one at this time offers a complete kit, but the parts can be obtained from just a few places. Please look at the parts list for rest of the details. The base and panel are made from 1/8 inch thick Garolite (TM McMaster Carr). A 24x12 and a 12x12 inch piece will make two radios. Other materials can be used, but I like the appearance of Garolite machines.

Before drilling, cover the Garolite on one side with wide masking tape. This gives you the opportunity to make your measurement marks. Set the cut width to 5 inches and cut all the pieces of Garolite the long way. This will give you a 7- and a 5-inch wide piece. (Cut all the pieces of Garolite if you intend to make a second set.)

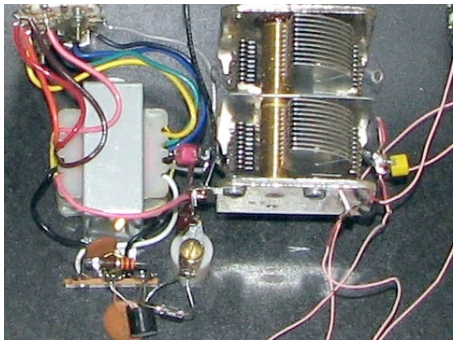
Then cut two 9-inch long pieces from the two pieces of Garolite. You have two 6-inch long pieces which can be used for the front panel. If you purchased a 12x12 inch piece of Garolite, cut the two pieces in half.

The variable capacitors are both dual section: a 400pF per section and a 330pF. A pair of 365pF capacitors can be used by increasing the ATU coil by one turn, and reducing the detector coils, each by one turn. While the detector section only needs a single section capacitor, the two-gang offers better frequency linearity (because of the offset from center shaft) and a better connection between the rotor and frame. Many of the single "365 caps" have a linear capacitance, making the tuning at the high end of the band very difficult.

The panel and chassis are fastened together with two pairs of angle brackets. Other methods can be used, but I like the Keystone angle brackets the best. It looks best if the panel overlaps the edge of the chassis base. All the outward holes are countersunk.

❖ Mounting and Adjusting Vernier Drives

After the chassis and panel are attached, the next step is the most difficult: mounting the variable capacitors and vernier drives. Start by placing strips of masking tape at the expected location of the vernier drives on the panel. Then find the vertical centers of the panels. Next, find the height of the vernier drive center. This



is done by attaching the three 1-1/4 inch long plastic standoffs to the bottom of each capacitor. A metal center point can be temporarily attached to the capacitor shaft with a shaft coupler. The point will accurately locate the height.

Once the height is found, extend the line to allow for marking the two mounting holes, which are 5/8 inches each side of the vernier center. Drill the center hole with a 7/8 inch forstner bit, and the two holes with an eighth inch drill bit.

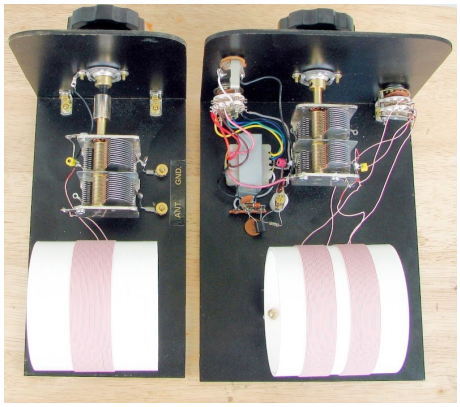
Attach the front panel and chassis together tightly after adjusting for the fit. (The Keystone brackets have #8 screw sizes; I used #6 screws to allow for adjustments.) Then attach the vernier drive and place the capacitor shaft in the vernier hole and tighten.

The ATU capacitor shaft doesn't go directly in the vernier. There is isolation required.

On the ATU, an insulated coupling should be used between the capacitor and the vernier drive. The vernier drive frame should be wired to the ground terminal. This will eliminate hand capacitance effects that will cause the antenna tuning to change after you pull your hand away.

You should be able to mark the hole positions by turning the plastic shafts slightly so that the outside bump is towards the rear and then towards the side. After you locate these positions, place markings on the chassis using a square. Replace the capacitor and check the alignment of your lines. When you first insert the shaft, you may want to pull it back slightly. This will give you leeway when finally tightening the capacitor screws.

Test the mounting of the capacitor and vernier combination. If you are a little off, you can "move" the bottom holes slightly, as that is not likely to show. In the final test, drill the countersinks and see how everything goes. If okay, congratulations! You are now over the hump!



❖ Front Panels

The front detector panel needs holes for the headphone jack and the two switches. Check the diameters before drilling, as the imported switch diameters are a little smaller than 3/8 inches. The ATU needs no further drilling.

Drill the holes to mount all the components, terminal strips and the antenna/ground connections on the ATU and detector section. No exact measurements are given, as the hole placement isn't critical. The pictures will show where everything generally goes. Now comes the wiring.

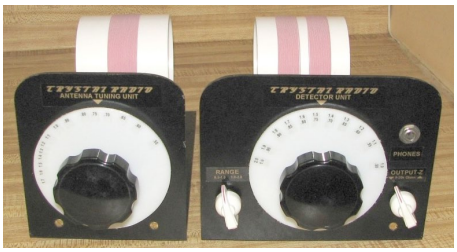
Nothing is too difficult here, except for the wiring of the contra coil wires to the switch. Two of the coil wires were soldered to the variable capacitor as there isn't a lot of extra room for two wires to a point on the switch.

❖ Alignment

After connecting the antenna, ground, and some high impedance headphones, you should start hearing stations. Careful adjustment of the variable capacitors is important. Once you have listened for a while, it is time for the alignment. A signal generator is very helpful for alignment and calibrating the dial. All alignment must be made with the antenna and ground connections in place. The signal generator is lightly coupled to the antenna/ground input.

The tuning dial can be made from any material. Three holes are drilled in the center to fit on the vernier reduction drive that connects to the capacitor. The dial can be marked in different ways. I used my Brother P-Touch ® labeling machine to make the numbers. Once the radio is built and aligned, the frequency numbers can be attached.

The detector unit is the first to be aligned. The ATU can be set aside for now, with the signal generator wires close to the coil. Set both trimmers at the mid position. When the band selector switch is in the high range and the capacitor is fully meshed, adjust the trimmer for just under 1000 kHz, but not lower than 990 kHz. This sets both ranges.



The selectivity trimmer can be adjusted later by listening and adjusting for the best selectivity, while maintaining reasonable volume levels. This completes the alignment. The frequency labels can now be attached. The labels can be made with the both high and low band frequencies shown. The high band frequency is double the low band frequency. The labels start at 2.0/1.0 MHz and go down to 1.0/0.5 MHz in 100/50 kHz steps. Calibrate the dial only using the high band. The low band frequencies will be close.

After the detector unit is calibrated, then calibrate and label the ATU dial. The calibration trimmer should be set so the top of the end of the minimum capacitance of the variable capacitor is just slightly above 1700 kHz. The markings start at 1.7 MHz and go down to 800 kHz in 100 kHz intervals. At that point, the calibration goes by 50 kHz steps down to 550 kHz. With the antenna connected, attached the dial markings. If you should change antennas, the trimmer can be adjusted so the alignment is good. Do all adjustments at 1700 kHz.

❖ Operation

With your antenna and ground connected, it is time to plug in the headphones and see what you can hear! Once a station is heard, select the best setting on the headphone impedance switch. You will notice tonal changes, too. Tune around and log the stations you hear. If you have used crystal sets before, you will really enjoy the calibrated dial aspects of this radio.

While tuning, adjust the distance between the two sections. During the day, when the signals are weaker, you can push the two sections closer together to improve the volume. At night, move the units apart so that the coupling is less, thus improving the selectivity. It won't take too long to find the sweet spot. Enjoy your new radio. Let everyone know how much you are able to hear. Bragging is a lot of fun, believe me!

PARTS LIST

Use a 12x24 inch piece of black Grade XX Garolite [McMaster Carr]
Make two complete chassis and panels with a 12x24 and a 12x12 piece

1 Garolite chassis 7 x 9 x 1/8 inch
1 Garolite panel cut 7 x 5-1/2 x 1/8 inch
1 Garolite chassis 5 x 9 x 1/8 inch
1 Garolite panel 5 x 5-1/2 x 1/8 inch
8 Rubber or vinyl feet
4 Keystone 618 angle brackets
21 Flat-head screw 6-32-3/8 [McMaster Carr]
10 Lock washers #6 internal tooth [McMaster Carr]
16 Nuts 6-32 [McMaster Carr]
10 Hex standoff, 1-1/4 inch long, plastic 6-32 male and female threads [McMaster Carr]
4 Binder head screw 4-40x 1/2 [McMaster Carr]
4 Nut 4-40 [McMaster Carr]
1 Solder lug #4 [Mouser]
7 Solder lug #6 [Mouser]
5 Binder head screw 6-32x 1/4 inch [McMaster Carr]
2 Vernier drive, 6:1 reduction ratio
2 Large knob, 1/4 inch shaft
2 Small knob, 6 mm shaft hole
2 HDPE 4 inch dial discs [DIY or Peebles Originals (special order)]
2 Flat-head screw 6-32x3/4 [McMaster Carr]
2 Washer #6 [McMaster Carr]
2 Thumb nut #6
1 Bogen T725 Transformer
1 Rotary switch 1P9T
1 Rotary switch 2P2T
1 Terminal Strip, 3 point
1 Spacer 1 inch 6-32 threaded each end [DIY]
1 Shaft coupler 1/4 inch metal [Mouser]
1 Dowel or plastic rod, 1/4 inch diameter or 1 inch long [McMaster Carr]
1 Trimmer capacitor 40pF [eBay]
2 Trimmer capacitor 20pF [eBay]
1 Variable Capacitor, dual 400pF S plate shape
1 Variable Capacitor, (dual) 330pF O plate shape
1 Coil, on 3-1/2 styrene form. 150μH 36 turns 165/46 litz wire
1 Coil, on 3-1/2 styrene form. 264/66 μH 2x26 turns 165/46 litz wire
1 Germanium diode 1n34a type
1 27 milli-henry choke
1 Resistor 33k low wattage [Radio Shack]
1 Capacitor, disc 0.1μF, low voltage [Radio Shack]
1 Capacitor, fixed 220pF, low voltage [Radio Shack]
1 Phone jack, 1/4 inch [Radio Shack]

WEBSITES:

http://makearadio.com Dave Schmarder's Homemade Radios
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http://bentongue.com Ben Tongue's crystal radio technical site.
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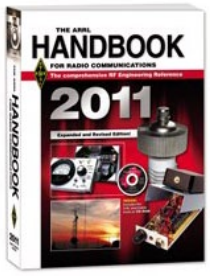
What's NEW

Tell them you saw it in Monitoring Times

Larry Van Horn, New Products Editor

The ARRL Handbook for Radio Communications

This is a book that most radio amateurs look forward to every year because its many uses in the radio shack are legendary. For more than eight decades, *The ARRL Handbook for Radio Communications* has empowered radio amateurs and professionals alike with its classic do-it-yourself approach, earning a position on workbenches and operating desks as well as in technical libraries and institutions.



The *ARRL Handbook* is part reference library and part applied theory, filled with practical treatments of basic electronic fundamentals, RF design, digital and software radio technology, and antenna construction. It strikes the perfect balance between presentation of time-tested material, coverage of the ever-expanding scope of amateur radio, and cutting-edge, experimental technology.

The new 2011 *Handbook* has been significantly enhanced, featuring new projects and the most up-to-date information available anywhere for the electronic enthusiast. New topics in this eighty-eighth edition include:

- Schematic capture and printed circuit (PC) board layout
- Amplifier tuning and maintenance, using surplus amp parts
- Restoring vintage equipment
- Remote station design

New project material in this edition includes:

- Microprocessor-based SWR Monitor-Meter by Larry Coyle, K1QW
- LTspice simulation files for basic electronic circuits
- Selecting the right battery for mobile operation

This edition also has content that has been expanded from previous editions including:

- New from Dr. Ulrich Rhode, N1UL: Oscillator and mixer circuit designs, HF mixer testing, VHF down-converter front end design, and Radio Frequency circuit simulation.
- Fifty percent more content on RF Interference, including digital TV, power line noise, and automotive RFI.
- Transmitting choke material consolidated for easy reference.

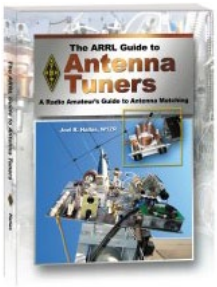
There is also a CD-ROM at the back of the book that includes all of the fully searchable text and illustrations in the printed book, as well as companion software, PC board templates and other support files. In order to use this CD-ROM you will have to have Windows XP, Windows Vista or Windows 7, or any of the Macintosh operating systems, using Adobe Acrobat Reader software. The Acrobat Reader is a free download at **www.adobe.com** and the PDF files on this CD-ROM are Linux readable.

This 1,416 page book is available in hardcover and soft cover editions and weighs in at over 6-1/2 pounds. The price for both the hardcover (a limited time only) and soft cover books is $49.95 plus shipping and handling.

The ARRL Guide to Antenna Tuners

In the amateur radio world, antenna tuners are devices that are often misunderstood. While not every station requires an antenna tuner to transmit radio signals, often an incompatibility between the transmitter and the antenna system results in poor performance. An antenna tuner between them is often the way to obtain efficient operation.

For the first time ever, Joel R. Hallas, W1ZR, has written a new book that removes the mystery and mystic surrounding antenna tuners in the radio shack. *The ARRL Guide to Antenna Tuners* discusses the details of the different configurations and requirements of antenna tuners. It explores the design, construction and applications of the different types. In this book you will learn what type of tuner is needed in your station and where to install it for maximum improvement.



This guide will give you a better understanding of your antenna system and how it can be improved through the selection and use of the appropriate antenna tuner. Some of the subjects you will read about in this new ARRL book include:

- So just what is an antenna tuner and why might I need one?
- A look at a typical configuration and how to tune an antenna tuner.
- Information on balanced, internal and external tuners.
- Transmission line choices for low loss and balanced versus unbalanced lines.
- What's a balun, an unun, and a choke?
- Antennas that work well with tuners.
- A survey of available commercial tuners and material on rolling your own tuner.

The ARRL Guide to Antenna Tuners is a 160 page soft cover book and sells for $22.95 plus shipping and handling.

You can order both the ARRL books mentioned in this column via snail mail to 225 Main Street, Newington, CT 06111-1494 or visit their website at **www.arrl.org**.

Microham Digikeyer™ II Digital Mode Interface

Microham has released a new digital interface unit – the Digikeyer™ II. This new interface is a powerful all-in-one USB interface used for amateur radio digital mode operation including modes such as RTTY, PSK31, MFSK, Olivia, WSJT, APRS, PACKET, and many others.

This new DigiKeyer II replaces several different external level converters such as the CT-62, IF-232, FIF-232, or CT-17 interface units. It combines the proven performance of the original DigiKeyer; a high performance USB audio class compliant sound system; the control and interfacing of microKEYER II; the K1EL WinKey keyer; independent PTT outputs for both low noise amplifier and power amplifier control; and MicroHAM's unique detector/driver for fldigi's p-FSK and q-CW modes.

The DigiKeyer II includes a rig control interface for all supported radios (Elecraft, Icom, JRC, Kenwood, Ten-Tec, and Yaesu), an internal stereo sound chip using standard Windows sound drivers, and a K1EL WinKey CW Keyer.

The DigiKeyer package contains the interface, a CDROM with drivers, control software and manual, USB A-B cable 2-meters (6.5 feet) long, and one radio cable (specify your radio when ordering), and it sells for $339. You can get more information at **www.microham-usa.com**.

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

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LETTERS

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Rachel Baughn
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A New Face for the Ham Bands

Kirk Kleinschmidt, NT0Z, is a new face for many *MT* readers, but he's been a ham for 33 years and has been writing about ham radio in books and magazines for 22 of them. From 1988 through 1994 Kirk was an editor at *QST* magazine, and during his time in Newington, Connecticut, he edited the 1990 *ARRL Handbook* and absorbed as much as he could from the engineers and techs in the ARRL Lab.

"They put up with my incessant questioning," Kirk says, "and I suffered a lot of good-natured teasing. But … in the end, I learned a lot through osmosis." The Lab, filled with sheet metal fabrication tools, experts at the ready and a vast array of high-end test gear, ranks near the top of what NT0Z "misses most about the East Coast."

A long-time QRP operator (QRP ARCI 5797), Kirk works mostly CW (160 through 6 meters), with some digital and SSB thrown in for good measure.

"I live in a condo for the moment," Kirk says, "So I run low power because I enjoy the challenge of it, and because it keeps potential RFI issues to a minimum. When I am able to move to an RF-friendly QTH I will probably run SSB a bit more and crank up the power to 100 W, if necessary."

Kirk also authored *Stealth Amateur Radio* in 1999, published by the ARRL, which became somewhat ironic several years later: "When I wrote the book, I was living in a small Minnesota town that has no restrictions whatsoever when it comes to radio, antenna towers, etc. I had a medium-size tower and a big horizontal loop antenna. I maxed out at 100 W, but I didn't bother anyone, and nobody was bothered by my tower, which was attached to the side of the garage and appeared to be "empty" because it had no directional antenna atop it and it merely held up one leg of my loop. I had to remember my college days to truly get into the spirit of "stealthy radio." Little did I know that I'd be condo-bound six years later and in need of my own advice."

An enthusiastic home-brewer, NT0Z has built his share of receivers, transmitters, antennas and station accessories over the years – even a linear amplifier, which belies his QRP roots.

The NT0Z byline has appeared in *QST* many times over the years, and Kirk has been writing about ham radio for *Popular Communications* since 1989. While his 2010 and 2011 *Buyer's Guide* features were among his first for *MT*, Kirk wrote several features for *MT*'s defunct sister pub *Satellite Times* in the mid-'90s, where he first met Larry Van Horn, N5FPW.

We'd like to welcome Kirk to the pages of *MT,* and, as Kirk readily agrees, if something goes horribly wrong, we'll blame it on Larry!

Rachel Baughn, Managing Editor

Antenna Buyers Guide No Service

Reader Chris Karnow of Boise, ID took us to task recently for publishing antenna manufacturers' claims in our November *Buyer's Guide* which he felt were exaggerated:

"The specifications, no doubt provided by the manufactures, are beyond dubious. No scanner antenna – discone, vertical dipole, directional beam or otherwise – can possess the ability to adequately receive the wide frequency ranges you indicated in the roundup. Presenting such self-serving garbage does your loyal readers a true disservice."

Chris has a good point about manufacturers' claims, but the key here is the word "adequately." Keep in mind that we are talking about receiving, not transmitting.

While none of the antennas listed can provide a perfect impedance match, uniform pattern, and ideal gain over the frequency ranges stated, let's not indict these manufacturers before we examine the issue more closely.

The majority of scanners are used primarily for reception of strong, local, public safety communications and don't require idealized antennas for "adequate" reception. The little whips included with hand-held scanners work well for local listening.

It's when distant reception of transmissions is important that antenna impedance, directivity, and gain become important. Extremely wide frequency coverage *is* available for receiving and transmitting on some antennas.

Let's take a look at the actual lab measurements for one of the antennas disputed by Chris, WiNRADiO's AX71C. It has an average VSWR of approximately 1.5:1 from 100-3500 MHz, narrowly edging 2.1:1 at about 1400 MHz. See the graph at **www.grove-ent.com/wrax71c.html**.

The MP Super-M Ultra has a lab-confirmed VSWR averaging 1.8:1 continuously from roughly 120-6000 MHz. Clearly, these antennas are capable of receiving and transmitting over far greater frequency excursions than Chris gives them credit for.

Bob Grove, Publisher

Cannabis or Can 'a Worms?

"I finished reading the article on grow lights within the November issue. On some levels, I was bothered by what I read. First of all, nobody ascertained that there was active cannabis growing in the area. When someone submits an anonymous article, it leaves no frame of reference. Nobody proved anything. The resident in question left the area. Why? Was it because some possibly paranoid person was running about the neighborhood writing down license numbers when their target was totally innocent? Who knows?

"So, I have a question. Had this person been growing 'legal' plants, what right does this person have to harass someone else without a shred of evidence? Although it may appear to be a 'grow room,' it could have been a completely legitimate operation. Otherwise, the police would have initiated a search warrant based on this so-called compelling evidence. I am happy they acted with some discretion and restraint. It is 'high' time this country stopped making the drug cartels powerful and wealthy like they did during the prohibition of alcohol. I happen to like cannabis. I will continue to smoke it as long as I can breathe air."

Submitted anonymously

The issue, as the article's author stated early on, was not whether or not someone in his neighborhood was growing dope. The issue was that something in his neighborhood was creating interference on the amateur radio bands, which no one, legitimate or not, is allowed to do. The problem came when he researched the possible source of interference and discovered that it could well be an illegal activity that may include more action than he wanted to be involved with and a possible threat to his own and his family's safety, as he stated in the article.

Rather than suffer the interference in silence or confront the individuals himself, it was prudent for the writer to alert the local authorities, who, for whatever reason they may have had, chose not to act.

For nearly 100 years hams have been forced to track down sources of interference to their on-air activities on their own. The article simply points out that all interference may not be as innocent as a neighbor's light dimmer switch and the writer cautions hams to that effect.

Ken Reitz, Features Editor

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

AR2300 "Black Box" Professional Grade Communications Receiver

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

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

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

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

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- Alphanumeric channel labels
- Fast Fourier Transform algorithms
- Operated by a Windows XP or higher computer through a USB interface using a provided software package that controls all receiver functions
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- Analog composite video output connector
- CTCSS and DCS squelch operation
- Two selectable Type N antenna input ports
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**Cellular blocked for US consumer version. Unblocked version available to qualified purchasers with documentation. Specifications subject to change without notice or obligation.*

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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

BELOW 500KHZ
http://below500khz.blogspot.com/ - by Kevin Carey

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

SCANNING REPORT
http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

UTILITY WORLD
http://mt-utility.blogspot.com/- by Hugh Stegman
www.ominous-valve.com/uteworld.html

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