Scanning - Shortwave - Ham Radio
Equipment - Computers

Monitoring Times

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April 2005

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The Changing World of FM DX

Also in this issue:

Antenna Alternatives:
Keep the Neighbors Happy!

Propagation Outlook for the Summer

MT Reviews:
The Sangean Super-909
Kestrel 4000 Pocket Weather Tracker
The Wireless PC Lock

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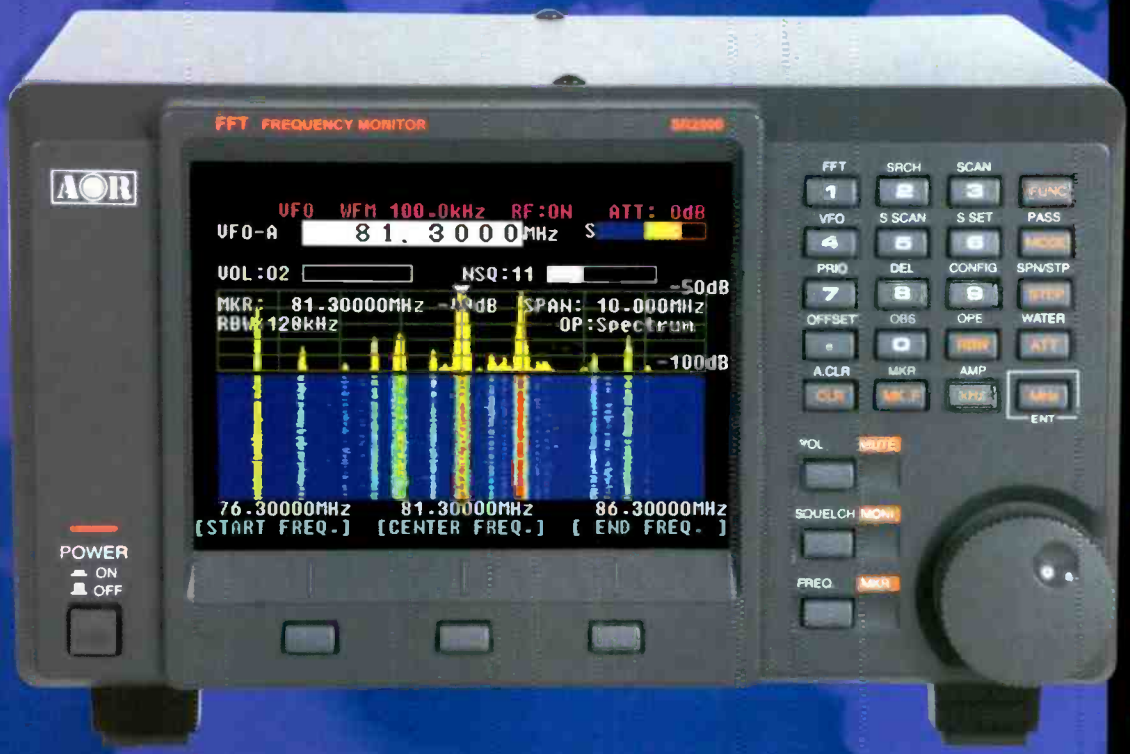
0 74470 74654 6

AOR SR2000 Frequency Monitor

Seeing is Believing!



High Speed FFT Search – Scans 10 MHz in as little as 0.2 seconds! Instantly detects, captures and displays transmitted signals.

- **FFT (Fast Fourier Transform) high speed display**
- **Displays up to 10MHz of spectrum bandwidth**
- **5 inch TFT color LCD display**
- **Waterfall (time) display function**
- **High speed FFT search** quickly captures new signal transmissions
- **Versatile color display** uses state of the art digital signal processing
- **Average or peak value readings**
- **Frequency coverage:** 25MHz ~ 3GHz (no gaps)
- **Ultra-stable, high-sensitivity triple-conversion receiver**
- **AM/NFM/WFM/SFM receive modes**
- **1000 memory settings** (100ch x 10 memory banks)
- **Easy menu-driven operation**
- **PC control** through serial port (or optional USB interface)

The SR2000 is an ultra-fast spectrum display monitor with a high quality triple-conversion receiver

AOR puts the power of FFT (Fast Fourier Transform) algorithms to work in tandem with a powerful receiver covering 25 MHz ~ 3 GHz continuous. The result is a compact color spectrum display monitor that's ultra-sensitive, incredibly fast, yet easy to use. The SR2000 is perfect for base, mobile or field use and can also be used in combination with a personal computer. It's another example of why so many Federal and State law enforcement, military units, surveillance agencies, government users, hospitals, RF labs, News Media and monitoring professionals rely on AOR, the Serious Choice in Advanced Technology Receivers.

SR2000
Standard Accessories:
AC adapter, control cables

AOR®
Authority on Radio Communications

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Tel: 310-787-8615 Fax: 310-787-8619
info@aorusa.com http://www.aorusa.com

HF receivers are a fine art. Just look at this one.

Many try but few succeed in achieving the fine balance of often contradictory parameters, which all combine to make a truly great receiver. The WiNRADiO G313i is one such masterpiece. Here is why:

Powerful graphical user interface

Small PCI card fits in any modern desktop

Sensitivity

Of course, the more sensitivity the better - as long as it is not at the expense of strong signal handling. The G313i receiver is one of the most sensitive receivers around. Which other receiver has such a low noise floor that it would allow you to pick and clearly hear CW signals under 0.05µV? Its AM sensitivity better than 0.35µV makes it into an ideal receiver for DXing and other long distance monitoring.

★ *"The measured sensitivity was remarkably consistent over most of the frequency range at -119dBm for 10dB S+N/N" - WRTH 2005*

Strong Signal Handling

Surely with such great sensitivity you would not expect very good strong signal handling? But with the G313i you get it anyway thanks to its respectable 95 dB of spurious-free dynamic range.

Spurious Response

While talking about spurii, how about internally-generated ones? Especially with a receiver which is placed inside a PC this would have to be pretty bad? Not with the G313i. It is one of the quietest receivers available.

★ *"As with the G303i, the G313i's lack of receiver spurious responses was quite astonishing given that the inside of a PC is hardly a hospitable electrical environment" - WRTH 2005*

Selectivity

With a Software-Defined Receiver surely the DSP filters will not be as good as conventional ones, right? Wrong again: The G313i offers continuously variable, graphically adjustable bandwith from 1 to 15000 Hz, with a filter shape factor of 1:1.35.

★ *"Overall I found the filter and notch slopes to be very steep indeed, a classic 'brick wall' response!" - RadCom March 2005*

Special Features

Along with great performance at an incredibly low cost, you also get much more with the G313i receiver. In addition to a real-time spectrum scope, two wide-band swept spectrum scopes with 16 Hz resolution, and a recorder for both audio and IF signals (making it possible to "re-receive" a transmission with different filter settings), it also has a continuously adjustable squelch filter, noise blanker, and many other goodies too numerous to mention in this limited space.

Measurement Tools

The G313i receiver contains many test and measurement features which previously have not been available in any receiver of this price class: The receiver's S-meter (which can display in S-units, µV or dBm) is calibrated to 2 dB accuracy and can measure signal strength all the way down to the receiver's noise floor of -137dBm. An audio spectrum analyzer with 5 Hz resolution, THD and modulation depth meters are also included. The internal TCXO reference oscillator with 0.5 ppm stability makes it possible to measure a station's frequency to 0.1 Hz resolution. And with the included SINAD measurement function, the G313i is the only receiver which allows you to measure its own sensitivity by adding only an external signal generator. Yet, there is still much more!

Too good to be true?

So many great features in one product are hard to believe; such an incredible receiver would surely have to receive 5 star ratings and be well known and widely used "in all the highest places"? Yes indeed: WRTH rating 5 stars, and supplied to defense, government and other discerning users worldwide.

For more information, please visit our website and judge for yourself why WiNRADiO receivers are in a class of their own.

www.winradio.com/g3

Monitoring Times

Vol. 24, No. 4 April 2005

Cover Story

The Changing World of FM DX

By Ken Reitz

Last month we looked at some challenges facing FM broadcasting. In this issue we look at challenges facing the FM DXer.

What if you want to extend the reach of your FM reception beyond your general geographic area? Your primary solutions will focus on the antenna, but there are also tuner, cable, and modification options as well to help pull in those distant signals.

On our Cover: Dwarfed by its AM antenna, WCVP's FM antenna is silhouetted against the North Carolina sky. (Photo by Larry Van Horn.)

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Reviews:

When RadioLabs performs its modification magic on the Sangean ATS-909, they call the resulting model the **Super-909**. Jim Clarke puts the augmented model to the test to see what makes it Super (page 70).

As we move into spring storm season, it is more important than ever to be mindful of severe weather. For those of us who aren't well-versed in the natural arts, the **Kestrel 4000 Pocket Weather Tracker** will watch the signs for you (page 69).

AM/FM reception for the apartment or the office can be a challenge, but **Terk's indoor antennas** are not only an improvement, they're art! (See page 68.)

Another aid to weak signal reception is simply to get a good set of headphones. check out three top competitors in the review on page 20.

Tivoli Audio is bringing its extraordinary sound into the future with the introduction of the **Tivoli Model Satellite Sirius table radio**, receiving AM/FM and Sirius satellite radio, plus plug-ins for CD player, additional speaker and sub-woofer (see page 66).

"Protect your computer with a radio and listen to your table?!" Has Catalano gone over the edge? No; with his flair for finding unique but useful products, our reviewer has unearthed two interesting products: The **Wireless PC Lock** protects your computer from meddling when you are away from it, and the **Soundbug** turns any flat surface into a speaker! (See page 72.)

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Power Source: 3 AA batteries (included)

G2000A

AM/FM Shortwave radio by F.A. Porsche

Timeless Porsche style - $80*
- Autoscan and direct keypad tuning
- 20 programmable station presets
- Dual alarm and sleep timer functions
- Snap-on protective leather case that converts to stand

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*Prices do not include Shipping/Handling and applicable taxes. To order please call us toll free at 1-800-793-6542

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Through_Necessity

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Power Source: Hand-Crank Power Generator with rechargeable battery pack, 3 AA batteries (not included) or AC adaptor (not included)

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- Hand-Crank Power Generator
- Built-in Cell Phone Charger
- Built-in flashlight and emergency siren
- Inputs for AC adaptor and earphones
- Rugged splash-proof ABS body

Dimensions: 6.7"L x 6.5"H x 2.5"W Weight: 1lbs. 5oz.
Power Source: Hand-Crank Power Generator with rechargeable battery pack, 3 AA batteries (not included) or AC adaptor (not included)

FR200

AM/FM Shortwave radio and flashlight - $40*

Emergency crank radio
- Hand-Crank Power Generator
- Built-in flashlight
- 7 International Shortwave bands
- Perfect for camping, hiking, and everyday use

6 colors: Metallic Red, Metallic Blue, Metallic Pearl, Metallic Bronze, Yellow, and Sand.

FR100

AM/FM radio and flashlight with blackout alert - $30*

Plug-in radio with blackout alert
- Just unplug it for bright light and an AM/FM radio
- Plugs into the wall for continuous charging
- Illuminates automatically during a power failure
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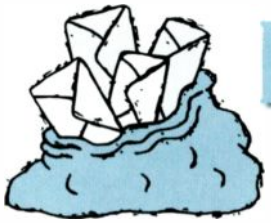

LETTERS TO THE EDITOR

Preserve Analog Shortwave Broadcasting

By Md. Azizul Alam Al-Amin
Bangladesh, alamin@librabd.net

Since the discovery of broadcasting technology in the last century, the radio – especially shortwave radio – still remains the most effective and easy mass communication media in the world. It plays quite an important role in the daily exchange of culture, trade information and significant events from all corners of the globe. Keeping a portable shortwave radio set in his pocket, anyone, anywhere, may connect to the rest of the world. Even an illiterate person is able to learn of the latest events by listening to radio.

There is no denying the fact that nowadays international broadcasters around the globe are competing fiercely. To serve their listeners better, most of them are trying hard to adopt the latest techniques and technology. They are collecting first hand news and information and compete to be the first to spread it over the air. Those who can give the most prompt, accurate, and, of course, impartial news make the biggest impression on the listener. If we look at the Iraq conflict, however, the western media failed to perform this mission due to many reasons; they are now trying to regain their popularity.

International broadcasters are trying various ways to increase the audience, because without a reasonable number of listeners a radio station would be worthless – like a service without customers. The whole aim of a radio station, in my opinion, is "For the listeners, By the listeners and Of the listeners."

The Digital Future

When Marconi first transmitted wireless signals over a distance of three kilometers more than a century ago in 1896, no one could suspect the global triumph that ultimately awaited the new technology. Now we are faced with a wave of changes within the media environment. With vast technological advances in telecommunications, we exist in a multi-media age in which the integration of media and communications has eliminated pre-existing media boundaries. Most of the media are now confronted with the task of preparing and making the leap into the highest echelons of new-age media.

Before the 1960s there were only two main ways for broadcasting. That is amplitude modulation, known as AM, and frequency modulation known as FM. Both methods remain in universal use. These methods are analogue systems.

The invention of the integrated circuit in the late 1960s and the microprocessor in early 1970s has brought about widespread adoption of digital techniques. The latest technologies – Digital Audio Broadcasting (DAB), Digital Radio Mondiale (DRM), WorldSpace, and Mobile Broadcast Network (MBN) – are now used in broadcasting.

Due to the digital revolution in broadcasting technology, conventional shortwave is facing an uncertain future. The trend to digital technology will say "good-bye shortwave" very soon. The question seems to be the exact date when the analogue type of broadcasting will terminate its operations.

The Future for SW Listeners

As a long time SW hobbyist I felt very depressed to see the dying of shortwave broadcasting, although I realize the importance of digital broadcasting, which will enable very high-quality audio without any interference or disruption. I am concerned particularly for the so-called third world countries, especially African continent, where even electricity is scarce. Here shortwave is still playing a primary role as it did a hundred years ago. Most of the peoples are living below the poverty line; they have not enough food or clean water. Will these hungry and needy but curious peoples be able to afford the latest digital technology? This picture is also likely in some parts of South Asia.

Mr. Allen Cooper of Allen Cooper Associates, UK, established that most international broadcasters find their largest audiences in the world's developing countries. At least three quarters of both BBC and VOA weekly global audiences are to be found in Africa, the Middle East and Asia. Mr. Colin M Wilding, Senior Analyst of BBC Marketing and Research, pointed out that BBC possesses a large number of listeners in Nigeria, Ghana, Ivory Coast, India and Bangladesh (*151 Million Listeners-But What Does It Mean?*). Most of the global audiences live in the third world and developing countries, especially Africa and South Asia, where many of them have no access to PC or internet, no devices to receive satellite signals, no television or even newspaper. They only depend on shortwave broadcast. It is their main source of news, information and entertainment because of its relatively very cheap cost.

Mr. Peter Senger, Chief Engineer of Deutsche Welle and Head of the DRM consortium, speculated that more than two billion radios are in use globally, receiving long, medium and short wave and generally FM as well. I think this number has increased dramatically. I am afraid for the future of these two or three billion radios when the new generation digital technology DRM will be in universal use.

According to the report of Dr. Kim Andrew Elliot, Audience Research Officer of VOA "Shortwave Broadcasting begins its Long Slow Fade (but International Broadcasting Endures)" published in the *World Radio TV Handbook* in 1995, shortwave audiences are decline but not everywhere. In Nigeria, for example, about 18 million people listen at least weekly to the BBC World Service. In Bangladesh 7 million do the same. Countries with limited domestic media provide the largest audiences for international radio.

While radios with shortwave bands are

typical in these countries, most provide mediocre reception. Let's look at Bangladesh, for example. In Bangladesh there are more than four million radio receivers, and despite rapid changes and development in the broadcasting arena, shortwave is still an important media because most people can afford it. Tens of thousands listen to radio programs every day. Both national and international radio programs are popular here. Most popular are BBC World Service, Deutsche Welle, Voice of America, China Radio International, Radio Veritas-Asia, Radio Japan, Radio Tehran, and Radio Korea International.

I visited many places in Bangladesh and met the listeners to discuss radio listening and how they pick up shortwave signals in their region. I was really surprised to notice a lot of people tuning radio, especially Bengali, English, Hindi and Urdu services. These listeners come from various age groups, but those who preferred radio listening were in their 20s and 30s.

In addition to individual listeners, there are many DX/listeners clubs scattered all over the country. Each DX club possesses 5-50 members, and some even 100 or more members. They usually listen individually or with their families. These clubs play an important role in publicizing radio listening in their locality. Sometimes the clubs organize a DX conference, seminar, exhibition at which many DX enthusiasts participate. Some also conduct social welfare programs such as non-smoking campaigns, tree planting, raised social awareness, etc.

To keep their potentially huge listening audience in the so-called Third World and developing countries, international broadcasters should not neglect traditional analog shortwave broadcasting until at least the next century.

References:
World Radio TV Handbook, 1995 edition.
Radio World, Worlds of Radio, Published by Deutsche Welle, Germany in Feb 1999.
An Essential Link With Audiences Worldwide: Research for international broadcasting, DW

We welcome your ideas, opinions, corrections, and additions in this column. Please mail to ***Letters to the Editor,*** 7540 Highway 64 West, Brasstown, NC 28902, or email *editor@monitoringtimes.com*. Letters may be edited for length and clarity.
Happy monitoring!

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APRIL ANTENNAS

"Light" Antennas

An antenna transmits and receives electromagnetic waves at wavelengths that are close to the length of the antenna, and it does so by converting electrical current to electromagnetic waves and vice versa. However, we are prone to forget the electromagnetic spectrum spans much more than just radio waves.

At the other end of the spectrum from radio waves, visible light can be captured by carbon "nanotube" antennas, which are rolled-up sheets of carbon atoms. Using arrays of multiwalled carbon nanotubes, researchers at several educational and military institutions have demonstrated the "light antenna" effect.

The method could be used to convert optical signals to electrical signals in communications equipment; to carry out optical computing; to detect different wavelengths of light including the infrared wavelengths used in telecommunications equipment; and to convert sunlight to electricity.

When an antenna farm becomes a forest

Navy ships can absolutely bristle with odd-shaped antennas – upwards of 150 on the newest destroyers! And every antenna dedicated to a single function, such as satellite communications or submarine contacts, requires its own equipment, back-up systems, etc. Besides the expense, the antennas can also interfere with one another and reduce their effectiveness.

Last year, the Office of Naval Research began testing the advanced multi-function radio frequency concept (AMRF-C), using electronic modules and software to enable antennas to handle multiple communications, radar, and electronic warfare functions. Plus, cut down the forest of antennas!

VOLUNTEERS NEEDED

Ham radio operators and scanner listeners in northeastern states are needed to assist in a wildlife radio-tracking project from mid-April to early May 2005. The New York State Dept of Environmental Conservation is placing tiny VHF radio transmitters on Indiana Bats, an endangered species, as they leave their winter homes in two caves. The goal is to track them to determine their summer habitat.

The caves are on Long Island and in western New York state. Researchers believe that the bats' summer homes may be in New York, New Jersey, Pennsylvania, Connecticut, Ontario and Quebec.

The tiny transmitters will be on many spot frequencies between 150 and 151 MHz. Although scanner receivers can pick them up when very close, a receiver with SSB/CW capability will give optimum range. For latest updates on this project, including frequencies, go to **http://www.homingin.com**. This site also describes the special characteristics of biological radio tags and has information on the best equipment to monitor them and do field tracking.

This appeal is via Joe Moell K0OV, author of an article on wildlife monitoring in the Dec 2002 issue of *MT*.

FCC

Nextel Accepts FCC Proposal

In early February U.S. operator Nextel Communications announced that it has formally accepted the FCC's proposal for the reorganization of its 800MHz operations in order to improve public safety radio interference. The implementation phase of reconfiguration of the spectrum band will begin immediately.

It was announced that New York, Washington DC, and San Diego will be among some of the first areas in the U.S. to see the first wave of the 800MHz spectrum reallocation process. The total reconfiguration of the 800MHz band will comprise four waves, the first three of which are to be completed by the second quarter of 2008, while the fourth wave, which covers the border areas of Canada and Mexico, may take longer due to diplomatic negotiations.

FCC Reaffirms Cable Ruling

In a bipartisan majority, the FCC reaffirmed policy set in January 2001 that says cable companies are required to carry only the primary video service of over the air television broadcasters, even if the station is using its digital bandwidth to transmit five or six channels when not beaming an HDTV picture. The National Association of Broadcasters is expected to appeal the ruling to Congress.

House Approves Indecency Fines

In February, the House of Representatives overwhelmingly passed a bill to increase maximum fines for indecency to $500,000 for a company and to $500,000 for an individual entertainer.

"With passage of this legislation, I am confident that broadcasters will think twice about pushing the envelope," said Rep. Fred Upton, R-Mich., chairman of the House telecommunications panel and author of the bill.

A similar bill has been introduced in the Senate, where it has broad bipartisan support. Any differences in the two bills will have to be resolved before it can go to President Bush for his signature. Last year, the two chambers were unable to reach a compromise.

Opponents said they were concerned that stiffer fines by the Federal Communications Commission would lead to more self-censorship by broadcasters and entertainers.

Excuse me, what am I missing? I thought that was the whole point!

More Disciplinary Action

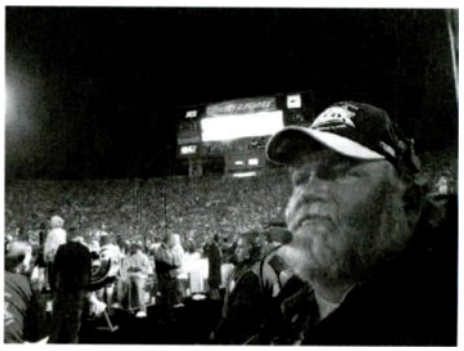
In a similar vein, here are two repeat offenders who seem to be incapable of self-censorship. On February 16 the FCC affirmed a $4000 fine for Paul D. Westcott, KC0OAB, of Purdy, Missouri, for "willful and repeated failure to respond to Commission requests for information about his station." KC0OAB has apparently been transmitting CW "24 hours a day, 7 days a week" on 7.030 MHz for several months. Westcott claims the tapes are for code practice, but has not addressed the complaint that the transmissions, which consist largely of biblical text, constitute religious broadcasting.

The Commission gave Westcott 30 days to pay the fine or risk facing collection proceedings through the US Department of Justice.

The infamous Jack Gerritsen (who briefly held license KG6IRO) of Bell, California, now faces a total of $52,000 in FCC-imposed or proposed fines! On January 21 the FCC proposed to levy another $21,000 forfeiture on Gerritsen –this time for interfering with a US Coast Guard rescue effort last October 29 on amateur frequencies.

"Gerritsen's apparent willful and malicious interference with the radio communications of the Coast Guard Auxiliary officer who was attempting to communicate with a ship in distress is egregious," said the FCC Los Angeles District Office District Director Catherine Deaton. "According to the evidence, Gerritsen knowingly operates, without a license, radio transmission equipment."

"Communications" is compiled by editor Rachel Baughn (editor@monitoringtimes.com) from newsclippings provided by our readers. Thanks to this month's reporters: Anonymous, Md. Azizul Alam Al-Amin, Howard Bailen, Wayne Chandler, KR Koenitzer, Pete Kemp, Sterling Marcher, Joe Moell, Jerry None, Ken Reitz, Michael Reynolds, Doug Robertson, Brian Rogers, Larry Van Horn, Ed Yeary.



Amateur Radio operator Wayne Chandler, N4KWC, used direction finding equipment to help eliminate interference between the more than 8000 RF radio transmitters that were in use by over 50 different law enforcement agencies, other government services, stadium security, vendors and broadcast and media crews during Super Bowl XXXIX. Chandler holds the rank of Captain with the Civil Air Patrol and is also the owner of a two-way radio sales and service company located in Jacksonville, Florida.

The Changing World of FM DX

By Ken Reitz

The FM band is a versatile band where it's possible to hear high fidelity stereo while still having a chance for real long distance (DX) openings. And, while most programming is canned and bland, there are local treasures of imaginative and innovative programming to be found all across America. This band is home to unusual college stations, religious stations, and unauthorized pirate stations, all of which keep FM DXers tuned in.

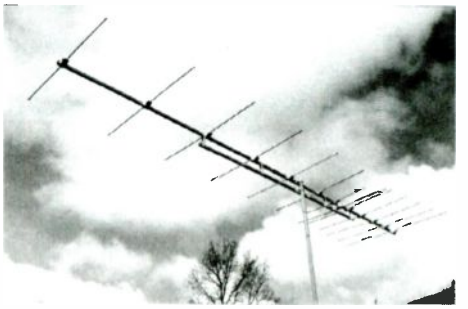
Improving Your Chances for FM DX

FM DX happens basically two ways: During the summer months freak E-layer skip conditions permit perfect reception from stations five hundred to a thousand miles away for brief periods of time. This type of DX is almost completely random. It usually catches the listener off-guard and often disappears before the listener realizes what happened or before a positive ID can be made. Sometimes this type of reception will last an hour or more and then disappear as quickly as it came.

The other type of DX is trying to extend the reach of your reception beyond your general geographic area, trying for more reliable reception for entertainment value. FM waves are generally line-of-sight reception with a little help from atmospheric refraction. It's tempting for those of us living within a 150 mile radius of a major metropolitan area to try to tune in some of the more interesting lower power FM stations. To do that we'll need some help.

The Antenna Option

The easiest way to improve FM reception on virtually any receiver is by improving your current antenna. The greatest improvement will be seen by adding an outdoor antenna. If you don't have the option for an outdoor antenna, there are a few indoor options.



The APS-13, considered by many FM DXers to be the premiere FM DX antenna. At $219 plus shipping it's not cheap. (Courtesy APS)

Typically, with any monitoring situation, the bigger your antenna the better your reception results. Below you'll find a comparison chart of widely available outdoor antennas. I've refrained from putting the often-abused dB gain figures in the chart because they aren't particularly reliable. I've also not included the nearly useless "miles range" figure most antenna companies tout for the same reason.

Few companies are making an FM-only antenna anymore. This is why VHF-TV antennas are also listed. Since the FM band is located between channels 6 and 7 on the VHF-TV band, any big VHF-TV antenna will work for FM reception.

All antennas listed below are 300 ohm impedance and, when used with 75 ohm coax cable, will require a 300/75 ohm balun. Some antennas are packed with the balun; others include a balun in the recommended and separately sold pre-amp kit; others have to be purchased separately. The balun has a short pig-tail of 300 ohm twin lead, which is attached to the two terminals on the driven element of the antenna. The other end of the balun has a 75 ohm coax fitting, which is where you'll attach your coax feed going down to your receiver.

MT FM ANTENNA COMPARISON CHART

Make	Model	Length	Boom Elements	VHF Impedance	Price
Ant Performance Specialists	APS-13	200"	13	300*	$219.95
Ant Performance Specialists	APS-9B	100"	9	300*	$119.95
Channel Master	3671	173"	n/a	300*	$165.00
Radio Shack	VU-190XR	160"	9	300	$99.99
Winegard	PR-7052	170"	10	300	$100.00

**antenna matching transformer included*
All antennas are UPS shippable

Antenna Mounting Options

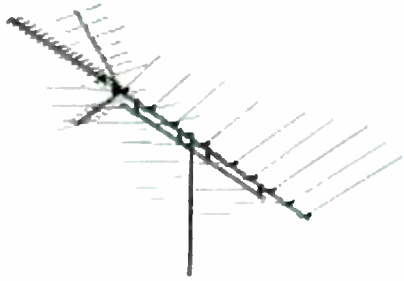
The higher you can put an outside antenna, the better your reception. Most of us have limits as to how high we can go, as dictated by homeowner's association agreements or cost. The cheapest mounting option is to use 10-ft. tubular mast sections available at Radio Shack and mount them to an outside wall with mounting brackets. Normally, two of these masts will get your antenna up high enough for good reception. If you add more mast sections you'll need some sort of guy support to keep the mast from bending over (particularly in a heavy wind).

Avoid tripod mounts, as the necessary penetration of the roof may cause hard-to-fix leaks. Avoid installations near electric power lines, as there is an extreme risk of electrocution should the antenna and/or mast come into contact with the line while you are attempting the installation. Also, avoid chimney mounts as the force from constant twisting of the antenna in the wind will eventually cause the mortar in the chimney to crack.

If you want to receive FM signals from more than one direction, you'll need a rotor. These are relatively cheap (about $70), but you'll need a length of rotator cable to power the rotor from the control box inside the house. Always overestimate the amount of cable you'll need. Also check to see how many wires your rotor requires.

The Antenna Pre-Amp Option

Any outside FM antenna's reception will be further improved by adding a mast-mounted pre-amplifier. These are typically broadband signal amplifiers which have two components. One is the mast-mounted device, which connects to the balun via a short piece of 75 ohm coax. The other component is the power supply and amplifier, which sends a small voltage to the pre-amp at the antenna by way of the coax cable. The pre-amplified signal comes down the coax to the amplifier, which sends it to your tuner via another coax cable.



Radio Shack doesn't make an FM-only antenna anymore but this Radio Shack UHF/VHF/FM antenna (model #15-2156) makes a decent FM antenna and at $100 you get UHF and VHF TV thrown in! Use an antenna rotator, a good pre-amplifier and RG/6 coax cable to make a nice DX antenna system." (Courtesy Radio Shack)

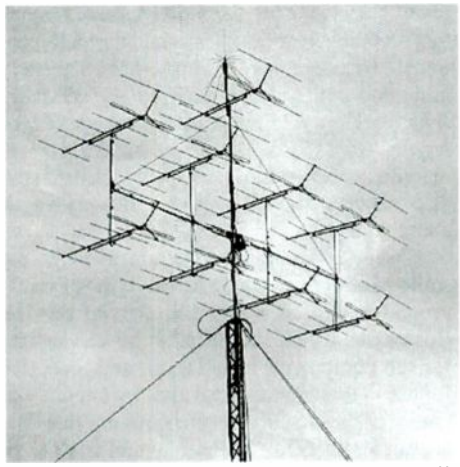
You may split the signal coming out of the indoor amp so that you can feed your FM receiver with one leg of the splitter and your TV set with the other. There is always a slight loss of signal whenever you split an antenna feed, but in most cases this really won't matter. However, if you chose a VHF-TV/FM antenna from the aforementioned chart, you won't get much in the way of UHF-TV reception. That's why, if your aim is to be able to feed both your FM receiver and your TV set from one antenna, it should be an FM/VHF/UHF-TV antenna.

The Antenna Stacking Option

A popular antenna installation among serious FM DXers is to "stack" two identical antennas for increased gain. This method is used commonly among hams who specialize in VHF single side band (SSB) activity, particularly when working the amateur satellites or doing Earth-Moon-Earth (EME) transmissions. The theory is that the more antennas you can stack, the more gain (see photo of Kelly Lindman's nine FM antenna stacked array). For decades America's cable-TV systems have been using this technique to bring in distant TV stations to their customers.

Stacking involves using a *phasing harness* which is simply a splitter/combiner for the FM band and two identical lengths of coax cable. The theory is that the signal arrives at both antennas at the same time and the lengths of cable must be identical to prevent one signal getting to the combiner too soon, thus arriving *out of phase*. Using a balun on each of the stacked antennas, the two lengths of cable are joined at the combiner and the signal is fed to your receiver with one length of coax. By stacking one antenna on top of the other (vertical stacking), you increase forward gain. By stacking one antenna next to the other (horizontal stacking) you narrow the beam width, which helps prevent stations on the same frequency from the side competing with the target station. Having four antennas in a vertical/horizontal stacked array (known as a *quad stacked array*), can provide a 4 to 5 dB gain over just one antenna.

There are several problems with constructing a quad stacked array, not the least of which is the size of the array. The optimum horizontal



Check out the 9 antenna FM DX array of Kelly Lindman on his tower in Skurup, Sweden.

and vertical distance between elements should be .6 wavelength apart. This keeps the antennas from interacting with each other and degrading reception. Lengths further than .6 wavelength also degrade reception. For the same reason, a non-conductive boom should be used on which the two stacks are mounted.

A final stacking option is called "stagger stacking." This method mounts one antenna above the other and slightly ahead of the other (you have to drill holes in the boom of one antenna to do this). The theory is to resolve interference problems at one particular frequency when that interference is coming directly off the back of the array. A complete treatment of this concept is found in the FM Resources list on page 12.

The Antenna Phasing Option

This method involves having two antennas (it doesn't matter if they are identical) which are typically mounted on two separate masts and directed with two separate rotators. The outputs of each antenna are joined in a phasing box which works in the same manner as a noise canceling antenna tuner used in long wave and medium wave DXing. The phasing box allows you to *null* a transmission on the same frequency as the target station.

With such a set-up it's possible to "tune out" a powerful local station and allow a weak DX station in. A thorough treatment of this concept is found in the web piece "Phasers!-The Whole Story" which is in the FM Resources list. This technique may prove very popular in the next few years as the FM band becomes increasingly crowded.

The Importance of Cable

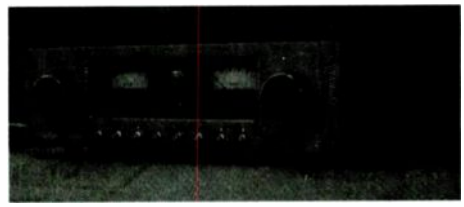
Regardless of your antenna, always use RG/6 coaxial cable for your TV/FM installations. This particular cable is relatively cheap and low loss compared to coax typically sold as FM or TV antenna lead. Widespread use of RG/6 started in the satellite TV industry as the standard installation. The slightly larger copper conductor, the bigger dielectric foam, and better shielding make this a "must" for FM antenna installation.

Some RG/6 is sold with a heavy, insulated ground wire attached to the outside of the coax, which is useful when grounding the mast to a ground rod at the antenna base or grounding the antenna in the house.

The High-End Receiver Option

Audiophiles seem like throw-backs to a simpler time. They like tube fired amplifiers and vinyl records. But, what they're striving for is purity of sound, and if they have to spend an extra thousand dollars in that pursuit it's not a problem. So, it seems like a good idea to at least see what kind of FM receivers audiophiles are listening to and why.

As in the old days, audiophiles like to keep their components separate. They prefer *tuners* which are hooked up to amplifiers and then to various speaker arrangements. One popular FM tuner is the Magnum/Dynalab MD-108, which one stereo magazine called "...one of the five or six best products for FM reception ever built..." In all modesty Magnum/Dynalab calls it "...the pinnacle of FM tuner performance " The price is also at a pinnacle: $5,850. A hard-wired analog remote control is a $350 option.



Long a benchmark in FM tuning, Magnum/Dynalab is still making high-end FM tuners. This model MD-108 sells for just under six grand. (Courtesy Magnum Dynalab)

Another popular high-end FM tuner is the Fanfare FT-1A which is made in North America and, despite a price tag at almost a quarter that of the MD-108, has also garnered much positive ink in the stereo press. The MD-108 uses digital tuning and at $1,595 includes a remote control.

Fanfare FT1A is a top of the line analog FM tuner/monitor which sells for just under $1,600. (Courtesy Fanfare)

There's a lot of verbal warfare among high-end receiver manufacturers and the magazine experts can't seem to make up their minds. If you live in an urban area, you'll no doubt have the chance to listen first hand, otherwise you'll just have to take their word for how great reception is.

Have you seen this Realistic FM receiver (circa 1982) lurking about in a local junk shop, ham fest, stereo store? It's considered one of the best FM performers even by today's standards. (Courtesy Antenna Performance Specialists)

The "Old School" Option

There's no doubt among all FM audiophiles about today's mass produced, made-in-Asia, household name tuner/amplifiers: they're rubbish. And, if the Magnum/Dynalab or Fanfare products aren't in your future, why not try something old? Like 30 years old. If you remember anything about the '70s, it was a time of big cars, big hair and hulking audio components. With massive transformers, 8 gang tuners in the front end, it helped to be a body-builder just to cart them home.

One attribute of those old tuners was their longevity. Who would have guessed that not only did these receivers survive, but they're highly prized in the audiophile world? If you see an old Kenwood 600T, for example, at a hamfest or junk shop, garage sale or dumpster, snap it up! It's considered one of the best ever made and, depending on condition, you can have it for free or pay as much as $500. For a complete list of these old-but-gold FM receivers, see *FM DX Overview* in the FM resources list below.

The Receiver Mod Option

Any time you get a couple of radio enthusiasts together it's no time at all before circuit modifications are in order. In the case of FM radio mods, it's usually because the original manufacturer stopped short of optimizing the reception capability of their receiver. After all, if it picks up all the locals with good signals and decent fidelity, what more could anyone want? For serious FM DXers, plenty!

Kenwood, Sansui and Realistic FM receivers are among the favorites of the FM DX crowd. All modification options are looked at by the hardcore enthusiasts who want peak audio performance and get the most sensitivity and selectivity that can be squeezed out of these receivers. They swap out filter capacitors, op amps, and even sneak a couple of tubes into a solid state receiver. The pages of the *Tuner Information Center* (see FM Resource list below) make great reading, and for reference purposes you should load up your printer and spend some time getting all this information on paper. There is a ton of information here and you'll be referring to these pages quite a bit as you delve into the FM DX hobby.

Don't feel competent enough to do the mods yourself? Send it to the folks at *Antenna Performance Specialties*. Check their web site for details on the modifications offered, the specific units they'll work on, and the price. Be aware, though, that "great improvement" in performance to the audiophile may not be all that noticeable to the neophyte. You should also know that these mods are not cheap, but then, great audio and DX never is.

SCS Intrigue:

The Mystery of SCS and the NPR Connection

Many metro areas have FM radio stations transmitting a tunable subcarrier known as Subsidiary Communications Service (SCS, ex-Subsidiary Communications Authorization-SCA), which can feature background music, reading services for the sight impaired, stock market updates, sports scores and more. Reception of these services has always been a mystery in monitoring circles. *What are these services? Why can't my FM radio pick them up? Can I legally listen?* SCS programmers, SCS receiver manufacturers, radio stations which transmit SCS content, and the FCC are all very vague about the answers.

Issues concerning listening to SCSs are somewhat complicated. In the case of background music, SCS is a commercial service. Businesses which subscribe to the service pay for the equipment, installation, and reception for use in their commercial establishments. The nature of these SCS transmissions are that they are not high fidelity and the content tends to be what is known pejoratively as "elevator music." In this day of 100 channel, commercial free, CD quality satellite and cable audio services, SCS music has little more than a certain curiosity appeal.

Another use for SCS is the transmission of reading services for the sight impaired. This is an altogether different issue. These transmissions are typically on a local public radio station subcarrier; the actual reading is done by volunteers; the receivers are usually loaned for free to those with such sight impairments: and there is no fee charged to users. Sighted people may want to tune in and may do so by buying one of many FM radios modified for such reception (see resources list below). To be perfectly legal, listeners have always been advised to write the SCS originating station seeking permission to receive such programming.

National Public Radio (NPR), in a memorandum to the FCC in March 2000, used a perceived threat against their stations' SCS services as a reason to deny granting of Low Power FM (LPFM) licenses by the FCC. The Commission was forced to examine the claim and performed extensive nationwide testing. Three years later it found that this simply wasn't the case. While NPR claimed support for LPFM broadcasters in its memorandum, saying that it welcomed such competition, the memorandum had the opposite effect. What NPR got was a three year reprieve from competition. There seems little doubt that most LPFM stations, whether religiously based or community activist based, would siphon pledges away from affluent NPR stations and that the real threat was to their own income.

For those with an insatiable desire for SCS details, *FM Atlas* has a current list of stations throughout North America broadcasting such subcarriers. They also offer an array of receivers, modified receivers and kit adaptors for SCS reception. Ramsey Kits also carries a similar FM-SCS tuner kit which is recommended for seasoned kit builders (see below for details on both companies).

The future of SCS is much less certain. Industry wide adoption of HDFM may mean that future receivers would have the capability to receive such subcarriers built-in.

FM DX RESOURCES

http://www.anarc.org/wtfda
Home of the World-Wide TV-FM DX Association, this should be the first place you start. With FAQs for beginners and a well-done database of articles on this subject you can spend hours on this site alone.

http://www.anarc.org/wtfda
Bruce Elving's FM Atlas is a great place for beginners to get a start in this hobby. Not only will you get a good overview of this end of the monitoring hobby, but for $23 you'll also get a handy reference book in the bargain. Includes latest info on SCA/SCS reception.

http://www.compolinc.com/sca_technology.htm
For an excellent description of SCA/SCS

http://home.earthlink.net/~w9wi/
MT's own Doug Smith, W9WI, has a very useful web site regarding all manner of DX including FM DX. Check out his impressive FM DX list.

http://www.fmdxweb.com/
Has list of Mexican FM stations by frequency, a real aid in IDing Spanish language stations which are heard easily over much of America's southwest.

http://home.iprimus.com.au/toddemslie/dx.html
Todd Emslie's TV FM DX page. Loads of great information about FM DX, including links to archive articles and other sites.

http://www.dxfm.com
Excellent FM DX web page packed with real-time information about current TV and FM band conditions.

http://www.amfmdx.net/fmdx
Though it calls itself "The FM DX Source" it's unfortunately not been updated in a while. Still, it has a number of interesting sources not found at other sites. Includes an excellent article identifying old FM tuners by make and model with a nice rundown on each.

http://www.antennaperformance.com/
Antenna Performance Specialties makes several top grade FM antennas. They offer two outdoor and one indoor FM DX antennas.

http://www.fmtunerinfo.com/
Tuner Information Center is where vintage FM tuners live again. Find out what makes a great receiver and get the inside dope on which are the hottest and where to find them.

http://home.computer.net/~pritch/betterfm.htm
DIY vintage tuner modifications. An excellent presentation of this subject is found here complete with pictures and sources.

http://www.audioadvisor.com/default.asp
Audio Advisor is a catalog of high-end FM products for the true audiophile. A wide selection of tuners, amplifiers, pre-amps, speakers, and more are available. Check your bank balance and visit their web site or call 800-942-0220 for their latest catalog.

http://www.classicaudio.com/forsale
Can't find any vintage audio gear in your area? Check out Classic Audio to get an idea of what's out there and what it will cost.

http://www.anarc.org/wtfda/stagger.pdf
Stagger Stacking is a way to improve reception and reject nearby signals using two antennas mounted on the same mast as in a vertical stacked array, but one mounted physically ahead of the other and fed out of phase with the other. An excellent presentation of the details is at the WTFDA website.

CATCH ME IF YOU CAN

Monitoring the Elusive Part 15 Broadcaster

By Kevin Hoult

It's always a thrill to catch a new signal, but imagine the excitement of finding a whole new broadcast. Then think of the fun you'd have finding a new broadcaster in your own neighborhood! This unique monitoring thrill can be yours, if you're fortunate enough to have a Part 15 Broadcaster operating in your area.

Operator-built live broadcast console.

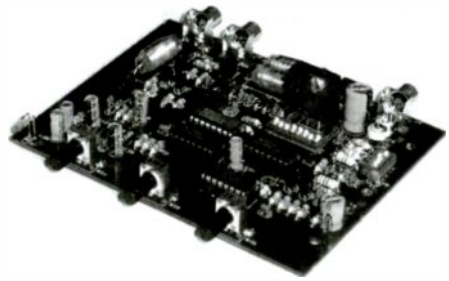
Part 15 Broadcasting has been around almost as long as the FCC, but recent technological developments have made Part 15 broadcasting easier than ever before. These same advances will make *monitoring* Part 15 broadcasting operations much easier, as well.

Part 15 broadcasting is an outgrowth of the Federal Communications Commission regulation limiting the radio frequency (RF) emissions of all kinds of products. Certain parts of this rule discuss specific approaches that can be used for broadcasting, such as carrier current, and hobbyists have been poking around in the corners of this rule for decades.

The objective of Part 15 broadcasting is somewhat different from licensed broadcast applications. Allowable range is limited, so these operators must be satisfied with focusing their efforts on a very small broadcast footprint. Some operators are still able to garner significant listeners by broadcasting to a very densely populated location, but we'll look at that in more detail later in this article.

New Technologies

Two technologies that have brought Part 15 broadcasting to the masses are inexpensive PLL (Phase-Locked Loop) transmitters and low cost home computers. Plug and Play PLL transmitters have brought Part 15 broadcasting out of the realm of the solder heads and hardware hackers and into the homes of average hobbyists across the country. You no longer need to photocopy a schematic from a dusty library book and scavenge parts to get on the air. The quality and affordability of today's low power transmitters are truly astounding.



The SSTran Part 15 AM transmitter circuit board

This is important for monitoring, because we are much more likely to find a transmission that's on frequency and drift free. I will always fondly remember my first transmitter, lovingly handcrafted using an old schematic and a proto board. I was using a 1000 kHz crystal, but my signal seem to appear at 790 kHz and 1120 kHz, and I even heard it on short wave! That, combined with my irregular hours of operation, probably made my first operation almost impossible to monitor.

Low cost personal computers have also brought enormous change to Part 15 broadcasting, through the availability of cheap and easy station and content automation. As romantic as the notion of live broadcasting might be, it could be quite difficult to attract a good listener base without being on the air 24/7, 365.

Free applications like WinAmp, shown here with a broadcaster skin, make automation easy.

Live broadcasting, auto reverse tape decks and CD jukeboxes help, but these approaches all have shortcomings. An old PC loaded with some free software and a collection of sound files can run almost indefinitely, keeping Part 15 broadcasters on the air continuously and making these broadcasts much more accessible to monitors.

Which Bands are Active

Theoretically, Part 15 broadcasting could take place almost anywhere on the spectrum as long as field strength is held within the limits specified and as long as continuous transmitting is permitted. In practice, Part 15 broadcasters tend to follow the receiver market.

The top of the band, from a practical Part 15 perspective, is the frequency modulation (FM) Broadcast band at 87 to 108 MHz. Part 15 operations could appear almost anywhere in this band. Some like to work the low end, hoping that the band is less crowded in the segment normally reserved for educational stations. Other broadcasters choose the high end for more manageable antennas and slightly greater range.

It's important to note that the broadcast FM segment is the most restricted form of Part 15 broadcasting, with strongly enforced limits placed on the actual range of the operation.

Next in line is 49 MHz using narrow band FM – or baby monitor radio, as one broadcaster called it. While this band is not generally too active, it is an easy place to monitor. We'll talk about monitoring strategies later in this article

Tops for common amplitude modulation (AM) is probably the 22 meter band, at 13,553 kHz to 13,567 kHz. This tiny portion of the shortwave spectrum is reserved by the FCC for unlicensed RF emissions of all kinds. The 22 meter band is used by those who wish to try shortwave broadcasting without ending up on MT's pirate pages!

Next we drop down to the medium wave broadcast band at 530 to 1710 kHz. While 530 and 1710 are reserved for TIS (Travelers Information Service) and are not available for Part 15 work, the rest of the band is fair game. Broadcasters do tend to cluster at the far ends of the spectrum, however.

For technical reasons, frequencies of 600 kHz and below seem to work best for carrier

current. Similarly, 1500 and above are best for over the air broadcasting, as the antenna match is slightly easier.

Monitors should still check the whole band, of course. One theory holds that operating towards the center of the band is best, because any harmonics any will occur outside the band. For example, a broadcast at 1000 kHz will have harmonics at 2000 kHz and 500 kHz.

Naturally, this all depends on there being an opening in these ideal locations. In some communities the broadcaster must go where the openings are, regardless of preference.

You might even find a few operators trying long wave – 153 kHz to 279 kHz. If you're probing the depths of Part 15 long wave you should apply all of the tuning tips already discussed in *MT*'s *Below 500 kHz* articles and web resources, as well as some of the techniques that will be described here.

A Special Challenge

Because Part 15 broadcasts are limited in range, there is a second aspect of monitoring that has more in common with radio fox hunting than broadcast monitoring. Fox hunting, as most monitors know, is primarily an amateur radio hobby which involves a race to find concealed, low power transmitters. Fox hunting techniques can be a great way to find a Part 15 operation, too!

Like an RF fox hunter, the Part 15 monitor must "take it to the streets" to be successful. So learning "where" to look involves more than just finding the frequencies – Let's take a closer look at "where" you might find a good Part 15 monitoring adventure.

Where to Look

A survey of the national Part 15 scene indicates you just might find one of these Part 15 hot zones in your area.

Parks, interpretive centers and other public places are a great starting point. While TIS is the primary outlet for these facilities, the cost and complexity of a TIS system puts this approach out of reach for many cash-strapped local government agencies. Though inexpensive by broadcast standards, costs for TIS are still measured in the thousands of dollars, whereas Part 15 costs are in the hundreds.

Bruce DeYoung, Extension Sea Grant Specialist and Professor of Management at Oregon State University, puts it this way: "Information systems form the backbone of the recreation and tourism industry. Effective communications serve as an information bridge to expand visitor information about available business services and heighten natural resource appreciation. Information technology can also convey messages about safety and recreational etiquette."

"Low-power radio is one way to bridge that information gap. This technology uses a small, relatively inexpensive AM transmitter to broadcast short, preprogrammed messages over a limited area. Visitors can tune in from their cars or boats and hear messages about a particular locale, attraction or facility."

You can read more about Dr. DeYoung's work in Low Power Radio at **http://seagrant.oregonstate.edu/extension/lpr/**

Ethnic communities are also great places to look for Part 15 operations. Dissatisfied with a lack of programming for community needs, ethnic Part 15 broadcasters frequently pop up with local information in the prevailing local languages.

Religious facilities like churches, schools and ministries are also turning to Part 15 to help reach parishioners and promote community events. High schools, in particular, are getting into Part 15 for student training and to build a sense of community on campus. Colleges and universities are excellent hunting grounds, although you might run into a pirate or two, as well.

These are all great examples of using Part 15 to reach a densely populated area. A large apartment or student housing complex might have as many as one thousand residents, all within the reach of a Part 15 transmitter.

Other Monitoring Opportunities

An increasing number of seasonal activities and displays are using Part 15 to help manage attendees, disseminate information and create atmosphere. Malls, car dealers, banks and other high traffic facilities are now using Part 15 for promotion and traffic management. Sporting events, camping grounds, outdoor swap meets, concerts and hamfests now frequently feature a Part 15 broadcaster to rebroadcast commercial radio signals inside a stadium or to entertain visitors.

Monitoring these broadcasts is especially helpful for beginning Part 15 monitors, because the location and frequencies are often well publicized. These operations give the monitor an opportunity to practice low power signal reception, and to check out monitoring equipment with a known signal.

The Ultimate Treasure

Of course, the real finds for Part 15 monitors are those intrepid broadcasters who broadcast purely for the love of radio. These delightful souls maintain a wide variety of broadcast operations originating from homes and workplaces in almost every state. With little in common except the love of broadcasting, these operations can be found almost anywhere. Now let's take look at some extreme monitoring strategies to help you catch these elusive signals.

Monitoring Strategies.

Your best first step might be to use the internet to support your monitoring activities. Broadcasters often announce operations on message boards, and many have web pages promoting their stations.

Try these websites for more info:

- Part 15 Stations of North America at **http://home.att.net/~weatheradio/part15.htm.** Maintained by Jonathan Smick, this site has been tracking Part 15 operations from LW to SW for many years.
- Florida low power radio stations at **http://home.earthlink.net/~tocobagadx/flortis.html.** A project of Terry L. Krueger and his Tocobaga Publications, this site covers all of Florida in great detail.
- The Low Power AM Radio Network at **http://www.lpam.net/Station-List.htm.** A multi-service site created and maintained by the irascible William C. Walker, long time supporter of low power radio.
- The Part 15 Radio Station Website at **http://www.part15.us.** Started by software guru and operator of Manteca Community Radio, Rick Collette, and maintained by a team of volunteers.

Next, you'll want to check your monitoring logs and public information in your area to make sure you have all the known, licensed broadcasters noted. This will give a good list of where *not* to look for Part 15 operations.

With the web information and your list of known broadcasters, you can start hunting in earnest. You will need to go mobile, and your best bet for initial mobile operations will be your automobile.

Hopefully, you'll have a good car radio to work with, although both selectivity and sensitivity of standard new car radios is terrible. Also make sure your car antenna is in good condition.

Using the "seek" or "scan" feature available on your car radio, keep working the AM and FM dials as you drive through your search area. It's probably best to have a helper here, so the driver can drive and the radio operator can give full attention to the dial.

You'll want to bring along your mobile scanner, too, if it has wide band FM (WBFM) reception capability. Set aside one bank for FM monitoring and program in all the vacant frequencies on the FM dial in your area. With your car tuner on "seek" and your mobile on "scan" you are bound to catch any FM operation in your search area.

To assist in capturing those elusive AM operators, consider bringing your better quality portable tuner with you in your Part 15 fox hunting vehicle, and try a Select-A-Tenna or similar antenna booster or a ferrite loopstick to increase your chances of monitoring success.

A surprisingly useful asset in searching for Part 15 broadcasters on the AM band is the venerable crystal or diode radio receiver. With

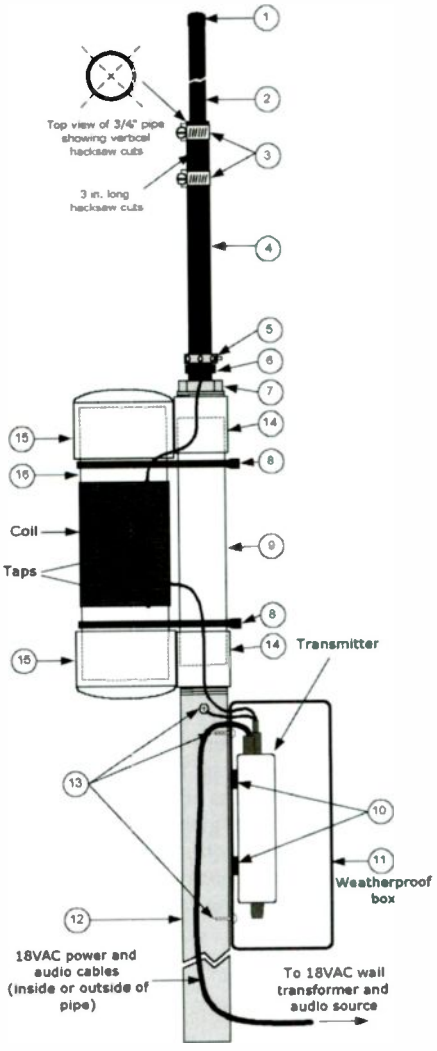
its single tuning stage, the crystal receiver set is less likely to block the very weak signals you're trying to capture. If you have some space for an antenna and a good ground, consider putting one of these old reliable units to work.

When to listen?

Unlike most broadcast band monitoring, Part 15 chasing is usually best during daylight hours, well away from the dusk, evening and dawn periods that favor sky wave. Those strong, distant signals tend to baffle most radio tuning circuits.

Use Eyes as Well as Ears

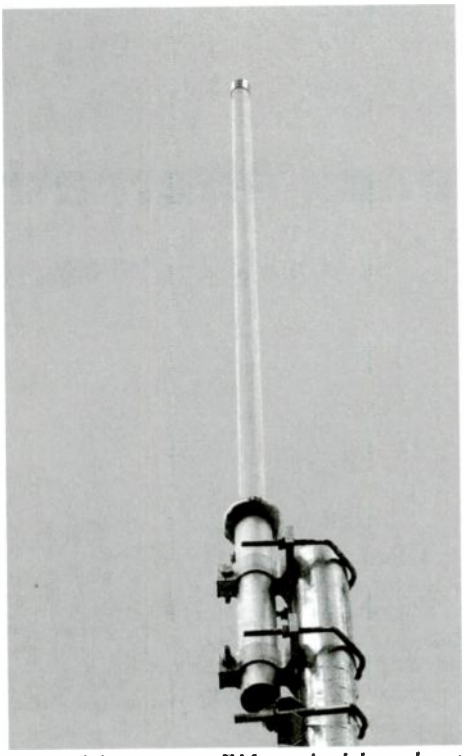
Though not always obvious, most Part 15 operations do offer visual clues for sharp-eyed monitors. Some operators post small signs advertising their station. Keep an eye out for stickers, flyers, handbills and small circulation, local newspapers for ads and announcements.



Construction diagram for the SStran base loaded Part 15 AM broadcast antenna.

Broadcasters who operate over the air will also be using an antenna of some kind, generally high and in the clear.

AM operators often use the standard 3-meter antenna to help meet Part 15 requirements.



Typical low power FM vertical broadcast antenna

These antennas are a bit over nine feet in length and are often base loaded with a good-size air coil. Some also employ a top structure called a "hat" to increase current flow along the antenna.

FM operators frequently use a Comet brand 5/8 wave vertical, with its distinctive ground plane whiskers. Others use a copper pipe J-pole, a vertical 1/4 wave dipole, or a Slim Jim.

Is it Part 15 or Sky Wave?

Of course, using the tuning tips and equipment outlined above will help you pull in any weak signal, not just a Part 15 operation. How do you know if you've captured the genuine article? Here are a few tips to help you identify your catch quickly.

First, a sky wave signal will have that characteristic waver that comes from bouncing off of a flexible, moving medium. A local Part 15 signal, though it might be weak, will be quite steady over time.

Second, the content is usually a tip off. Most, though not all, Part 15 operators tend to favor programming that is quite unique. Often the lack of some particular programming is one of the forces that motivates a Part 15 broadcaster to enter the hobby.

Recent changes in recording industry and copyright rules which require payment of performance fees for commercially released music, have also influenced Part 15 broadcasters. Self-produced, unreleased, and public domain materials like certain Old Time Radio shows and some big band music (and even NOAA weather rebroadcasts) are quite common on many Part 15 play lists.

The lack of commercial messages, unusual or infrequent station IDs, and atypical call letters are also good content cues. While Part 15 regulations do not specifically prohibit using K or W type call letters, the FCC frowns on any operational activity that could lead to confusion of a Part 15 operation with a licensed broadcaster. This means three or four letter K or W calls would be strongly discouraged.

The third way to tell if you've caught a Part 15 operation is to use your ears. While many hobby broadcasters use extensive digital and analog audio conditioning like signal processing and compression, an extremely low power radio signal is still going to sound distinctly different. Modern radios just weren't designed to pull in a signal that weak, so the audio section will respond quite weakly to the demodulated low power signal. This is especially true as distance from the transmitting antenna increases.

Many Part 15 operators put out an very nice signal, but that signal just won't have the punch of a five, ten or fifty thousand watt transmission.

Catch Us While You Can

Sadly, we might be experiencing the zenith of Part 15 broadcasting right now, and we could see this eclectic corner of the hobby disappear very soon. The ever declining quality of radio receivers, especially when it comes to selectivity, makes it more and more difficult for Part 15 broadcasters to attract listeners. New, proprietary, digital broadcast technologies like DAB and IBOC could reverse the ease of access to the advanced broadcast technology Part 15 broadcasters now enjoy.

Broadband over Power Lines (BPL) is especially threatening to Part 15 broadcast monitoring. Operating in the 2 MHz to 80 MHz frequency range, BPL sits right on top of the AM broadcast band, and harmonics will interfere with the whole range of Part 15 broadcast activities. While BPL power levels and harmonics seem to get little scrutiny from regulators, Part 15 activities are closely scrutinized. The FM band is particularly vulnerable because the power output for FM Part 15 is severely limited. The "highFERs" (high frequency experimental radio operators) at 13 MHz and 49 MHz NBFM are as good as gone if BPL becomes widespread. "LowFERs" might be safe down in 153 kHz to 279 kHz, but the lack of widely available receivers hurts public appeal of this band, so is little used in the USA. If the corporate forces behind BPL have their way, perhaps lowFERs will be the last refuge of experimental broadcasting.

With these cautions in mind, and using the information provided here, you should be able to enjoy a bit of this exotic fare before Part 15 broadcasting goes the way of the dinosaur.

About the author

Kevin Hoult has been active in the monitoring hobby since 1963, when he received a crystal radio receiver as a birthday gift. An active Part 15 broadcaster since 1989, Kevin holds a Masters degree in Business Administration and is a hardware and operating systems instructor at a Vancouver, Washington, vocational school.

Antenna Alternatives

By Arthur R. Lee WF6P

Before the first shovel-full of dirt is turned on a new housing development, antenna restrictions and limitations are inked into the sales agreements for buyers. These Conditions, Covenants and Restrictions (CC&Rs), are a plague to shortwave listeners (SWL) and hams alike. We wouldn't expect to put up a 200 foot tower mounted with stacked Yagis in a mobile home park or in a densely-packed neighborhood, yet we want to put *something* up to enjoy our hobby of listening to or participating in world-wide communications. What can be done?

When my daughter's friend Cathy visited us a few months ago, she spotted my stack of *Monitoring Times* magazines on our coffee table. "I used to subscribe to that magazine," she said. As a shortwave listener she loved listening to foreign broadcasts. She said she sold her radio and no longer listens. She moved into a mobile home with her mother and cannot have an antenna. Thinking of the spare Yaesu FRG-7 receiver I would loan her, I told her that there were invisible antennas she could rig.

Making Do

On the island of Guam in 1950, picking up shortwave signals was an exciting way to relieve the loneliness of being over 5000 miles away from the United States. Living in metal Quonset huts, we sailors rigged antennas for our tube-type radios in the simplest fashions. The easiest antenna was simply to attach our lead-ins to the copper window screens. Fortunately, the screens were supported in wooden frames, insulating them from the metal huts. They worked well enough on a limited basis, and when conditions were right, we could pick up distant stations. Some sailors just stretched a long wire from their radios and tied it to a nearby coconut tree. A few hams with portable rigs and antennas would go up on the cliffs overlooking the broad Pacific and work the States. This was in the days when there were relatively few hams. Converted war-surplus military radios or homebrew rigs prevailed and CW was the popular mode.

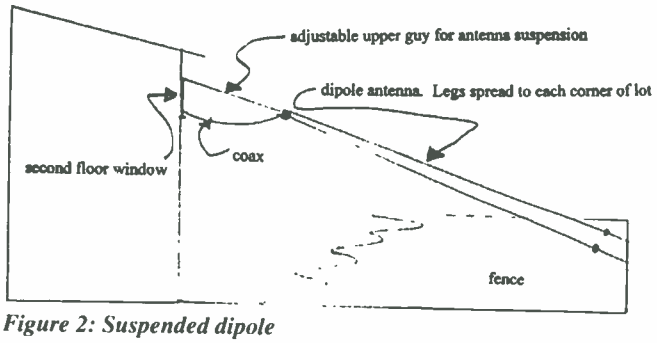


Figure 2: Suspended dipole

In today's world of high-rise apartment or condominium living, closely-packed neighborhoods or mobile home parks, all with tight antenna restrictions, how can we still receive or transmit? First of all, don't despair. There are many communities where CC&Rs are ignored or enforcement is non-existent. This doesn't mean we can flagrantly disregard the rules, but nearly always, an unobtrusive or hidden antenna will work just fine. Here are a few I have used successfully over the years.

Invisible Wire

When our son lived in married student housing on a college campus in Kansas, my wife and I stayed with him several months each year. I brought with me my trusty ICOM IC 730 transceiver and power supply. I purchased some fine copper wire at the local hardware store, and on the kitchen table, I constructed a simple multiple band antenna for 10, 20 and 40 meters (Figure 1). I passed a short stub of coax through the second story window.

The antenna hung down and my 10-year old granddaughter and I stomped through the snow, pulling and spreading the elements out and securing them to the end of the brick building. Using rust-colored insulators, the antenna was close to being invisible. It worked like a charm. It hung there for over three years while he was in school and was never detected. I had no ground (due to plastic drain pipes), so did have to suffer through some RF lip burns on the mic. My West Coast net pals gave me a 59 on most of our daily check-ins and QSOs.

Unobtrusive Dipole

My daughter's rented home in Poway, California, brought a new challenge. Again, from the second story, I rigged a 40 meter dipole out the window (Figure 2). The neighbors were friendly and either didn't notice the oddly flattened dipole strung from the rear bedroom or didn't know what it was. The yard was fenced on all sides with the legs of the dipole tied off to the fence posts. By lengthening and shortening the nylon suspension cord, I experimented with the distance of the antenna from the house.

A metal drainpipe ran parallel and just

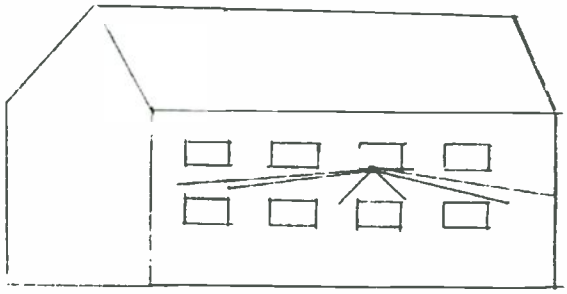


Figure 1: Multi-band antenna from student apartment

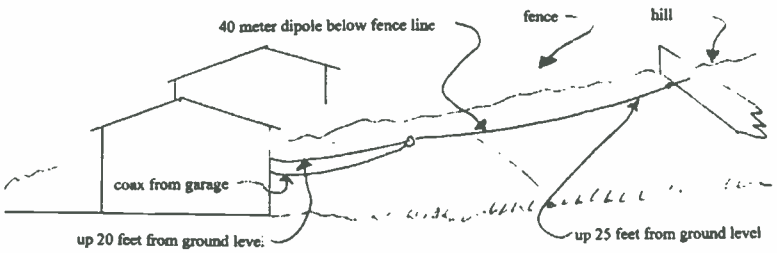


Figure 3: Unobtrusive dipole

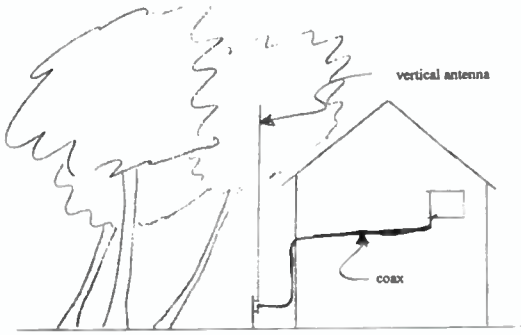


Figure 4: Vertical backyard antenna

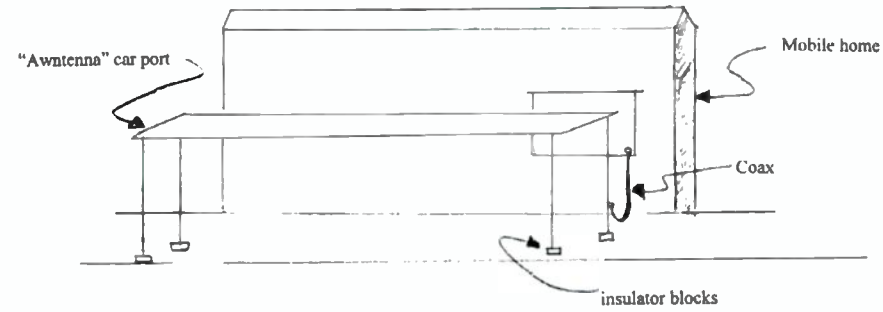


Figure 6: Car port "Awntenna"

above the antenna. If the antenna was too close, it gave me a high SWR reading. Was this an ideal antenna? Hardly, but I was able to work nearly the entire USA and South America. This time, I could drop a braided wire down to a ground rod driven into the soft earth.

Tucked Behind the House

Later on, my daughter moved to a new home. I had to set up another "hidden" antenna. With an upward sloping, hillside corner lot, it was a simple matter to run a 40 meter dipole up the hill leading from her garage window (Figure 3). The coax feed was tucked out of sight behind the chimney. With an extension ladder, I attached a pulley and cord system to the roof line where I could lower the antenna for service. Most of the antenna was below the fence level and only after a year, the next door neighbor, out of curiosity, inquired as to "What's that wire?" We explained that it was for our radio. She was satisfied.

All-Band Trapped Vertical

Another antenna I found useful where none were allowed, was a Butternut all-band trapped vertical. This fine, nearly 30 foot tall antenna was ground-mounted in the backyard among the trees and close to the house (Figure 4). Hidden by the roof, it could not be seen from the street at all. The branches of the trees provided the side-to-side cover we needed. After five years of constant use, there never was a complaint registered.

More Mobile Home Solutions

Lastly, as with Cathy, several of my ham friends live in mobile home parks. Park layout and terrain features vary with each situation, but two simple devices have served them well. One is the old flagpole-disguised vertical antenna (Figure 5). This antenna is about a 30 foot long PVC pipe containing a wire suspended inside. This vertical wire is fed at the bottom. The coax can be buried or hidden in shrubs. To become a real and unobjectionable flagpole, you might want to rig a nylon halyard with a pulley at the top and fly a flag! Who can object to our patriotism?

My friend Carrie Jenkins, K16QO, says that in her mobile home park, she has a difficult neighbor who complained about a 20 meter dipole mounted a few feet above ground on Carrie's rear deck. To pacify her, Carrie took it down and then strung a long wire antenna under her eaves on the opposite side of her mobile home. It works just fine with a tuner, except on 80 meters where a resonant frequency trips one of the house-wiring circuit breakers if she exceeds 10 watts output.

Yet another mobile home dweller, Patty Winter, N6BIS, solved her hidden antenna problem in a unique way. With the help of a few fellow hams, she insulated her aluminum carport awning from the ground and used it as an antenna (figure 6). That was pretty creative – and it worked! She told me she made some fine DX contacts.

Other Resources

For additional reading, check with your public library for books on ham and shortwave listening antennas. One I highly recommend is the *Practical Antenna Handbook (4th edition)*, by prolific ham writer, the late Joseph J. Carr. There is even a chapter on hidden antennas. The *ARRL Antenna Book* has been around for years and contains useful tips and formulas for various antennas. The *ARRL Handbook For Radio Amateurs* also contains chapters on antenna construction of all types. Both ARRL books are available at **http://www.arrl.org/shop** or by writing to the American Radio Relay League 225 Main Street, Newington, CT. 06111-1494.

We can't all enjoy the luxury of living in an area with acreage to erect an extensive antenna farm. For those of us who live in town, we have to get by with something far less. While many of the hidden antennas are a compromise with regard to length and height, they can be quite effective, overall. Operating a modern rig with a good RF ground and tuner, coupled with the fact that most TV sets of today operate from cable inputs, eliminates most of the old TVI problems. Simple, unobtrusive wire antennas can be unseen or overlooked by neighbors and provide hours and hours of listening or transmitting pleasure.

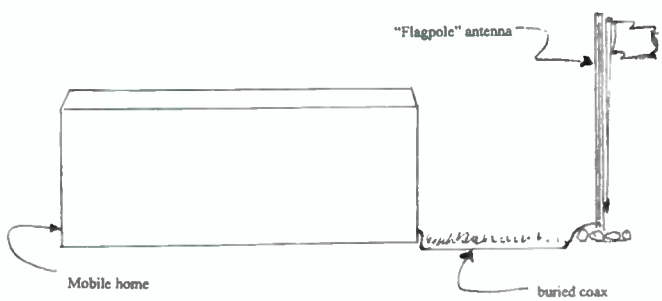


Figure 5: Flagpole antenna

Magnet Scanner Mount

By Clint Duckworth

"The higher, the better" is the statement given by most scanner professionals to people who want to pick up frequencies that are far away. Even if you live in a valley like I do, you can sometimes put up a scanner antenna high up on a mast and still receive those distant stations quite well.

Although some people are satisfied just listening to local police and fire departments, and my stock antenna picked those up quite well, I decided that I wanted to pick up those distant stations as well. Fortunately, I found a way to do that without buying an expensive mast-mounted antenna.

It starts by going to your local Radio Shack store and purchasing a mobile-mount magnet scanner antenna. The antenna is thirty six inches high. Although meant for the top of a vehicle, this antenna also works great as a base station antenna. All you need for it to work is an air conditioner with a metal cabinet that a magnet will adhere to. Just place the antenna on the air conditioner (I placed mine on the outer edge of the unit), run the coax through a hole in your window, or open the window a little and slide the coax through it and run it to your scanner. That's all there is to it.

You are now set to tune in to more stations than you did with the stock antenna. Do not turn your air conditioner on while using this antenna because it interferes with the frequencies that come in. Also, keep the air conditioner plugged up, even when it's not on. This will "ground" the antenna so what comes in will be clear.

I live about 35 miles from the Mississippi state line. With the stock antenna, I could not pick up nearby counties in Mississippi, but since I started using this magnet mount antenna, they come in great. Of course, how clear your signals are depends on atmospheric conditions, and if you live in a valley like I do, sometimes the signals will pass right over your antenna. But give this a try: I think you'll like it.

Propagation Outlook for April-September

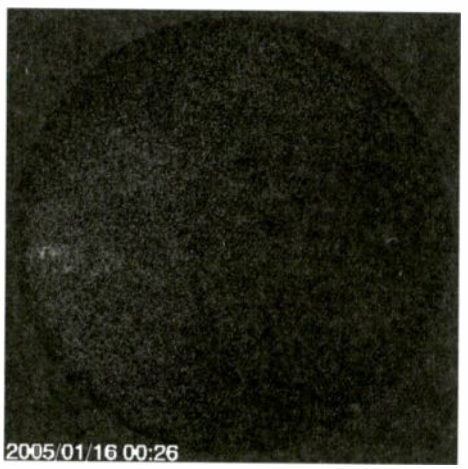
By Tomas Hood NW7US

It is that time of year again, when the Sun makes its way northward, bringing longer hours of daylight to the Northern Hemisphere. And with the summer season a change in radio signal propagation takes place on much of the spectrum between medium wave (MW) and the upper limits of shortwave (SW), even up into the very high frequencies (VHF). During the summer, when the days are longer, higher shortwave frequencies can be used for longer periods of time, while lower frequencies may become noisy and prone to signal absorption loss.

Because the days are longer, lower shortwave frequencies and medium wave frequencies become unusable for most of the day. This is caused by the lowest of the ionospheric layers, the *D layer*. This ionospheric layer tends to absorb radio signals. The greatest absorption occurs at the lowest of the MW and SW frequencies, and the amount of absorption is directly tied to the amount of sunlight energizing the layer. At night, when the D layer is in darkness, it quickly loses energy and no longer absorbs the signals it did during the daylight hours. But because the hours of darkness are so short in the summer season, the window for DXing MW stations and tropical shortwave stations is very short.

Not all radio DXing opportunities are lost during the summer, however! At the end of March, international shortwave broadcasters typically change their transmission schedules and the frequencies they use, so they can better reach their audience. This opens up a different window of DX opportunity for the shortwave radio listener.

The VHF/UHF hobbyist also benefits from the changes in season. The summer season holds a lot of unique opportunities for exotic radio activity. DXing distant FM radio stations and TV broadcasts via tropospheric ducting becomes an exciting summertime activity. Some hobbyists enjoy catching pings of FM stations off of meteors blazing through the ionosphere that leave behind a thin but dense ion cloud that reflects VHF and sometimes UHF signals. Don't forget the interesting pursuit of exotic VHF propagation via the Aurora, too.



Active sunspot region 10720 (or just, 720), from January 2005. This flare turned out to be one of the most flaring regions of the last few years, with 15 M-class and 5 X-class events since 14 January. (Source: NASA/SOHO)

Shortwave Propagation

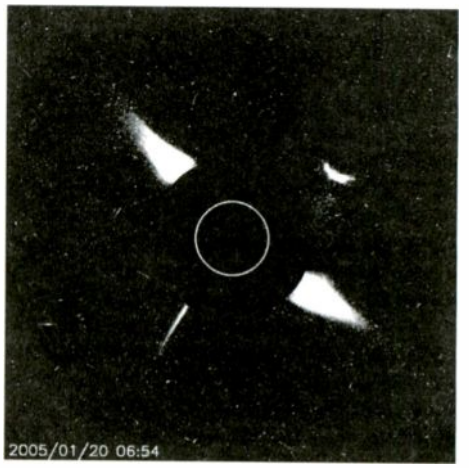
As we move through the spring and into summer in the Northern Hemisphere, the characteristics of shortwave radio propagation changes. Paths between many areas of the Earth begin opening up on higher shortwave frequencies, and openings between the northern and southern hemispheres become more reliable. Because the Sun is mostly overhead over the equator during the last part of March and early part of April, we have mostly an equal day and night period in both hemispheres. The *Vernal Equinox* on **March 20, 2005**, marks the day when the hours of daylight and darkness are about equal around the world. This causes an equalization of the ionosphere, resulting in optimal DX conditions over more of the Earth than during other times of the year. The same thing happens during the autumn equinoctial period.

As **high summer** arrives, conditions on shortwave frequencies become quite different from those of winter. Radio paths running east and west are not as strong as the signal paths that run between points north and south.

At the **end** of the summer season, we move again through the equinoctial period, and those east/west paths open back up, and we enter the prime DX season.

From **April to June**, fair to good propagation occurs on both daytime and nighttime paths on the middle shortwave bands. The strongest propagation occurs on paths that span areas of both day and night. During April, peaking in May, and continuing into June, the frequencies between 9 and 16 MHz may offer occasional 24-hour DX to all parts of the world. Thirty-one meters will be the most stable as a nighttime band, with propagation following grayline and nighttime paths.

During the early part of the summer season (April through May) propagation is still hot on lower SW frequencies, like 41 meters, with Europe in the evening, and Asia in the mornings. Occasional DX openings will occur on the tropical bands around sunrise. However, these bands are quickly being degraded by the seasonal increase in noise.



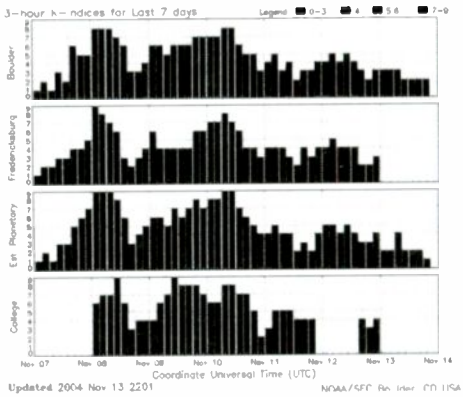
During the intense flaring in January 2005 from active sunspot region 10720, energetic protons were pummeling SOHO as well as other spacecraft. The particles show up as a "snow storm" in the images as they crash into the detectors and deposit part of their energy. This image shows the coronal mass ejection related to the X7.1 flare of January 20. This flare is the third-largest of Solar Cycle 23. (Source: NASA/SOHO)

June marks the changeover from equinoctial to summertime propagation conditions on the shortwave bands. Solar absorption is expected to be at seasonally high levels, resulting in generally weaker signals during the hours of daylight when compared to reception during the winter and spring months.

As we move into **July**, solar absorption is expected to increase. This causes generally weaker signals on the lower to middle shortwave frequencies during the hours of daylight when compared to reception during the winter and spring months. This higher absorption will continue to play a role in weaker signals on shortwave until the autumn.

Solar activity is half of what it was last year. This results in lower maximum usable frequencies for the same period than last year. At the highest end of the HF spectrum, propagation from DX locations east and west are becoming a rare event. North and south paths may still be hot, especially around sunrise and sunset.

During this summer, 19 and 16 meters will be the most reliable daytime DX band, while 19 and 22 may offer some nighttime openings on periods with higher flux levels. Because we are well into the decline of the current solar cycle, Cycle 23, I don't expect a lot of long-range DX on the highest HF bands. Some sporadic-E will make reception of signals possible, though.



The geomagnetic activity graph from November 2004, showing the two severe geomagnetic storms, which produced record-breaking sporadic-E at a time when this form of propagation is unusual. (Source: SEC)

Twenty-five through 31 meters will be fairly good in the evenings and mornings. At night, those paths that remain open may be marginal. During periods of low geomagnetic activity anticipated this summer (we get less solar storm activity during the years closer to cycle minimum), this band may offer long distance DX all through the night. The most reliable band for both daytime and nighttime should be a toss-up between these two bands.

Forty-one and 49 meters offer domestic propagation during daylight hours and somewhat during the night. The *tropical bands* (60, 75, 90, and 120 meters) are not noticeably affected by the solar flux, but are degraded during geomagnetic storminess. Through the summer, expect these bands to be more challenging, though less this year than last year, due to the geomagnetic activity levels expected. Look for Europe and Africa as early as sunset. After midnight, start looking south and west for Pacific, South America, and Asia. Short-skip should be possible out to about 750 miles during the daytime.

Expect some openings on 75 and 90, similar to how 40 meters will be acting. Fairly frequent short-skip openings up to 1000 miles are possible during darkness, but expect very few daytime openings with all the static and absorption. MW and 120 meter propagation is rough in the summer, due to the high static and higher overall absorption caused by the short nights and higher D-Layer ionization.

Overall, daytime bands will open just before sunlight, and last a few hours after dark. Look higher in frequency during the day, as these frequencies will be less affected by any solar storms occurring, and more broadcasters have transmissions in these upper bands.

VHF

On VHF, the possible aurora during **April**, and then the increase in *sporadic-E* propagation as we move into **June**, may produce some great long-range VHF and even possible UHF DX. At the same time, there is usually a seasonal decline in *Transequatorial Propagation* (TE) during the summer months, but some VHF openings may still be possible during June. The best time to catch an opening across the geomagnetic equator is between 8 and 11 PM local daylight time. These TE openings will be north-south paths that cross the geomagnetic equator at an approximate right angle.

Statistical studies show that a sharp increase in sporadic-E propagation takes place at mid-latitudes during the late spring and summer months. During **July** and **August** short-skip propagation over distances as great as 1400 miles should be possible for about ten percent of the time on 6 Meters. Higher VHF (2m) openings may also be possible during periods of intense sporadic-E ionization.

Tropospheric ducting begins to form over wide areas of North America, and over the Atlantic and Pacific Oceans, during the **middle to late summer**. Watch for stalled high-pressure cells between your location and the DX station. Stalled high-pressure weather cells, with pressures reaching above 1025 millibars, are known to cause ducting of VHF radio signals. Ducting allows VHF radio signals to bounce through these natural waveguides far beyond the normal line of sight distances.

Tropospheric ducting forms each year between Hawaii and the U.S. West Coast, and from San Francisco to Los Angeles, Denver to Dallas, Texas to Florida, the Great Lakes to the eastern seaboard, from the Great Lakes to Texas, Nova Scotia to Miami, and from the Midwest to the Southeast.

Advanced visual and infrared weather maps can be a real aid in detecting the undisturbed low clouds between the West Coast and Hawaii or farther during periods of intense subsidence-inversion band openings. This condition occurs also over the Atlantic. There is a great resource on the Internet that provides a look into current conditions. Bill Hepburn has created forecast maps and presents them at **http://www.iprimus.ca/~hepburnw/tropo_xxx.html** which includes maps for the Pacific, Atlantic, and other regions.

Widespread *auroral displays* can occur during **April**, bringing with them unusual ionospheric short-skip openings on the VHF bands. Best times for these to occur are during periods of radio storminess on the SW bands. Look for days with high planetary K (Kp) and A (Ap) figures (typically, the Kp should be over 5).

There are a number of meteor showers during this period between April and September that might provide opportunity for observing VHF/UHF *Meteor Scatter propagation* DX. Most meteor showers are at their best after midnight. After midnight, you're on the leading edge of the Earth and you're meeting the meteors head-on. Before midnight, you're on the trailing edge of the Earth and the meteors have to catch up to you. As a result, not only are more meteors seen in the pre-dawn hours, but their impact speeds encountering the Earth's atmosphere are much higher and the meteors are generally faster and brighter. This causes greater ionization, which is what you use to refract a radio signal. Look for TV and FM broadcast "pings" (short bursts of reception) during these events. If you are an amateur radio operator, look for six and two meter openings off of the ionized meteor trails.

Lyrids, a major meteor shower, should take place from mid to late April. The unpredictability of the shower in any given year always makes the Lyrids worth watching, since we cannot say when the next unusual return may occur. If this year's event is average or better (30 to 60 good-sized meteors entering the atmosphere every hour), this should make possible meteor-scatter type openings on the VHF bands.

Another major meteor shower, the Eta Aquarids, will occur in May. This shower has a peak rate of up to 20 to 50 per hour.

Minor showers include the Alpha Aurigids (continuing from August), the Beta Cassiopeids (peaking September), the Epsilon Perseids (peaking September), the Delta Aurigids (peaking September) and the Piscids.

Recent Space Weather and Radio Propagation

We continue to see moments of intense solar activity, even though we are far along the downward slope of Solar Cycle 23. Short periods of high solar activity flare up out of quiet conditions, waking up the radio spectrum. As any solar cycle moves through the downward slope away from the years of maximum solar activity toward the year of solar minimum, it is normal to see flare-ups (pun intended) out of long quiet periods. We saw some very intense activity during November and December 2004 and then again during January 2005.

During November 2004 a very strong sporadic-E opening occurred, setting records on VHF DX. This was also a month of very intense solar activity when we saw extreme geomagnetic storms caused by the release of huge clouds of plasma from the Sun. In January 2005 we experienced the largest proton storm in years, the hardest proton event of this solar cycle and the strongest (at the measurement greater than 100 MeV) since 1989. This came during a series of intense flares from sunspot region 10720. This region spawned an incredible number of flares, some of which were very strong. The largest flare from this region was the third-largest flare of this cycle.

However, solar activity, when averaged out, is nearly half of what it was just a year ago. Along with the steady quieting down of solar activity, we see longer periods – sometimes weeks – when the geomagnetic activity settles down and stays relatively quiet. This current cycle is still expected to end sometime late 2006 or early in 2007.

Write Me

Do you have questions about space weather and radio propagation? Do you have observations about aurora, sporadic-E, or meteor shower propagation that you would like to share? Please write me an e-mail message or a letter.

I also invite you to check out my propagation resource center (including discussion forums) on the Internet at **http://prop.hfradio.org**. If you have a cellphone or other handheld device capable of reading WML, I have a WAP version of this resource center at **http://wap.hfradio.org**. You can even sign up for my propagation eAlert service for free. These propagation eAlerts keep you informed of the various index numbers, in real-time. I wish you a happy radio-monitoring season!

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A Set of "Cans" for Your Listening Post

Originally made of metal or Bakelite, headphones were known to old-timers as "cans," and it was the only way to listen at the beginning of the radio era. Original crystal receiving sets didn't have an audio amplifier stage and listeners were obliged to use a set of headphones. Two listeners would sometimes split the headphones and each take an earpiece and hold it up to one ear so both could listen in. Some sets had Fahnstock clips (headphone jacks were yet to be invented) for two complete headsets, but a really good antenna was required to get enough signal to power both. The advent of the powered audio stage brought about the "loudspeaker," as speakers were originally called, and headphones became an accessory for people who wanted to listen privately or to tune in DX (long distance) stations as is done today.

Since the 1960s there have been basically two types of headphones: the communications variety and the Hi-Fi type. Communications headphones were not concerned with audio fidelity, were usually relatively cheap, and rarely had amenities such as ear cushions or padded head straps. Headphones for audiophiles were entirely different. They were heavy and had large, fluid filled ear cups designed to seal out all external noise. They had padded head straps and were very expensive. Then in the 1970s there was a revolution in audiophile headset design when companies such as Sennheiser brought out lightweight Hi-Fi headsets with simple, acoustically transparent, foam ear pads. Today's headset selection includes everything from cheap plastic Walkman® style headphones to all manner of Hi-Fi phones. Prices range from $10 to $700.

The Bose Corporation set the standards for headphone technology and introduced this noise canceling set a few years ago. The Quiet Comfort 2 is made out of the country (China) and carries a price tag out of this world: $299. (Courtesy: Bose Corporation)

There is one category of headphone which has gained a lot of popularity over the last few years. Using *noise canceling* technology these sets are designed to remove unwanted or conflicting external sound from the audio you're trying to hear. This is done by using two small microphones (one for each ear cup) to pick up the ambient noise outside the ear cups. Using a special circuit, the noise is introduced into the ear cups out of phase, thus reducing or eliminating the noise, depending on the source and how near the noise you are. Noise canceling has been in widespread use in aviation for decades, but only in the last few years has it become a feature of headphones for home use.

❖ Bob Heil Strikes Again

Amateur radio operators are all familiar with the series of microphones produced by Heil Sound, the company started and owned by Bob Heil, K9EID, a long time ham and audio expert, who got his start by building sound systems for famous rock bands in the 1970s. He was very successful in the 1980s in the satellite TV industry, and in the 1990s introduced the first real, if not exactly affordable, home theater systems.

Today his line of ham radio microphones is omnipresent on the bands, with Heil devotees practically breathless with their enthusiasm for his products. Manufacturers had traditionally included microphones with the transceivers they made almost as an afterthought. Heil believed these mics were not optimal and set out to change that. The results can be heard daily on every band. In fact, the Heil line is now standard issue on some transceivers.

Heil Quiet Phone noise canceling headphone: At a third the price of the Bose it does double duty at your rig or stereo for $99. (Courtesy: Heil Sound)

Now he has turned his attention to audio reception, and the first step was to produce the Heil *Quiet Phone* active noise canceling headphone. This is a headset designed to deliver optimal audio performance for ham, shortwave listener, and audiophile alike.

❖ The Well Designed Quiet Phone

The Quiet Phone is well designed and well built. The ear cups are big enough to totally surround the ears without pressing down on them. A foam padded cushion keeps the foam-covered speakers off the ear, while a flexible, rubbery headband connects the two ear cups and rests lightly atop the head. The Quiet Phone has one cord which comes out at the bottom of the left ear cup and is over four feet long. It features a mini stereo plug and includes a 1/4-inch adaptor.

Sennheiser, which makes an extensive line of headphones, now offers this noise canceling set (PXC-250) which retails for $150. (Courtesy: Sennheiser)

The Quiet Phone ear cups can be turned so as to lie completely flat on a surface (a space saver when packing). The headset is easily adjustable; however, it is intended to sit on the head only one way. The cups are marked "L" and "R" on each and the lettering is marked in white and easily read against the black plastic ear cups. The ear cups are comfortable, but there might have been more spring in the headband so the cups fit tighter to the head.

The Quiet Phone noise canceling circuit is powered by a single AA battery which is in a compartment in the cord. There is a small LED next to a very small on/off slide switch on the left ear cup which lights up to indicate the noise canceling feature is in use. The light is a great idea, because the circuit will drain a battery in about 30 hours of use. So, if you don't need to use the noise canceling feature, turn it off. When the switch is off it functions as a normal headset. I found the battery-in-the-cord compartment tugged at my left ear as it flopped around in use.

❖ The Quiet Phone in Action

Noise canceling headphones are designed to take out steady noises such as motors, engines, or other sources where specific audio frequencies are constant. This is why they're popular with frequent air travelers who use them to enjoy some peace and quiet from the dominating drone of the jet engines. This technology is less successful in a noisy environment where the volume and frequency of the noise is constantly changing, such as in a crowded office.

Even here you'll at least get *some* respite from the noise. I used the Quiet Phone to listen to a variety of audio sources ranging from satellite radio to low power ham stations on a crowded 20 meter band and DX stations on the AM band. I used it in environments which featured mild and severe background noise.

While listening to the stereo and sitting very close to a furnace duct, I could clearly hear the rush of the air and the blower from the furnace under the music. Switching on the noise canceling simply made it disappear Next came the dishwasher test: sitting some 15 feet away and listening to music the washer was a definite distraction, but it was reduced to barely discernible with the noise canceling feature engaged. While listening to weak SSB stations on the HF ham bands with TV audio going on in the same room, there was a less dramatic reduction. That's because the furnace and washer both produce relatively low frequency noise in a very regular pattern but the TV audio frequencies were all over the chart.

When listening on the ham bands I found it really helped having sealed ear cups and excellent, balanced audio reproduction to hear the DX: the noise canceling was the icing on the cake!

Sony also makes a noise canceling headset. This model (MDR-NC20) features foam covered ear cups and battery compartment in the headset and sells for $150. (Courtesy: Sony Corp.)

There are a number of noise canceling headphones on the market today. In the chart below you'll see a comparison of some of the main features for four popular models. If you're considering adding a set to your listening post, it may help in making that decision. All specs are provided by the manufacturers and you'll notice that audio details on the Bose unit are not available. That's their company policy. You can do your own comparison test at almost any major home electronics store.

The Heil sets are available directly from Heil **(http://www.heilsound.com)** or through any of the big amateur radio retail catalog companies, including Grove Enterprises. One final note. The Heil headset is the only one made in the USA. The rest are Chinese imports. Looking at the price tag on the Bose, it really makes you wonder where all the money goes.

❖ Reader's Tip on Reading CW

Long time *MT* subscriber Judy May W1ORO checks in again with a tip on reading CW if it's not exactly your second, third, or fourth language. She writes:

"...I enjoyed your article on using the beacons to check the bands in the Feb. issue of MT. I had fun about a year ago sending signal reports to 10 meter beacons and getting back QSL cards and certificates in reply ... In your article you touched upon the difficulty encountered by those readers who do not know Morse code. I wanted to share with you a tip I came up with before I studied CW and got my General Class license. It works equally well whether you are deciphering an HF beacon or a local fire or police dispatch frequency Morse ID. I would record the CW ID on a tape recorder and then transfer the audio to computer hard drive using a microphone, sound card, and the common utility Windows Sound Recorder (found in Programs > Accessories). By using the menu Effects > Decrease Speed, anyone can slow down and copy the dots and dashes composing the ID, and then decode the characters at their leisure."

Great tip, Judy! Do you have a tip that will help the rest of us beginners? If so, just zip me an e-mail or drop a line care of this magazine and I'll pass it on.

Comparing Published Specs on Four Noise Canceling Headsets

	Bose	Heil	Sennheiser	Sony
Ear cup design	foam around ear	foam around ear	foam on ear	foam around ear
Frequency Range:	N/A	20Hz-20 kHz	10Hz-21kHz	16Hz-22kHz
Active cancellation:	N/A	50-1200 Hz	0-1000Hz	N/A
Noise Attenuation:	N/A	up to -20 dB	up to -25 dB	up to -10 dB
Weight:	6.9 oz.	4.5 oz.	2.3 oz.	6.2 oz.
Power (battery type):	1 AAA	1 AA	2 AAA	1 AAA
Warranty:	1 year	1 year	2 years	1 year
Price:	$299	$99	$150	$150

Ask Bob

Bob Grove, W8JHD
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Q. *Why do scanners need attenuation? What happens when a scanner has "strong-signal overload?" (Mike Agner)*

A. It would seem that a scanner needs all the sensitivity it can get; after all, if a signal is weak, it needs a boost. Years ago, I served as a technical consultant to the manufacturer of Bearcat scanners. I vividly recall a brief conversation as the chief engineer and I were walking across the parking lot on the way to lunch: "What customers are clamoring for is preamplification in their scanners," I claimed. "They don't need preamps – they need attenuators!" was his terse reply. And here's why:

Any amplifying device has a limited range of input levels that it can handle. Too low, the signal can't be heard (that's where preamplification comes in); but too high, they become "non-linear;" that is, they no longer respond uniformly – a characteristic we simply call distortion.

This distortion is often revealed as intermodulation ("intermod"), the undesirable production, through signal mixing, of phantom signals heard at numerous frequencies throughout the receiving range, interfering with the scanning and searching functions, and often covering up legitimate signals.

Another response to such overload is desensitization ("desense"), the general reduction in all signal levels while the interfering blockbuster is transmitting. This is caused by the interfering signal overdriving the automatic gain control (AGC) circuitry.

And thirdly, selectivity filters in a scanner work over only a limited range of signal strengths; when that is exceeded, the signal leaks around the bounds of the filter, interfering with reception on either side of the strong-signal frequency.

In strong-signal environments, overload from nearby transmitters like those obnoxious pagers is a fact of life. While such signal interference can be reduced by external filters, sometimes simple attenuation of signal levels will bring such blockbusters down to manageable levels.

A 3 dB attenuator may be as simple as a 47 ohm resistor in series with the center conductor of the coax; however, most attenuators are "tees" – three resistors arranged like the letter T. The upper two resistors are in series with the center conductor, and the descending resistor connects to the shield, using tiny resistors and the shortest leads possible. Use carbon film or metal film for lowest noise, and avoid wire-wound resistors (they behave like coils, not resistors, at radio frequencies).

For a 10 dB attenuator, the upper resistors would be 47 ohms each and the descending resistor 68 ohms; for 20 dB attenuation, use two 82 ohm resistors and a 22 ohm.

Q. *I have a ham transceiver with general-coverage reception. I've run a random wire up to the attic, but hear virtually nothing. Is this due to impedance mismatch? (Tom Carroll, Lees Summit, MO)*

A. With a random 10-30 foot wire sticking out of the SO239, you should get scads of medium-strength signals. Impedance mismatch is of minimal impact on reception for those lengths and frequencies. During the daytime, try listening to the SW broadcasters in the 11.6-12, 15-16, and 17.5-18 MHz bands. At night you should hear plenty in the 5.8-6.2, 7-7.4, and 9-9.5 MHz ranges. If you hear virtually nothing, then consider:

- A break in the antenna line or receiver connector;
- A panel-selected switching requirement (if it exists) for selecting the antenna;
- A defective front-end RF transistor in the receiver section;
- A shielded antenna location (metal siding, metallized Mylar insulation, adjacent heating/air conduit, etc.) preventing adequate antenna reception (put a wire outside for the test).

Q. *Why does the U.S. have so few shortwave AM broadcasters, and no longwave broadcasters? (Joe Kenneth Wood, Greenback, TN)*

A. As a long-standing member of the International Telecommunications Union (ITU), the United States has no authorization to utilize the 150-300 kHz longwave broadcast band widely used in Europe, and our shortwave broadcasters must beam their programming outside of the U.S. since it is not recognized as an American domestic service.

Our 540-1700 kHz medium-wave broadcast band has much better propagation characteristics than longwave broadcasting would, and many shortwave broadcasters site themselves at the borders of the continental U.S. in order to beam their signals across the mainland so they can be heard domestically as well as by their foreign audience.

Q. *What frequency range and antenna is used for vehicle keyless-entry systems? (Mark Burns, Terre Haute, IN)*

A. In the U.S. and Japan, 302, 315 and 318 MHz seem to be the common frequencies, while 433 MHz is in use in Europe. The receiving antenna is part of the under-dash receiver module.

Q. *I would like to position my shortwave antenna for the best reception from Europe and Asia; what would the direction be? (R.L. Schultz)*

A. The answer to this question depends upon where you are geographically; there would be about 20 degrees difference in direction between the east coast and the west coast. However, at shortwave frequencies, the directional lobe is so broad that it isn't really necessary to concern yourself with such a small difference.

Another problem is that you want both Europe and Asia which are widely separated. Again, the broad beamwidth comes into play and you won't notice a great deal of difference. If I were you, I'd position it with the bottom of the slope facing northeast. That is a polar bearing from the U.S.

You can figure it out yourself by visiting one of many Internet sites that have beam-heading programs, like **http://www.njdxa.org/dxcclist.shtml**, and simply type in your zip code, then look up your target country in the resulting list.

If you have a world globe, simply tighten a piece of thread or string between your location and your target; that will reveal the correct bearing.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.) The current Ask Bob is now online at our website: *http://www.monitoringtimes.com*

Getting Started

Bright Ideas

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April is the traditional time for spring cleaning. I think we can all agree that the most important piece of equipment for monitoring is the coax and antenna system. Your receiving ability is no better than your antenna system. Time to inspect your outside antenna, coax, and weather seals to see if old man winter did any damage.

Back indoors, we can check the mechanical connection between your radio, and your antenna/coax. Is your BNC connector firmly attached to the radio? It is possible for it to become loose, or even break free and spin. This is not good! If your connector is loose, it needs repair by someone competent in opening the radio and resoldering the correct joints. If you are not familiar with the process, find a pro.

If it is a BNC connection, remove the antenna/coax and look at the female receptacle. There should be a small opening lined with metal. If the metal has two or four side tabs, you might need to take a safety pin and gently probe between the metal sides and the plastic outer material. This forces the metal slightly inward to make a tighter fit. The key word is **gently**. This is a fragile component.

You can also dip a cotton swab in 70% isopropyl alcohol to clean the female receptacle, the outer metal shield, and the male pin in the rubber duck. Use the dry end of the cotton swab to soak up any excess fluid, and you are good to go.

If your connection is an SMA, there is not much you can do, so don't mess with it. If the radio has a PL 259, or N connector, remove it and check the male pin. Like the BNC, you can clean it and the female receptacle. When reinstalling, make sure the male head of the coax is snugly pushed in **before** you tighten the outside barrel.

Bear in mind that, for BNC and SMA types, an aftermarket antenna that is not perfectly designed to fit your specific radio may result in a less than perfect mechanical connection. Thus, reception may be less than perfect, perhaps even worse that the original factory rubber duck. To compare the "fit" between your original rubber duck and those third party antennas, try to listen to the NOAA weather broadcast or another frequency that is very busy. Use your ears to judge the sound quality, and if your radio has a strength meter bar, your eyes can be a second judge. If the new replacement antenna is making a good connection, and thus better reception, there might be a physical gap between the radio and the base of the antenna. You can use a plastic washer, or rubber "O" ring to improve the appearance and weather seal. If the "O" ring is too fat, you can carefully slice it to fit. Be careful with those razor blades!

I made another visit to the Flying J truck stop and discovered another new product. The Spotglo™ seatbelt light sells for $9. This LED light snaps onto the chest seatbelt and projects the light into a person's lap for reading a map, frequency list, programming the radio, etc. Note this application is intended for **passengers**. Drivers should only use this product when the vehicle is stopped and safely parked.

I found one more item that I just had to get. The "Back Seat Organizer" hangs over the headrest of the driver or passenger seat. This item has many pockets for holding everything from the *Police Call* book to your maps and first aid supplies. Yes, it even has a pocket at the very top that is perfect for holding a normal size scanner/receiver. The best part was the price, just $10.

Despite the name, this item could also be hung over the **front** passenger seat. It is a cheap alternative to the much more expensive seat caddy organizer from Galls Police Products. I still carry the Galls model in my front seat and the new one, as its name implies, on the **back side** of the passenger seat. You can never have enough storage pockets or be too organized!

A similar walk-around tour of my local Wal-Mart discovered a large magnetic mount "side alley light" that is perfect for first responders or emergency vehicles. A bargain at $10. A heavy duty magnet with a large weatherproof casing for the very official-looking lamp component. With a 20 foot cord it can be used in many applications. Since I often work out of the back of my vehicle with the rear hatch door up, this is a great work light. Check out the entire automotive section.

I also bought a plastic see thru tray for all the little items that had begun to collect in the front passenger area. AA batteries, fuses, screws, nuts, blots, antenna connectors – where does all this stuff come from? Well, at least I now have a storage **solution**, instead of a **storage problem**. I try to stay organized, but there are always more items needed for operations.

If you own ham radios, you have probably purchased and used programming software from ADMS. Well, they finally got around to writing "patches" for their earlier software products. These patches are **free**, and can be downloaded from **http://www.rtsars.com/**

Obviously, you need a legitimately purchased original program on your hard drive for the patch to work correctly. Many of the latest radio products have seen freeware/shareware come forth from private radio enthusiasts. No doubt this took big bucks away from the commercial source. Perhaps they "get it" now and will produce more timely and reliable software. In the meantime, hats off to those who wrote software for the recent RS Pro series scanners and Yaesu ham products. Check back with their sites as they have many updated versions.

Have you checked out the newly retooled website for Grove Enterprises? I did, and found a new product, the 72 month Anthology CD series (that is the last six years of *MT* for the non math majors). All 72 back issues in a completely searchable CD series format. Just $89.95 or only **$69.95 for MT subscribers, a $20 savings**. It does not get any brighter than that. If you are still buying *MT* at the newsstand, you can save a lot of money by subscribing to the regular magazine, or the downloadable electronic form. Visit **http://www.grove-ent.com/**

I often visit the local Radio Shack stores for yellow tag clearance items. With eight stores in Spokane, it usually takes a full day. My efforts were recently rewarded! I bought a Radio Shack FRS/GMRS drop-in charger for $10 model RS 21-1930. They also had high power full 22 channel FGS/GRMS two packs on clearance for $29.95, model RS-21-1904. Yeah, I know, by the time you read this there may not be any left. Check with your local store. If they don't have any, ask them to check, via their POS computer for other local store availability. The real lesson is this: you need to visit your RS store *often* to find the real good buys on clearance items.

On a recent trip to a new medical center, I was shocked to find the parking garage had a clearance of just 6'8". Luckily, my Ford Escape has a small profile and I have quarter wave spike antennas. But I also have a window mount dual bander, and it took quite a beating. I now carry the appropriate Allen wrench to remove that antenna when necessary. When planning on a new vehicle or new antennas, consider the foldover type from Diamond© Antennas, or removable magnetic mounts. 6'8"? What were they thinking?!

Next month we get ready for wildland fire season and what we need in our "Grab 'n Go Bag."

The World Above 30 MHz

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Understanding Trunking

Based on reader mail that I receive, questions about trunked radio are at the top of the list for scanner subjects that cause confusion. This month I'll provide a basic introduction to the concepts underlying trunking and describe how the newest scanners are able to keep up with the digital networks that we all hear so much about.

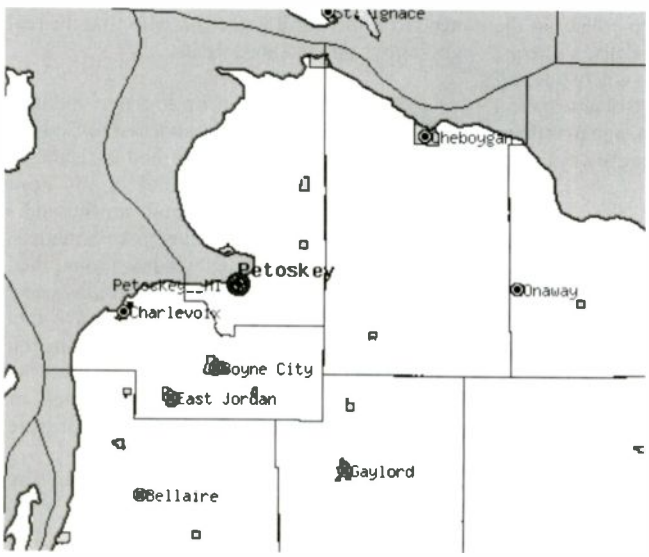
Hi Dan,

My name is Mike and I live in northern Michigan and I have 1000-channel digital Uniden Bearcat BC-796 scanner and it is very hard to understand trunking or talk groups. I enjoy my scanner very much. I also have one mobile and three handhelds. I live in Petoskey, about 25 miles north of Gaylord. I also have a 30-foot tower. I have a discone antenna and I can pick up signals in an 80-mile radius from my house

Mike in Petoskey

Petoskey is located on the shore of Little Traverse Bay in Emmet County, which is home to more than 30,000 residents. That area of northwest Lower Michigan is mostly suburban and rural, with a good number of hills and plenty of forests.

Mike, I hope things are defrosting up there – for Petoskey, April is the first month with an average temperature above freezing! Despite the cold, your location is a good one for monitoring trunked radio and the Bearcat BC-796 scanner is capable of following the systems in your area. With that outside tower and antenna you should have little trouble picking up a lot of activity.



Sharing Frequencies

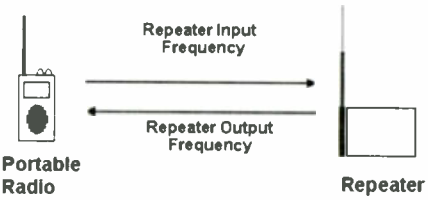
Simply put, trunking is about sharing. More specifically, trunking is a method of sharing a limited number of radio frequencies among a large number of users.

But let's start with the basics. Mobile and portable radios communicate with *repeater sites* installed at fixed locations. These locations are usually on hilltops or other high points, in order to provide good coverage. They're called repeaters because they receive signals from mobile and portable radios and repeat them on another frequency. These repeater sites are usually linked to *dispatch centers*, where trained personnel monitor and participate in the activity on the system. For police, fire and ambulance operations, these centers are referred to as Public Safety Answering Points (PSAPs), because they are the places where those 9-1-1 calls end up.

Communication between a radio and a repeater site occurs in two directions. The repeater transmits on one frequency, called the *output frequency*. Mobile and portable radios receive on this frequency and are thus able to monitor the forward link. Radios transmit back to the repeater on the *input frequency*. Most scanner listeners tune to the repeater output frequency because it is typically much stronger, and therefore easier to receive, than the input frequency.

Conventional Operation

Agencies or departments that don't have too many users can get by with a very limited number of frequencies. For instance, many small town police departments may use just one frequency. The repeater site and each officer's radio are programmed with the same frequency and all activity occurs on it. When someone is using the system, everyone can hear it. Anyone who wants to talk on the system has to listen first to be sure no one else is already talking. If someone is talking,



the other person has to wait until the first person is done. This is about as simple as sharing can get. Dedicated channel usage like this is called *conventional*.

The Petoskey Police Department operates a conventional repeater on 154.740 MHz from an antenna located on Highway 131 just south of town, close to the border with Charlevoix County. Entering 154.740 into your scanner will allow you to hear all of the Petoskey Police radio traffic, since all activity occurs on that frequency.

The Petoskey Fire Department repeater transmits on 155.220 MHz. Petoskey Public Schools can be heard on 151.865 MHz and 152.420 MHz. The Northern Michigan Hospital on Connable Avenue in Petoskey uses 155.385 MHz. All of these frequencies are conventional in operation.

Splitting Things Up

Agencies or departments with a larger number of users may still be able to operate conventionally, but they need more frequency pairs. Each pair might be dedicated to a particular function. For instance, a medium-sized police department may use one pair for dispatch on the north side of town and another pair for dispatch on the south side. Officers would select one pair or the other, depending upon their location.

As an example, I have a listing for the Emmet County Sheriff's Department that shows two frequencies: 155.820 MHz for operations in the north end of the county and 155.685 for operations on the south end. You would need to program both frequencies into your scanner in order to hear all the activity, assuming you're in a location that can receive both frequencies.

For more county activity in northwest lower Michigan, there are a number of conventional frequencies to monitor. Three local counties in the Petoskey area have combined their resources to form the Charlevoix-Cheboygan-Emmet (CCE) Central Dispatch Authority, which operates an E-911 PSAP covering more than 1,600 square miles of land and 200 miles

of shoreline, including the southern end of the Mackinac Bridge.

The Authority uses a set of common frequencies that allow the state police, three sheriff's departments and eight local police departments to talk with each other. This is the easiest type of *interoperability* – let everyone use the same radio frequencies, as if they're all part of one big agency. The Authority also provides radio services for 28 fire departments, representing nearly 1,000 full-time and volunteer firefighters. Fire frequencies are divided by function and include dispatch, fireground operations, mutual aid and emergency medical services.

Repeater Sites

The CCE Central Dispatch Authority is licensed for operation from a number of repeater sites, including locations in or near the towns of Boyne City, Cheboygan, East Jordan, Harbor Springs, Mackinaw City, Petoskey and Wolverine. This is typical for a geographically dispersed system, where repeater sites are centrally controlled but physically located dozens of miles apart. CCE ties these repeater sites back to the dispatch center by way of dedicated microwave links.

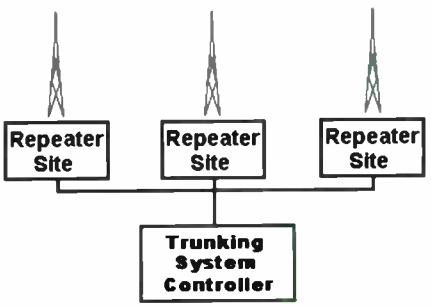
Although the Federal Communications Commission (FCC) has licensed CCE to use a dozen or so frequencies between 150 MHz and 155 MHz, not every repeater site transmits on every frequency. Some sites transmit on only one while others transmit on as many as seven. Because CCE is operating a conventional system and frequencies are dedicated to particular geographic areas, repeater sites transmit only on the frequencies that are relevant to the area they cover.

In Emmet County you should be able to hear Fire Dispatch on 154.400 MHz, which is transmitted simultaneously from more than one repeater site. By using more than one repeater, adequate reception is ensured from nearly any part of the county.

❖ Trunking

Adding frequencies and splitting activities geographically works up to a point, but for agencies or departments that have a significant number of users, conventional operation isn't a viable option. No matter how they might try to divide up the activity, there are just too many users who want to use the system.

This is where trunking comes in. Instead of using each frequency pair for a specific purpose, the pairs are combined in a "pool" that can be shared among all users. When someone wants to use the system, he or she makes a request to some type of central controller, which looks at the pool of frequency pairs to see if there is one that is not currently in use. If so, that pair is temporarily assigned to the radio making the request and the person can talk on that frequency. When the person is done talking, the channel is *released* and put back in the pool, available for someone else to use.



So, if you were monitoring only one radio frequency, you would hear "snippets" of conversation whenever the controller happened to choose that frequency from the pool. If it selected a different frequency, you would miss that transmission.

Since these radio frequencies are shared, radios need a way to separate the transmissions they want from the transmissions they don't want. This is done through identifiers called *talkgroups*. Groups of users who share a common purpose are assigned a unique identifier that is programmed into the radio of each group member. A radio may have several talkgroups programmed into it, and the user selects the one he or she wants to use at any particular time.

So, where a conventional system would dedicate a radio frequency to each group, a trunked system uses a talkgroup instead.

Control Channels

Radio frequency channels in a trunked system can be divided into two types: traffic and control.

Traffic channels are what the controller assigns to a user when he or she wishes to speak, and they carry the sound from the talking user out to all of the listening users. The sound may be carried on the channel in different formats. The oldest format is referred to as *analog*, where the sound is represented by a continuously varying signal. Every consumer scanner on the market works with analog traffic channels. Newer formats carry the sound as a stream of *digital* data – binary digits ("bits") of 1's and 0's. Some scanners on the market are capable of correctly interpreting one particular digital voice format used in APCO Project 25 systems, which we'll discuss later on. Other digital voice formats cannot be decoded by consumer-grade scanners and thus are not able to be monitored.

Control channels carry instruction and status messages between radios and the controller. These channels are painful for a human to listen to because the messages are in digital form, so all you hear is a rough hissing sound. However, in a properly programmed radio (and in a trunk-tracking scanner), these digital messages are received and interpreted by a microprocessor, which then performs the appropriate action.

A site typically has one radio frequency set aside as a control channel, while the rest are used to carry traffic. Because control channels are transmitted continuously from repeater sites, many systems change the control channel frequency from day to day in order to spread out the wear and tear on the repeater equipment.

Trunking Process

When a group member wishes to speak with the other members of his or her talkgroup,

the following steps take place:

1. All radios are tuned to the repeater output frequency that carries the control channel. This is called the *idle state*.
2. The user starts the process by pressing the push-to-talk button on his or her radio.
3. The radio transmits a request to the repeater, along with the radio's current talkgroup identifier.
4. The repeater receives the request and forwards it to the controller.
5. The controller checks if there is a traffic channel not currently in use.
6. If there is a traffic channel available, the controller assigns it to the talkgroup and marks it as "in use."

(If all of the traffic channels are in use, the controller sends a "busy" message back to the user's radio, which in turn emits a busy tone to inform the user to try again later.)

7. The controller sends a message out to all radios, telling them that the talkgroup is active on the assigned traffic channel.
8. Radios that receive the message and are programmed with that talkgroup tune to the assigned traffic channel.
9. The requesting user's radio receives the message and emits a "go ahead" beep to the user.

Steps 1 through 9 happen very quickly, usually in less than one second.

10. The user begins speaking.
11. Eventually the user stops talking and releases the push-to-talk button.
12. The user's radio transmits a "finished" message to the repeater.
13. The repeater receives the message and forwards it to the controller.
14. The controller receives the message and in turn sends a message out to all radios indicating that the talkgroup is no longer active on the assigned traffic channel.
15. Radios that were tuned to the assigned traffic channel retune to the control channel.
16. The controller releases the active channel and marks it as "not in use."

These sixteen steps are repeated each that time a user wants to say something to a talkgroup. From the user's point of view, the system is available whenever he or she wants to talk and the user doesn't really care which radio frequency is being used. From the controller's point of view, the radio frequencies are loaned out on a temporary basis to talkgroups for only as long as they're needed.

Trunking Analogy

Another way to envision this process is to imagine getting a table at a restaurant. When you arrive at the restaurant, you tell the hostess you and your dinner party would like a table. The hostess then checks to see if there is a table that is not currently occupied. If there is a table available, the hostess comes back and leads your party to it. If all of the tables are occupied, you have to wait until some other dinner party finishes and leaves their table. When a table eventually opens up, the hostess assigns your party to it. You and the rest of your party then occupy that table for as long as you need it. When you leave, the hostess notices that you've departed and is now free to seat someone else at that table.

This is how trunking works. The hostess in our example is the controller, managing the radio frequency channels (tables) and assigning them to talkgroups (parties of dinner guests) as the requests come in. During busy times, talkgroups may have to wait until a channel is available, but if the system was designed correctly (the restaurant has enough tables), in most cases the channel is available immediately.

So trunking is a way of efficiently sharing a limited resource of radio frequencies, and talkgroups are a way for a trunked radio to determine which frequency it should be using, at what time, and for how long.

❖ Trunking System Types

There are a number of different kinds of trunked radio systems in operation, many of which you can monitor with the trunk-tracking scanners on the market today. A chart comparing the capabilities of trunk-tracking scanners, including which types of systems can be monitored, is available at **http://www.signalharbor.com/trunking.html** or also at **http://www.monitoringtimes.com**

It is important to match the scanner to the type of system you want to monitor, since the control channel formats are different among the various types of trunking systems.

Following is a brief overview of the most common trunking systems in use. More information is available on my web site, and I'm happy to answer reader questions.

Motorola

Motorola Type I and Type II systems are the most common trunked radio systems used by public safety agencies today. Type I systems are older and make use of a "Fleet Map" to organize talkgroups. Type II systems are newer and have more capability than Type I. Every trunk-tracking scanner on the market is able to follow analog voice traffic on both types. Some Type II systems have a mixture of analog and digital voice traffic.

Programming a scanner for these systems requires only entering the control channel frequencies, since control channel messages include the traffic channel frequency. Each repeater site may have a maximum of 28 radio frequencies, with at least one and as many as four of those frequencies used as a control channel.

EDACS

Enhanced Digital Access Communication System (EDACS) is another popular public safety radio system. Each repeater site will have at least one dedicated control channel and as many as 23 traffic channels. In addition to analog voice, EDACS can carry different proprietary digital voice formats, which system operators may also encrypt. Traffic on EDACS control channels may also be encrypted through an optional product known as ESK (EDACS Security Key).

Scanners on the market today cannot decode the digital voice formats and will not work properly if the control channel is encrypted.

EDACS requires that the system frequencies be entered into the scanner in a specific order. Each radio frequency is assigned a Logical Channel Number (LCN), and the LCN should correspond to the scanner's channel number.

Logic Trunked Radio

LTR systems are not as common in public safety but are often used for industrial and business applications. LTR systems do not have a separate control channel, but use a technique called *subaudible signaling* to carry talkgroup and frequency information on the voice channel.

APCO Project 25

The Association of Public-Safety Communications Officials (APCO) created a set of standards for digital public safety radio. These standards are collectively referred to as *Project 25* and were intended to inject competition into the public safety radio market by allowing agencies to purchase compatible equipment from different manufacturers.

Because APCO Project 25 (P25) is a set of standards, there are systems in operation that use some standards but not others. P25 has a Common Air Interface (CAI) and a specific format for digital voice, as well as a standard for trunking.

1. There are conventional P25 systems that do not use any trunking but do use P25 digital voice.
2. There are hybrid systems that mix analog and P25 digital voice traffic on a Motorola Type II control channel. You may find this on systems that are transitioning from older analog technology to fully digital but during the interim want to save money by continuing to use their old radios.
3. There are also "pure" P25 networks that use all digital voice and the P25 control channel standard for trunking.

For Mike in Petoskey, there is a statewide P25 network that can be monitored by the new APCO-25-capable scanners, including the BC-796. The Michigan Public Safety Communications System (MPSCS) is one of the largest and earliest P25 systems put into operation with more than 180 repeater sites. One of those sites, located in Petoskey, transmits on 866.4625, 867.4625, 868.4625 and 868.9625 MHz. Numerous federal, state and local agencies make use of MPSCS with hundreds of active talkgroups.

That's all for this month. Check my web site at **http://www.signalharbor.com** for trunk-tracking scanner details, and as always I welcome your e-mail at *danveeneman@monitoringtimes.com*. Until next month, enjoy the April showers and look forward to the May flowers!

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Bearcat 278CLT 100 ch. AM/FM/SAME WX alert scanner	$139.95
Bearcat 250D 1,000 ch. Trunktracker III handheld scanner	$339.95
Bearcat 245XLT 300 ch. Trunktracker II handheld scanner	$189.95
Bearcat 248CLT 50 ch. base AM/FM/weather alert scanner	$84.95
Bearcat Sportcat 200 alpha handheld sports scanner	$159.95
Bearcat Sportcat 180B handheld sports scanner	$139.95
Bearcat 80XLT 50 channel handheld scanner	$99.95
Bearcat 60XLT 30 channel handheld scanner	$74.95
Bearcat BCT7 information mobile scanner	$139.95
AOR AR16BQ Wide Band scanner with quick charger	$199.95
Sangean ATS909 306 memory shortwave receiver	$209.95
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US 2182 kHz Watch Continues

On a number of occasions, this column has stated that there is no longer a mandatory voice radio watch on the upper-sideband (USB) frequency of 2182 kilohertz (kHz). This is not quite the case. While it's true in several countries, others including the United States still require that their licensed vessels not using other radio systems keep a watch on this international calling and distress frequency. We apologize for this error.

The relevant US rule is found in Title 47 of the Code of Federal Regulations (CFR), Part 80, Subpart G (Safety Watch Requirements and Procedures). Section 304 (b) states, in part, that, "Each ship station operating on telephony on frequencies in the band 1605-3500 kHz must maintain a watch on the frequency 2182 kHz." This section was amended in 1998 and 2003 to drop the watchkeeping requirement on 500 kHz Morse telegraphy, but 2182 was untouched.

US public coastal stations are similarly required to, "monitor such frequency(s) as are used for working, or at the licensee's discretion, maintain a watch on 2182 kHz" (Section 301). In addition, the rules continue the requirement that all stations maintain radio silence for three minutes after the hour and half hour. Old clocks used in maritime stations often have these marked on the dial, along with two similar intervals on the quarter hours that are observed on the now largely deserted 500 kHz. These silent periods were intended so that weak distress signals could be heard.

Finally, the US Coast Guard has noted on one of its web sites that it has no immediate plans to discontinue its own radio watch on 2182 kHz. Last month, we discussed other Coast Guard activity on higher frequencies, including 4125 kHz USB. In practice, 4125 is usually a busier frequency than 2182, due to its longer range, especially at night. Reports of 2182's death, however, are somewhat exaggerated, and distress calls still turn up there.

Larger vessels, of course, are required by international conventions to use the Global Maritime Distress and Safety System (GMDSS). GMDSS divides up the seas into a number of operating areas based on the coverage of various terrestrial and satellite communication systems. GMDSS ships using the medium-frequency (MF) band keep a watch on 2187.5 kHz. This frequency uses an automated signaling mode called Digital Selective Calling (DSC).

Again, we apologize for any confusion here. Maritime regulations are in a period of change, and it all gets rather opaque at times.

❖ More US Coast Guard

As long as we seem to be doing a sweep through maritime radio's seemingly yearly changes, it's worth noting that many of the US Coast Guard's local Groups and Sections still transmit MF maritime safety information broadcasts. These are announced on 2182 kHz USB, usually right after the silent periods, and then commence soon after on the USB frequency of 2670 kHz.

It seems as if there are a lot fewer of these than in the past, though any Coast Guard unit will make such a broadcast in urgent cases. For whatever it's worth, here's the latest, somewhat shrunken, list of regularly scheduled broadcasts on 2670. Times are Coordinated Universal Time (UTC):

Fort Macon, NC	NMN 37	0103, 1233
Cape Hatteras, NC	NMN 13	0133, 1303
Hampton Roads, VA	NMN 80	0203, 1333
San Francisco, CA	NMC17	0203, 1403
Eastern Shore, VA	NMN 70	0233, 1403
Humboldt Bay, CA	NMC11	0303, 1503
Astoria, OR	NMW	0533, 1733
North Bend, OR	NOE	0603, 1803
Port Angeles, WA	NOW	0615, 1815
Honolulu, HI	NMO2	0903, 2103
Long Beach, CA	NMQ9	1303, 2103

❖ Weird Russian Telemetry

A very strange little station popped up in this month's log. It's the Russian Air Defense tracking link. While there's nothing odd about passing radar target positions over shortwave radio, this must be the world's only system using continuous-wave (CW) Morse telegraphy!

According to Ary Boender's great write-ups, this automated station is, in fact, a backup to more modern equipment and is used mostly for training. The full description is in issues 53 and 59 of Ary's excellent *Numbers & Oddities Newsletter*, with far too much detail to get into here. It's at **http://home.luna.nl/~ary/**. Just go to the downloads page and get the compressed 2002 and 2003 archives.

What's heard on the air is a 14-character numeric string always preceded with the Morse procedural signal "BT" (break). The "0" is cut to a Morse "T," and unused digits are padded with the Morse question mark (?).

Most of the time, you'll hear a channel-idle marker sent once per minute. This is a station ID, currently almost always "99," immediately followed by a 24-hour time stamp in Moscow local time. This is 3 or 4 hours ahead of UTC, depending on the season. The minutes are not always completely accurate. Other time zones and identifiers such as "44" are heard on rare occasions, probably from different transmitters. All markers terminate in "??"

Strings containing "real" information are also BT plus 14 characters, but with more and different numbers, fewer question marks, and no time stamps. The clever tracking grid and numeric code were originally cracked by aircraft noting changes in the strings along with their own known positions.

The CW frequencies are fairly low, and so late night is the best time to spot this station in most of the world. Over 100 frequencies are known. The most recent hit was on 2219.5 kHz. Others were on 4951.5 and 5198.0. Going back a ways, we also see 3314, 3322, 4015, 4032, 4071.5, 4201, 4391, 4418, 4559, 4631.5, 4868, 5131, 5141.5, 5195, 5201, 5210.5, 5260.5, 5313, 5316, 5731, 5765, 5873, 5877, 5921.5, 6321.5, 6979.5, and 7994 kHz.

While this is not a true "numbers" station, it's been given the standard designator "M21" by ENIGMA 2000, the online incarnation of the highly respected European Numbers Information Gathering and Monitoring Association. This is how it will usually be found in logs and Internet searches.

Good hunting, and see you next month.

Utility World

Utility Logs

Hugh Stegman
hughstegman@monitoringtimes.com
www.ominous-valve.com/uteworld.html

ABBREVIATIONS USED IN THIS COLUMN

AFB.....Air Force Base
ALE.....Automatic Link Establishment
AM.....Amplitude Madulation
ARQ.....Automatic Repeat Request teleprinting system
AWACS.....Airborne Warning And Control System
CAMSPAC.....Communication Area Master Station, Pacific
CAMSLANT...Communication Area Master Station, Atlantic
Coq-8.....Coquelet-8, French & Algerian teleprinting made
CW.....Morse cade telegraphy ("Continuous Wave")
DEA.....US Drug Enforcement Administration
E10.....Israeli female phonetic alphabet "numbers"
E10a.....All abnormal variants of E10
FAX.....Radiofacsimile
FEC.....Forward Error Correction teleprinting system
FEMA.....Federal Emergency Management Agency
HFDL.....High-Frequency Data Link
HF-GCS.....High-Frequency Global Communications System
JSTARS.....Joint Surveillance Target Attack Radar System
M21.....Russian CW air tracking, ?=missing character
M89.....Chinese 4-letter-call CW net w/4-figure groups
MARS.....Military Affiliate Radio System
Metea.....Meteorological
MFA.....Ministry of Foreign Affairs
MXI.....Russian single-letter navigational beacon cluster
PACTOR.....Packet Teleprinting Over Radio
Piccolo.....High-pitched British multi-tone teleprinting
PR.....Puerto Rico
RSA.....Republic of South Africa
RTTY.....Radio Teletype
SAR.....Search And Rescue
SITOR-A.....Simplex Teleprinting Over Radio, ARQ mode
SITOR-B.....Simplex Teleprinting Over Radio, FEC mode
SYNOP.....Synoptic Weather Observation Codes
UK.....United Kingdom
Unid.....Unidentified
US.....United States
V2c.....Cuban "Atencionl," pauses every 10th group
VFT.....Voice Frequency Telegraphy

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time).

2182.0 Fishing Vessel *Endeavor*, working Oceana Radio, (US Coast Guard Auxiliary, VA), and Coast Guard Group Ft. Macon, NC, in a medical emergency at 0818. (Allan Stern-FL)

2219.5 Unid-Russian Air Defense station (M21), with a 14-character time-stamped CW string each minute, at 1921. (Day Watson-UK)

3167.4 "3-T-Z"-US Navy, working "L-0-U" in Link-11 coordination net, at 0234. (Mark Cleary-SC)

3275.0 JP47-Algerian Military, working JP40 in ALE at 0052, then calling JP50 at 0055. JP50 calling JP40, ALE at 0056. Many other JP## callsigns copied, also using 4505, 4766, 4798, 5035, 5065, and 5295. (Watson-UK)

4015.0 SYN75-Abnormal Israeli Intelligence callup (E10a), parallel on 6930, at 1830. (Ary Boender-Netherlands) SYN75, same transmission, switching to normal null-message callup SYN2 (E10), at 2024. (Chris Smolinski-MD)

4250.5 HEB01-Bern Radio, Switzerland, returning to the air with data markers identified in CW every three minutes, at 1649. (Watson-UK)

4433.0 WT8L-Unknown station calling Q8QY in CW, at 1928. (Watson-UK) *[Sounds like the mysterious Chinese numbers net, ENIGMA designatar M89. -Hugh]*

4681.0 ZS-SNA-South African Airways, working Johannesburg in HFDL, at 0342. (Bob Hall-RSA)

5088.5 USAIS1012-US Army Intelligence and Security Command, Ft Belvoir, VA, calling several Army stations in ALE, at 1651. (Perron-MD)

5119.8 FDI22-French Air Force, Narbonne, CW markers at 1742. (Watson-UK)

5150.8 VTK-Indian Navy Tuticorin, with markers at 2238. (Watson-UK)

5320.0 NOWK-US Coast Guard Cutter *Dependable*, working Cutter *Maka* and distressed fishing vessel *Pravider*, at 0410. (Rick Baker-OH) Rescue 1503-US Coast Guard SAR, working Group Atlantic City and the three aforementioned vessels, at 2230. (Cleary-SC)

5422.5 Radio Paradise-US Coast Guard Auxiliary, MI, in a net with Radio Conway (SC), Radio Choptank (MD), Radio Huntington (WV), Radio Media, and Radio Winona, at 0132. (Cleary-SC)

5616.0 UAL 943-United Air Lines 767, working Shanwick at 1312. Connie 328-Kalitta Air 747 freighter *[Famous ex-airliner, 34 years old and in great shape. -Hugh]*, working Shanwick at 1322. USA 3-US Airways A330, working Shanwick at 1335. (Cliff-UK)

5696.0 CAMSPAC Point Reyes-US Coast Guard, CA, working Coast Guard 1713 in SAR involving distressed motor vessel *Explorer*, at 1713. (Baker-OH) "J-5-F"-US Coast Guard, go-fast smuggling boat tracking with CAMSLANT, at 1407. (Cleary-SC)

5732.0 Panther-US DEA, Bahamas, giving 18C a grounded vessel's position, at 2220. (Cleary-SC)

5841.0 Panther-US DEA, Bahamas, working "1-7 Charlie" at 0037. (Baker-OH)

6368.5 HEB02-Bern Radio, Switzerland, markers identified in CW, at 1646. (Watson-UK)

6422.0 PWZ-Brazilian Navy, Rio de Janiero, PACTOR-I weather in Portuguese, at 1025. (Hall-RSA)

6761.0 Reach 139-US Air Force Air Mobility Command, calling Sooner Control, no joy at 2354. (Cleary-SC)

6797.0 Cuban AM female Spanish "numbers" in the V2c format, muffled audio, began at 2203 and ended at 2243. (Edward Walsh-AL)

6834.0 GYA-UK Royal Navy, Northwood, FAX Middle East service at 1816. (Watson-UK)

6930.0 SYN5425-Abnormal Israeli Intelligence callup (E10a), repeating six times a minute from 0025 tune-in until 0200, changed to SYN59 at 0201, and was still going at 0300. (Walsh-AL) SYN2-Israeli Intelligence null-message callup (E10), for three minutes at 0247. (Mark Morgan-OH)

6985.0 0FCSFEM-FEMA Communications Supervisor, VA, sending USAIS1012 (US Army, VA) an ALE test message at 1703. (Perron-MD)

7313.5 AFF2FL-US Air Force MARS, FL, in the Region 2 training net with AFF2T and AFT2IU, at 1408. (Cleary-SC)

7508.0 ZSJ-South African Navy, Silvermine, Antarctic FAX ice chart at 0800. (Hall-RSA)

7617.0 CAMALEON3-Mexican Army, calling RM4 (Region 4, Monterrey), ALE at 0116. (Ron Perron-MD)

7633.5 Reach 252-US Air Force, patch via Air Force MARS AFA1MH, at 1922. (Cleary-SC)

7635.0 Hill CAP 49-Control of Civil Air Patrol National Daytime Net, checking in Kitty Hawk 30, Hill CAP 604, and Red Robin 8, at 1729. (Cleary-SC)

8045.0 ASTRO-Mexican Army, calling ENCINO in ALE, at 0301. (Perron-MD)

8056.0 CLH-US Army Special Forces, Ft. Bragg, NC, calling CLS (Special Ops, Ft. Campbell, KY), also on 9145, ALE at 1330. (Perron-MD)

8171.5 EAATS-Eastern Army Aviation Training Site, PA, ALE sounding at 1519. (Perron-MD)

8301.6 Sector San Juan-US Coast Guard, working helicopter Stingray 39, at 2306. (Cleary-SC)

8307.1 CGD9-US Coast Guard District 9, Cleveland, OH, calling NRKP (Cutter Mackinaw), in ALE at 2101. (Perron-MD)

8446.5 HEB03-Bern Radio, Switzerland, markers identified in CW, at 1643. (Watson-UK)

8484.5 HEB04-Bern Radio, Switzerland, markers identified in CW, at 1608. (Watson-UK)

8568.3 FUV-French Navy, Djibouti, RTTY "voyez le brick" test loop at 0040. (Perron-MD)

8834.0 3B-NBH-Air Mauritius flight 884, an A319 with HFDL position for Johannesburg, at 1231. (Hall-RSA)

8879.0 Speedbird 175-British Airways 747 working Gander and

Shanwick, abandoning its New York flight plan and returning to London, at 1518. (Cliff-UK) *[News media reported this flight was refused US entry for security reasons relating to a name on the passenger manifest. -Hugh]*

8891.0 CLX774-Cargolux Airlines freighter, working Iceland Radio at 1602. N919CT-Gulfstream 4 working Iceland, Arctic Radio audible in background, at 1613. (Patrice Privat-France)

8912.0 Charlie Oscar Echo-US Army Corps of Engineers, Mobile, AL, authenticating and checking Charlie 26 into the net, at 1605. (Cleary-SC)

8930.0 Reach DQ1-US Air Force, chartered 747 from Emirates Sky Cargo, with company traffic via Stockholm Radio at 1345. (Cliff-UK)

8971.0 Wafer 21-US Navy P-3C, working Goldenhawk (USN, Brunswick, ME), at 1809. (Cleary-SC)

8980.0 Coast Guard 2136-US Coast Guard helicopter, patch to District 7 Command Center at 2114. (Cleary-SC)

8992.0 Reach 5033-US Air Force tanker, patch via Puerto Rico HF-GCS to Barksdale AFB, at 1722. (Cleary-SC)

9007.0 Canforce 2652-Canadian Forces, getting weather from Trenton Military at 2139. (Cleary-SC)

9025.0 ICZ-US Air Force, Sigonella, Italy, calling KEH34, US Consulate in Basra, Iraq, ALE at 0621. (Perron-MD) Bolt 31 Heavy-US Air Force tanker, radio check at 1434. (Cleary-SC)

9045.0 RM6-Mexican Army Region 6, La Boticaria, calling CAMALEON3 in ALE, at 0445. (Perron-MD)

9060.0 RM3-Mexican Army Region 3, calling CAMALEON3 in ALE, at 1059. (Perron-MD)

9065.0 R0339-Idaho National Guard, calling KBOI, Boise Air Terminal, ID, in ALE at 0312. (Perron-MD)

9360.0 OXT-Copenhagen Meteo, still sending FAX ice charts after announced 1/1/05 shutdown, at 1008. (Watson-UK)

9996.0 RWM-Moscow standard time station, CW pips at 1646. (Watson-UK)

10000.0 "Yosemite Sam"-Mystery pirate beacon, probably in NM, with buzz and word "Varmint!" audible through WWV, at 1517. (Smolinski-MD) Unknown databurst and voice, either Sam or errant ALE, under WWV at 1704. (Jeff Haverlah-TX)

10281.3 1hb8gva-Red Cross, Geneva, calling BEL (Belgrade?) in PACTOR-I, then switching to PACTOR-III for traffic, at 1512. (Watson-UK)

10691.5 814388-unidentified aircraft, calling HTR (Hooter Ops, US Army Special Forces, Ft. Campbell), also on 9145 and 12068.5, in ALE at 1831. (Perron-MD)

10993.6 Coast Guard 1712-US Coast Guard HC-130, position for Sector Key West at 1300. (Cleary-SC)

11175.0 Reach 6023-US Air Force, patch via Lajes to Hilda Global, (Scott AFB, IL), at 1137. (Cliff-UK) Cacti 51-US Air Force tanker, patch via Puerto Rico HF-GCS to Red Baron (Mildenhall Air Base, UK), reporting wing problem at 1139. (Cleary-SC)

11205.0 Sweet 71-US Air Force C-130H, working Smasher (US Joint Task Force, Key West, FL), at 1535. (Cleary-SC)

11220.0 Air Force 7-US Air Force distinguished visitor unit, patching Andrews Control via Andrews HF-GCS, then attempting secure mode with no joy, at 1817. (Cleary-SC)

11232.0 Darkstar Quebec-US Air Force, patch with unknown ground station at 1637. (Larry Wheeler-VA) Sentry 60-US Air Force AWACS, patch via Trenton Military to Fuzzy Ops, NY, at 1608. United Nations 03, patch via Halifax Military to Wing Ops, at 2053. (Cleary-SC) Trenton Military-Canadian Forces, patching US Air Force JSTARS Razor 33 to Peachtree Ops (Robins AFB, GA), at 1955 and 2018. (Perron-MD)

11285.0 Medevac 444-German Air Force A310, medical relief aircraft returning injured German tourists from the tsunami, working Chennai Radio, India, at 1508. Qatari 303-Qatar Airways A321, working Chennai at 1515. (Cliff-UK)

11384.0 SU0141-Aeroflot flight giving HFDL position, at 1035. (Watson-UK)

11396.0 Northwest 11-Northwest Air Lines flight enroute to Tokyo, working Manila at 1405. Indonesia 6115-Possible tsunami relief flight, working Jakarta at 1427. (Cliff-UK) SIA235-Singapore Airlines, working Brisbane at 1620. (Privat-France)

11427.5 RBT-Algerian Embassy, Rabat, Morocco, calling MAE (MFA Algiers), ALE at 1131 and 1142. (Watson-UK)

11444.7 Unid-Egyptian MFA, Cairo, calling Abidjan in SITOR-A, then working unknown embassy, at 1538. (Watson-UK)

11453.0 IMB3-Rome Radio, with RTTY weather observations in SYNOP and an unknown 5-figure code, at 1510. (Watson-UK)

11475.0 MAE-Algerian MFA, Algiers, calling TNS, Tunis, in ALE at 1114. (Watson-UK)

11625.0 SCLC131-Venezuelan Army 131st Infantry Battalion, calling PCRC1, Region 1, ALE at 1329. (Perron-MD)

12191.0 SCLC501-Venezuelan Army, calling SCLC511, 511th Jungle Infantry Battalion, ALE at 1327. (Perron-MD)

12225.0 KRR-United Nations, Sudan, calling NYALA1 in ALE, at 1519. (Hall-RSA)

12557.0 Unknown vessel calling Istanbul in SITOR-A, at 1428. (Watson-UK)

12574.0 UBAU-Russian vessel *Aleksandr Mironenko*, traffic for Murmansk in 3rd-shift Cyrillic RTTY, at 1720. (Watson-UK)

12587.0 LZW-Varna Radio, SITOR-B traffic list and markers at 1440. (Watson-UK)

12590.5 RRR34-Moscow Radio, SITOR-B traffic list and markers at 1432. (Watson-UK)

12654.0 TAH-Istanbul Radio, Turkey, SITOR-B weather, started late at 0840. (Watson-UK)

12687.0 HEB05-Bern Radio, Switzerland, markers identified in CW, at 1642. (Watson-UK)

13025.5 HEB06-Bern Radio, Switzerland, markers identified in CW, at 1640. (Watson-UK)

13200.0 Cacti 51-US Air Force tanker, patch via Puerto Rico HF-GCS to Keflavik, Iceland, at 1155 . (Cleary-SC)

13215.0 RCS-Probably Rockwell/Collins Air Force facility, TX, ALE sound at 1840. (Privat-France)

13503.6 KWK93-Unknown US State Department, calling KWK96 in ALE, at 1531. (Perron-MD)

13510.0 CFH-Canadian Forces Halifax, NS, RTTY weather at 1250. (Watson-UK)

13882.5 DDK6-Hamburg Meteo, FAX ice charts at 1527. (Watson-UK)

13885.9 Unid-Moscow Meteo, grainy FAX charts at 1416. (Watson-UK)

13927.0 Razor 32-US Air Force JSTARS, patch to Peachtree Ops via AFA1RE, ME, at 1820. (Cleary-SC)

14408.0 Reach 304-US Air Force, patch via AFA3HS, KS, at 1617. (Cleary-SC)

14670.0 CHU-Canadian standard time station, Ottawa, pips and voice in reduced-carrier USB, at 1622. (Watson-UK)

15025.0 LV 595-US Navy P-3C, working Smasher (Joint Task Force, Key West, FL), at 1902. (Cleary-SC)

15920.0 CFH-Canadian Forces Halifax, NS, RTTY marker with listening frequencies of 2822, 3394, 4167, 6454, 8303, 12380, 16576, and 22182, at 1558. (Watson-UK)

16283.6 KWK90-Unknown US State Department, calling KWK96 in ALE, also on 18248.6 & 20810.6, at 1621. (Perron-MD)

16346.7 kdfespsr-Egyptian MFA, Cairo, working London embassy in SITOR-A and -B, at 1520. (Hall-RSA)

16913.5 HEB07-Bern Radio, Switzerland, markers identified in CW, at 1651. (Watson-UK)

17147.0 CBV-Valparaiso Radio, Chile, FAX weather satellite image at 1137. (Hall-RSA)

17441.5 5YE-Nairobi Meteo, Kenya, RTTY weather at 1526. (Hall-RSA)

17458.5 HQ703N-Probably US National Guard Readiness Center, Arlington, VA, calling A100KN, National Guard, Alaska, in ALE at 1541. C090AN-US National Guard, California, calling AZC91NG, AZ, also on 16338, in ALE at 1658. (Perron-MD)

17988.0 NOJ-US Coast Guard, AK, ALE sounding, also on 13221, at 1949. (Perron-MD)

18879.0 MTS-UK Royal Air Force, Mt. Pleasant, Falklands, with several clear and encrypted Piccolo channels in wideband VFT, at 1021. (Watson-UK)

19814.0 022NHQCAP-US Civil Air Patrol National Operations Center, Maxwell AFB, AL, sounding in ALE at 1457. (Perron-MD)

21250.0 PC100H-Scheveningen Radio, Netherlands, amateur band special event marking 100th anniversary of this recently closed maritime coastal station, at 1110. (Baker-OH)

22446.0 FUV-French Navy, Djibouti, RTTY "brick" test loop at 0912. (Hall-RSA)

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Voice Frequency Telegraphy

This month we take the first look at a once popular technique for squeezing multiple channels of various signals onto the same transmitter simultaneously. We also have some updates to pass on regarding the HF activities of Doctors Without Borders.

❖ Voice Frequency Telegraphy

Here's the conundrum: you have to get five times as much data from one end of a link to the other, or you have to get five different channels of information from transmitter to receiver. How do you do it? Five sets of receivers, transmitters and modems each on a different frequency – one for each channel?

Fortunately, there is an easier way: one that can still utilize just a single set of equipment on one frequency. Let's assume that you have five channels of 75bd RTTY with a tone spacing of 200Hz to send. Let's also imagine that you did, in fact, start with five separate transmitters each sending a single channel of this signal on a different frequency. We could start by spacing the transmitters at 1MHz and receive each signal independently. If we reduced the spacing of each channel, say to 100kHz, we still need five receivers to read each channel.

Imagine now, that we continue to reduce the spacing until we can fit all of our five channels into the same bandwidth required to send a typical voice transmission, about 4kHz. Presto! We now can use the same transmitter to send all five channels with still enough separation between the channels to recover each without mutual interference.

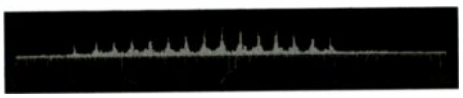
This is the essential idea behind Voice Frequency Telegraphy (VFT), otherwise known as multiplexing or MUXing for short; alternatively, because we combined the channels in frequency, we have achieved frequency division multiplexing or FDM.

❖ Measuring VFTs and the Importance of the Pilot

As we look at some real VFT examples, we need to understand how to describe a such a signal. Typically, most VFTs are carried by upper sideband (USB) transmitters positioned on a whole kilohertz point. Each channel is then measured in terms of its offset in Hz from the (suppressed) carrier point (0Hz) to the center point of its two tones.

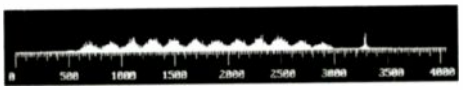
Here is a typical example – the common BR6028 or "Barrie" (short for BR Communications, the most well known manufacturer of modems using this configuration), which has seven channels of 75bd 170Hz RTTY positioned at +850, 1190, 1530, 1870, 2210, 2550 and 2890Hz respectively.

You can still hear the New Zealand Navy's BR6028 VFTs on 11010 and 13458.2kHz from time to time. A US outlet on 8045 and 4085kHz appears for a few days now and again, too.



Notice, too, that the BR6028 also has a pilot tone at an offset of +560Hz. Because tuning errors and drift at the receiver can be a real problem in VFTs, a constant tone at a well-known position is often sent along with the data. The receiver can then lock onto this guiding pilot tone and stay correctly aligned regardless of drift or other disturbances.

Here is another commonly heard VFT used by the British Military, which features one, two, or (more rarely) three or four channels of Piccolo-6, a six tone MFSK system. The offsets in this case are +510, +910, +1310 and +1710Hz. Note that this configuration does not use a pilot tone. If you do hear one of these guys (and they appear quite frequently), stay tuned to the often idling first channel, since this is the engineer's channel and is where the operator chatter in the clear takes place. The other channels are most usually on-line encrypted.



Of course, we're not limited to FSK signals, be they two or more tones, to make up our VFT. PSK signals may also be used. This is the case in the Russian Air Force 12 tone modem or vocoder (voice encoder) otherwise known as MS5 or FIRE. This modem uses 12 channels of 120bps DPSK extending from +700Hz to +2900Hz with a pilot at +3300Hz. The MS5s have a very distinctive sound (see Resources) and can be found just about anywhere on the dial most days.

Spread 'em out in Time

VFT is a very powerful method for meeting our needs for sending a number of channels of information over the same transmitter. However, there's more we can do using this technique.

Rather than independent channels, we can also send the same information over each channel. Why? If we delay the data in each channel by a few tens or hundreds of bits we can minimize the errors due to transmission noise and interference at the receiver by reintroducing the channel delay and voting on the number of bits we receive on each channel. The majority vote decides whether we decode a particular bit as a "1" or a "0". We haven't increased throughput (the amount of information sent in any period of time), since we are still sending data at an overall rate of a single channel, but we've now dramatically increased the robustness of our signal! This version of the VFT technique is called TDM or Time Domain Multiplexing, since we're now also spreading our multiplex of channels in time.

Up until about 1996, the Belgian diplomatic service used a BR6028 type VFT with each channel delayed by about 0.25sec to send their embassy traffic.

While there may not be too many examples of VFTs around the bands anymore, it's a technique worth getting to know. Next month, we'll look at a few more examples that pop up from time to time. You can also retrieve lists of frequencies on which these signals have been heard by going to the Modes page in the Database section of Utility Monitoring Central (see Resources).

❖ Medecins Sans Frontieres Update

Some other time we'll do a fuller profile of this interesting French-based humanitarian NGO (Non-Governmental Organization), but for now, the continued crises in Africa and SE Asia have resulted in a few new channels emerging.

The MSF uses PacTOR for most of its operations with selcals (selected calling), usually six letters, beginning with "PACM" (probably short for PACtor Mailbox). The final two letters of the selcal is usually a cryptic clue to the location of the station.

New channels recently monitored:

17432.76 kHz calling PACMNK
(probably Nouakchott, Mauritania)
19020.00 kHz calling PACMCI
(probably Ivory Coast) and ZWEDRU (Zwedru, Liberia)

That's it for this month. My thanks to Day Watson for the screenshots of the various VFTs. Enjoy your digital listening.

Resources

Utility Monitoring Central - http://www.chace-ortiz.org/umc
VFT Audio Clips - http://rover.vistecprivat.de/~signals/TABLES/MCVFT.HTML
MS5 12 Tone Modem Clip - http://rover.vistecprivat.de/~signals/WAV/CIS12CH.HTML
Medecins sans Frontieres - http://www.msf.org

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Get Out and Visit Your Shortwave Stations!

In the *radioescutas* group, Ivan Dias of the DX Clube do Brasil writes (in gh translation): I decided to pay a visit to my hometown 120 mb station, Rádio Cacique, one of the most obscure stations and one of few still using that band. I was warmly received by Sr. Edir Correa, who was astonished by some of the QSLs I brought along and my explanation of the DX hobby. They still had on file reports from the '70s and '80s from Europe, South Africa and the USA, and unfortunately one from that fraud Bellabarba. I suggested they resume QSLing with the full-data card they had in the '80s, and explained IRCs to them. They were also unaware they had been on 2370 for six months instead of 2470 (actually, I also can also barely hear them on 2470 while 2370 is very strong). Reports should be sent to Sr. Edir Correa, Rua Saldanha da Gama 168, Centro, Sorocaba SP, Brasil.

Then, as part of a big three-country summer holiday trip, Arnaldo Slaen reported to *HCDX* and *Noticias DX* on his visit to R. Baluarte, the only non-government SW station in Argentina; its studios are in a picturesque location a few blocks from downtown Puerto Iguazú, a nice little tourist town in the northeastern province of Misiones. It's on 6214.5 with less than 500 watts since mid-2000, on a completely home-made transmitter from Buenos Aires; schedule is 0900-2400 UT, totally rebroadcasting FM Futuro 101.7, with a 20-meter longwire outside the town aimed at southern Brazil, where the station has an important audience. This religious group also has a MW station with separate programming on 1610, R. Maranatha. They are happy to get reception reports from all over the world, but can't play CDs, so it's best to give details in writing, to *icnfuturo@hotmail.com* or to those in charge of QSLing, Pastor Hugo Eidinger or Sra. Ana de Eidinger, Hipólito Yrigoyen esquina Andresito, Puerto Iguazú, Provincia de Misiones, Argentina. Scott Barbour tells *DX Listening Digest* a station heard in NH on 6215 as late as 0033, with announcers and ballads, was presumably this, running later on weekend.

ALASKA Construction of new tower and antenna for KNLS began Jan 17. Kevin Chambers had a crew ready to begin assembling the 365 feet tall antenna in Anchor Point. Once tower is finished, curtain antenna that would cover 3 acres if laid down on the ground would be assembled; steel everywhere. Weather seemed to be cooperating; looking at turning on new antenna March 28 (WCBC) With second transmitter (gh)

AUSTRALIA ARDS, ex-5050: Community Development Radio Service website, http://www.ards.com.au/broadcast.htm has various links including soundfiles (Tim Gaynor, *DXLD*) Currently only on 1530 kHz; but the support page says: "Please join us in making this capacity building service readily available on AM (subject to licensing) as well as Short Wave as soon as possible. We commenced the 'shoestring' service on 1 August 2003." (gh)

BANGLADESH Bangladesh Betar, English at 1230-1300 heard on 7185 and // 4808 but nothing on 4880, or 9550. Others please check 4808 when you hear 7185 (David Norcross, Hong Kong & Hawaii, *DXLD*) Then reported by several with surprisingly good signals in Pennsylvania on 7185 – new transmitter and/or a pipeline to PA (Larry Yamron, NASWA *Flashsheet*; Brian Alexander, *DXLD*; John Figliozzi, *HCDX*)

BELGIUM [non] If you're reading this before March 27, tune in RVi before its expected abolition, in English via Bonaire 11730 at 2200 and 9590 at 0500 (gh)

BOTSWANA VOA added 4930 from here Feb 1: 0300-0630 VOA English, 1600-1700 VOA English, 1700-1800 VOA *Studio 7* [for Zimbabwe], 1800-2200 VOA English (Wolfgang Büschel, *DXLD*) 4930 heard the first day at 0410-0425 with news, sports, business news. Good signal with rapid fading // 4960 from São Tomé, slightly weaker. Though the two were less than 1 S unit apart, 4930 had stronger audio (Jim Evans, TN, NASWA *Flashsheet*)

BRAZIL R. Inconfidência [6010] resumed a mysterious parallel transmission on unauthorized 5910, heard at 1253 (Adalberto Marques de Azevedo, Brazil, *Noticias DX*) Don't confuse with the new Colombian on 5910v though it may cause further interference (gh)

Rádio Educação Rural, Campo Grande (MS), heard around 0410 on 4755, now rebroadcasting Rede Milícia Saturday from São Paulo, instead of closing down earlier. Phoned the station and João Bosco told me it is now carrying religious programming from that network 24h. Station name and address remain the same, but there is no management in Campo Grande. Network site is http://www.milicia.org.br (Célio Romais, Porto Alegre, Brasil, *radioescutas*) Devoted to Virgin Mary, as implied by MIDI Ave Maria when launching website; doesn't list this OT station but R. Alvorada, 4865 (gh)

Am hearing a pirate with horrible modulation on 7842 (Marcelo Xavier Vieira, Itambé, via Carlos Felipe, *radioescutas*) At 1436 on 7842 AM, ID as Rádio Diário da Manhã, mentioning Lages, Santa Catarina, several times (Anderson Assis de Oliveira, Itaúna/MG, *ibid.*) Carrier heard as early as 0900, opening at 1020 as *"ZYT30, Rádio Diário da Manhã, transmitindo para todo Brasil"*, homage to Che Guevara. Operator sounded like a ham, mike tests, gave frequency as 7840 (Anderson Assis de Oliveira, *ibid.*) There were two real stations by this name in SC, one on 740, now CBN, and another AM in Lages, surely no relation to this pirate (Rudolf Grimm, SP, *ibid.*) Another evening on 7842, oscillating almost 1.5 kHz every 20 minutes, ID as *"Rede Difusora para todo o Brasil via Satélite"* (Denis Zoqbi, *ibid.*)

CANADA Robert Earle Fisher, host of the *Listeners Corner* for over 30 years on CBC International Service, died peacefully Jan 27 at Cobourg, Ont., at the age of 88 (*Globe & Mail* obit via Theo Donnelly, Vancouver, via Bryan Clark, NZ, *DXLD*) Included portrait in front of a CBC mike, quite the dapper gentleman. For the newcomer, Earle Fisher was a very popular SW broadcaster in the '60s, the point of contact for listeners to the predecessor of RCI, long before the era of Ian McFarland (gh)

RCI frequency manager plans to recommend reintroduction of 2300-0100 broadcast next winter, as the later 0100-0300 broadcast this winter skipped over northeastern US, even on 6190 (Sandy Finlayson, a Canadian in PA, *swprograms*)

RCI and its relay clients via Sackville, CRI, VOV and RKI, had major problems on Sunday, Feb 6 into UT Feb 7; audio feed from Montreal kept dropping out and was finally lost altogether, replaced by fill music; furthermore, some of the scheduled broadcasts went out on the wrong frequencies (Alan Johnson, NV; Andy Ooms, AZ; Pete Bentley, NY; Jorge García, Venezuela; gh, OK, *DXLD*; Sandy Finlayson, PA; Chris Campbell; Ted Schuerzinger; Ricky Leong, QC, *swprograms*) There was a major failure on Sunday in the Bell circuit linking Montréal and Sackville. Replacement equipment was flown to Moncton (the closest airport) overnight, and repairs were taking place by noontime the next day. The fill music originated at Sackville. They're set up to do that, just for this sort of eventuality (Bill Westenhaver, RCI, *DXLD*) Does "Bell circuit" mean a landline? Per http://hawkins.pair.com/rci1.shtml the Canadian Anik satellite system is used to feed Sackville. Surprising they are able to play music fills but not to make do with call-up connections (Kai Ludwig, Germany, *DXLD*) Or internet feed backup (gh) Anik satellites are part of Telesat, of which Bell Canada, the telco serving Quebec, is a major owner. If they had terrestrial microwave backup they would still be dealing with Bell Canada (Mark Coady, Ont., *DXLD*)

COLOMBIA From Feb 12 at 0211, reactivated 6139.73, the old Melodía 730 AM, Bogotá, now IDs as Radio Líder 730 AM, HJCU, still part of the Cadena Melodía de Colombia. They already stopped using the name Melodía on AM 730 almost a year earlier; now we know why (Adán González, Venezuela, DXLD) 6140 reactivated 0400-0500 Feb 12, but now R. Melodía is relaying R. Líder (John Cereghin, DE, *HCDX*) Also at 1102-1118, booming signal (Scott R. Bar-

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; A-05=summer season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

bour, Jr., NH, *DXLD*) *Líder* is simply a rendering of "Leader", for which sense true Spanish words such as *jefe, conductor, director* or *guía* are inadequate (gh) 6139.8, 0637-0707, program of Spanish ballads, choral anthem(?), tones, ID *"En Bogotá, Colombia, ésta es Radio Líder"* (Ron Howard, CA, *DXLD*)

Jan 14 at 0201-0206 on 5910 heard La Voz de tu Conciencia, testing, 5 seconds behind their original frequency 6010, but strong interference on 5910 (Adán González, Venezuela, *DXLD*) First report of new frequency they had been trying to bring up for a couple of years. QRM probably Ukraine (gh) 5910.39 finally went into regular service with full power on Jan 30, now relaying Marfil Estereo 88.8 FM, Puerto Lleras (Björn Malm, Ecuador, *DXLD*) Well heard here around 0600 with 88.8 ID (gh, OK) Also at 1205 with sermon on The Fall of Man (José Elías Díaz Gómez, Venezuela, *DXLD*) And also heard on 5810.75 at 0130, mixture of La Voz de tu Conciencia, 6010.14, and a weaker Marfil Estéreo 8.8 on 5910.47 (Björn Malm, Quito, Ecuador, *DXLD*) Formula 2A minus B, or "leapfrogging" one signal over the other, in this case roughly 100 kHz apart, and there is likely another around 6110, masked by other stations. 5910v has QRM from a beeping ute on 5912 (gh) Sometimes the two are in parallel, such as at 1053 on 5910.43 and 6010. Also seemed to sign on at 0200 since only Ukraine was heard before then; 0208 llaneras and rancheras. The 6010 programming also heard on very weak 5810.81 at 0031 (Adán González, Venezuela, *DXLD*)

R. Mundial, 2740 = 2 x 1370 at 0730, with religious programming in Spanish (Alvin Mirabal, Puerto Rico, *HCDX*)

Colombia Mía on 3200.15, both morning and evening, from Carepa in Antioquia Dept., owned by the military, 2 x 1600 (Björn Malm, Quito, Ecuador, *DXLD*)

CARACOL network with fútbol on 3219.8 at 2125-2315, presumed harmonic of 1610, Armonías de Occidente (Rich D'Angelo, PA, NASWA *Flashsheet*)

Different Colombian stations have been heard relayed on 6923.5-USB, such as Radio Caracol 810 kHz, at 1106-1123 (George Maroti, NY, DXLD) 6923.4-USB, Parques Nacionales de Colombia, 1345 *Punto de Encuentro* discussion program between Medellin and Bogotá (José Elías Díaz Gómez, Venezuela, *DXLD*)

CUBA Our facilities in Bauta, 15 miles west of Habana, are being revamped. 6060 is using an antenna that was severely damaged by hurricane Charley on 13 August. Engineering crew had to put up two new towers, in order to rebuild the antenna. But now that will be changed to a curtain array with a lot more gain in a few months. Charley went exactly through the station; fortunately, the buildings were very strong and reinforced (Arnie Coro, RHC *DXers Unlimited*)

DJIBOUTI From some sources I got info that RTD's new 50 kW SW transmitter (4780?) might be operational sometime this March (Jari Savolainen, Finland, *DXLD*) 4780 was supposed to have been built by IBB as part of the deal to establish the 1431 Radio Sawa station (Chris Greenway, Kenya, *ibid.*)

ECUADOR After a week of testing DRM on 15375 for the HFCC in Mexico, HCJB announced irregular DRM tests with 6 kW in Quichua the second half of Feb on 3220 and 6095 at 1000-1300 and 2200-0100, but only one at a time since they have only one DRM exciter (vio George McClintock, *DXLD*)

EQUATORIAL GUINEA R. Africa No. 2 reactivated on 15190 after several years, from mid-Jan, with US religious programs in English, first heard at 1615 (Jari Savolainen, Finland, *DXLD*) Gave usual Cupertino CA address of Pan American Broadcasting, the broker. In March 2003 it was reported that two new 50 kW shortwave transmitters were to be installed in Equatorial Guinea by Chinese technicians. Radio Bata has been heard recently (albeit intermittently) back on 5005, so perhaps the second transmitter has been installed on 15190? (Dave Kenny, BDXC-UK) Fortunately there was little interference here to BBC via Antigua, our best morning frequency, but on bad days, an annoying undercurrent from screaming gospel hucksters (gh, OK) Heard as early as 1430 (Anker Petersen, Denmark, *DXLD*) Erratic, also heard as early as 0615, with power variations, tape playback foulups (Chris Greenway, Kenya, *ibid.*) Beware of R Pilipinas from *1730 on 15190! (Vlad Titarev, Ukraine) Previous operation had No. 2 service on weekdays for S. Africa, R. East Africa on weekends (Bill Matthews, OH, *DXLD*) Heard on a Sunday at 1600 as Radio East Africa (Christer Brunström, Sweden, *SW Bulletin*) Same another Sunday at 1445 (Manuel Méndez, Spain, *DXLD*)

GERMANY [and non] I have been listening to DRM from Sackville for several months. Now heard Wertachtal on 3995. I have all "Green Lights" and am receiving the audio and data perfectly. Receiver is a Ten-Tec RX-320D, antenna a GAP Vertical Titan DX. I am sure a lot of amateur radio operators have been wondering what the "noise" was on 3995! (Glenn Farr, N4AK, Travelers Rest, SC) Although 3995 DW DRM continues coordinated for A-05, this may be terminated as part of overall DW reductions in SW broadcasts. Klaus Schneider says that Ismaning 6085 will likely be converted from AM to DRM on April 1 (Kai Ludwig, Germany, *DXLD*)

GOA I just found out the names of the two 250 kW SW transmitters of AIR Panaji: *Mandovi*, and *Zuari*, named for rivers like the six 500 kW at Bangalore, India (Jose Jacob, *dx_india*)

GREENLAND The KNR low-power SW outlet at Tasiilaq on 3815-USB has finally been heard abroad, at the LEM206 DXpedition in Finnish Lapland, January 11 at 2200; details at http://www.dxing.info (Jari Savolainen, *DXLD*) Presumably first time heard outside Greenland (Håkan Sundman and/or Mika Mäkeläinen, *LEM206 log*)

GUATEMALA During a local power failure I did some DC DXing with reduced noise; fair signal on 2320 at 1135-1158 with UT-6 time checks and Guatemala often mentioned, harmonic? (Chuck Bolland, FL, *DXLD*)

TGRI, R. Izabal, Morales is the only 1160 in *WRTH*; then there's TGY R. Progreso, on 580 (gh)

INDIA For more than a month from early Jan to Feb, AIR replaced several external services on 11585 with a relay of Rainbow FM 102.6, Delhi, especially for the Andaman & Nicobar Islands, at 0030-1200 and 1215-1830 (Alokesh Gupta and Jose Jacob, India, *DXLD*) Unique, jingle AIR ID at 1230 set to the Doobie Bros. *"Listen to the Music"*, then into Hindi (Scott R. Barbour, Jr., NH, *DXLD*) Why was this mostly musical network, the one so urgently needed by the Andamans & Nicobars that AIR relayed it on SW? Anyhow it gave us a unique chance to hear it (gh) See also GOA

Cannot find Program schedules of AIR GOS on its website nor on unofficial sites by Jose Jacob and Alok Das Gupta; does any such schedule exist in print or any other form? AIR used to put out a monthly magazine, arriving here by sea-mail months out of date. So it was only by chance that I ran across their mailbag show *Faithfully Yours*, a Monday at 1438-1444 on 9690 quoting Ross Comeau in MA that he had enjoyed good reception from AIR for 30 years. It's comments like that which unintentionally could make AIR think there's no need for a genuine relayed SW service to NAm. Fat chance: (gh) Public broadcaster Prasar Bharati is likely to face a Rs 350 crore budget cut (Nivedita Mookerji, *Financial Express* via Alokesh Gupta)

INDONESIA Because RRI Korean announcer Lee-Youngju retired, RRI in Korean stopped. Korean IDs continued at beginning and end of 1200-1300 broadcast on 9525, but nothing but music in between (Sungchul Cho, South Korea, *DXLD*) They cannot find a successor; website http://www.rri-online.com/modules.phs?name=SNL_Korean not updated since autumn 2003 (Takahito Akabayashi, Tokyo, *DXLD*)

IRAN Adalberto Marques de Azevedo posted IRIB's QSL policy in Spanish in *@tividade DX*. It's totally absurd; I've not seen this reported about their English broadcasts. He quolifies it as "an intelligent way to keep listeners captive" – well, only if they are rabid QSL hounds, who just have to get every possible card (I can think of a couple eligible guys). It's easy to get the first QSL, but after that, just one more report won't do. The second one comes only after 10 more reception reports – and this keeps stepping up until you have to send 200! to get the tenth one after the ninth one. After that they start awarding diplomas, and when one thousand, seven hundred sixty-seven reports have arrived [surely not 3767, a typo more than once], a "very valuable" but unspecified gift. Is anyone fool enough to take them up on this?! Maybe the process can be automated! How about a separate report for every minute of a one-hour broadcast with a Remote Monitoring System? Not all individually in one P-mail each, I hope. What if one – just one – report is lost in the P- or E-mail? This could become a bone of contention. What if a report does not contain verifiable, or even incorrect (wrong station) details? IRIB must have an enormous bookkeeping staff standing by to handle this onslaught (Glenn Hauser, *DXLD*)

[non] V. of the Iranian Nation, 1430-1500, on new 11620 ex-15660 with ID: *"Seda-ye Mellat-e Iran"*. Strongly jammed by Iran (Ray Merrall and Noel Green, UK, DSWCI *DX Window*) Understood to be from Egypt, already for decades. In the mid-nineties there were reports about some coöperation agreement, enabling the CIA to use the Abis site for such, uh, special broadcasts (Kai Ludwig, Germany, *DXLD*)

Radio Voice of Women / Radyo Seda-ye Zan, Sat 1900-1930 via RMI Jülich 9495 was cancelled by Feb 11 (*Observer*, Bulgaria)

ISRAEL Unless they got yet another reprieve, remember that all SW broadcasts from here were to be cancelled on March 31 (if not 27); updated English schedule as of Jan 29 was: 0430-0445 UTC 6280 7545 17600 kHz, 1030-1045 15640 17535, 1830-1845 9390 11585 11605, 2000-2025 6280 9390 15615 (*Observer*, Bulgaria) However, 6280 is customarily replaced by a higher frequency sometime in Feb or Mar. I see they also have a rather unusual service to NAm and Europe in Amharic at 1900-1935 and Tigrigna at 1935-1945 on 11585 and 11605, also to NAf on 9390. One hour earlier if these last into DST (gh)

KOREA SOUTH RKI conducted a survey of all KBS employees, searching for a new name following merger with the overseas TV service KBS World in Feb 2004. A majority favored "KBS World Radio" among 10 options named. After some tests in Feb, KBSWR also launched its 11th language service, Vietnamese on March 3, 1500-1530 on 9640 (via Alokesh Gupta, New Delhi, *DXLD*)

LATVIA KREBS TV in Riga, the exclusive license owner for SW transmissions from Latvia, is expanding relay services on 9290. At the demand of customers, besides 100 kW, also offers smaller power rates of 1, 5 and 10 kW from Ulbroka. Also DRM tests are planned on 9290 for the summer. 9290 is available 24/7 for lease through KREBS TV (Bernd Trutenau, Lithuania, *World Of Radio*)

LIBYA LJB service to Iraq heard at 1800-1900 on 11890 in LSB + AM, and 11180 in USB + AM. Not heard on listed 11660 (Arthur Miller, Wales, World DX Club Contact)

MALAWI *WRTH* 2005 on page 271 lists a 1 kW transmitter for TWR on 4870 at Lilongwe. I've sent couple of e-mails to TWR offices in Africa and Europe asking if this is on the air or a future plan, but they didn't bother to reply (Jari Savolainen, Finland, *DXLD*)

MÉXICO R. Educación, 6185, plays a great variety of international music, especially during the 0600 UT hour (0500 in summer), though often blocked by Brasil. Detailed advance playlists: http://www.radioeducacion.edu.mx/HojaProg1.html – and you can give up and listen to webcast instead (gh)

MinCom authorized R. Educación to use 25620 for special DRM tests during the week of February 7-11 in the daytime, 250 watts with Riz transmitter and omni rod antenna (Jeff White, FL, *DXLD*)

No one on the DRM forums reported hearing 25620, but I did in OK, on a lucky day when there was a sporadic-E opening, at 2140 UT, DRM buzz peaking about 10 over S9. Though I have no DRM receiver, I monitored a regular steady fade cycle, which I doubted was propagationally caused. When tuned to the center of the channel, the fades were slight but detectable on the S-meter and the ear, about every 12 seconds. It seemed as if the frequency were shifting back and forth by a few kHz, but this is hard to pin down with DRM via analog! Then when I tuned off to one side, the fades were much more pronounced, but less frequent, roughly 25 seconds apart. Perhaps some DRM expert can recognize these symptoms and explain them? (gh)

XEJN, R. Huayacocotla on 2390, was heard at sign-off 0100 ID-ing as Radio Lacaxcajak, their Otomi language name, with children singing the Mexican National Anthem – cute! (Mike Westfall, N6KUY, WDX6O, Lost Almost, NM, *dx398 yahoogroup*)

NEPAL Following the king's coup, R. Nepal was still heard on 5005.4 but with reduced power, and not every day. At 1520-1540 (fade out), orchestral music, 1530 Nepali talk by woman, 1536 more music before disappearing in the noise. Evidently this S 3 dB signal for the past year or more is not coming from a 100 kW transmitter. AIR 5010 (100 kW) was heard at the same time with S 9 + 10 dB! (Anker Petersen, Denmark, DSWCI *DX Window*)

NIGERIA 4770 was reactivated in late Jan, heard around 1900 (Chris Hambly, Victoria, *DXLD*) FRCN Kaduna, 50 kW same day at 2042 with animated discussion (Michel Lacroix, France, *HCDX*) R. Kaduna back on 4770 at 2245 (Eric Cordier, France, *DXLD*) 4769.98, heard until sign-off at 2300* and from sign-on at *0431, with talking drums, 0500 news in English. Weak, poor with muffled audio (Brian Alexander, PA, *DXLD*)

PERÚ Before 0100, R. Imperio, 4385, is simulcasting 1490 with programming of Peruvian music; after about 0100, non-stop religion (Björn Malm, Ecuador, *condiglist*) Folk music before 0000 with listener call-ins (Rafael Rodríguez, Colombia, *ibid.*) From Chiclayo, belongs to God Is Love Pentecostal Church (César Pérez Dioses, Chimbote, *radioescutas*)

Station on 6329.11 is not R. La Voz del Faique as previously reported but R. La Voz de Sallique, in Sallique, Cajamarca (Henrik Klemetz, Sweden, *DXLD*)

PHILIPPINES PBS, Marulas, Valenzuela, back from 9619.10 to 9581.90 at 0500 in Tagalog, but transmitter or antenna problems causing horrible splatter up to 9740! (Roland Schulze, Philippines, DSWCI *DX Window*)

SLOVAKIA RSI's reprieve until the end of March may have been extended until the end of June since mention was made in the German program of QSLs for the second quarter, perhaps (Paul Gager, *A-DX* via Kai Ludwig)

SUDAN R. Peace, 4750 stronger than last year, until 1745*, maybe a little more than 1 kW or I am getting good back-radiation from the dipole, consistent for the southern Sudan location (Chris Greenway, Kenya, *DXLD*) 4750, 0408-0415* African music, English ID, fair (Chuck Bolland, FL, *DXLD*) *WRTH* 2005 page 363 lists additional 5 kW transmitter for Radio Peace on 5895, in Nuba Mountains, but Kelly Coleman, BFO, couldn't tell me anything about it yet (Jari Savolainen, Finland, *DXLD*)

[non] Clandestines from Eritrea: SAF radio on 6985 is no longer heard, but V. of Sudan is, on 8000 at 1530-1600. This is operated by the opposition group, the National Democratic Alliance (NDA), based in northern Sudan and not a signatory to the north-south peace deal. So, it's consistent with the political situation for 6985 station to close and 8000 to continue (Chris Greenway, Kenya, *DXLD*)

TAIWAN RTI streamlined, closed five language services at end of January: Korean, Burmese, Arabic, Mongolian, Tibetan (CNA via *Media Network*) Setting off labor dispute, 63 workers complaining about being laid off (*Taiwan News Online* via *Media Network*) 82 jobs were eliminated; RTI had been accused of keeping on retirement-age workers; that leaves 13 languages. Budget has been cut year by year from 9 to 5 Taiwanese gigadollars (Cheryl Lai, RTI president, on the Spanish service via Rubén Guillermo Margenet, *DXLD*) However, from July, RTI is also in charge of five foreign language broadcasts for domestic audiences, including English (*Taibei Times* via Mike Terry, *DXLD*)

Fu Hsing Broadcasting Service, Taipei 3rd program in Chinese is now on SW 15250 at 23-01, 04-06, 08-10, 13-15, one second off webstream via http://www.fhbs.com.tw Probably for mainland, but China does not jam it (Takahito Akabayashi, Japan, *DXLD*)

U S A The former VOA Bethany site, West Chester, OH, is in urgent need of repair. Hoped to get local and federal grants of $1.2 million for electrical, heating and structural work on the building, which houses the Gray History of Wireless Museum, the Media Heritage broadcasting collection and township park offices (Cincinnati *Enquirer* via *Media Network*, Ray T. Mahorney)

The Leo Sarkisian Library of African Music, a rare collection of indigenous music donated to VOA by the internationally known VOA broadcaster, musician and ethnomusicologist, will become available to scholars in the Spring of 2005, in the Cohen Building, 330 Independence Ave., SW, Room G108 (VOA press via Mike Cooper, *DXLD*)

Even though VOA pays the phone bills, calls to *Talk to America* have been steadily declining, and host Doug Bernard was considering making it another kind of talkshow, perhaps taking calls only once a week (Sergei Sosedkin, swprograms)

Bush's budget proposal for FY 2006 includes increasing BBG's by 10% from $592 to $652 million (*Media Network* blog)

Projected DST SW schedule of *WORLD OF RADIO*, from April 3: WBCQ: Wed 2200 7415 & 17495-CUSB; Sun & Mon 0300 9330-CLSB; Mon 0430 7415. WWCR: Thu 2030 15825, Sat 1030 & Sun 0230 5070, Sun 0630 3210, Wed 0930 9985. WRMI: Sun 0330, Mon 0230 6870. See http://www.worldofradio.com/radioskd.html

New on WBCQ from Jan 29: *This Week in Amateur Radio*, Sat 2100-2200 on 7415; unlike the version for repeaters, songs and other fun stuff allowed here. See http://www.twiar.org/twiari.html (Doc Becker, WBCQ, and via Rachel Baughn, John Norfolk) DST shifts to 2000-2100 UT (gh) WBCQ also added a show called *I Found Jesus*, with Dr. Rev. Prime, UT Tue 0000-0100 on 7415 (Allen Weiner) A parody appearing sporadically; DST timing would be Mon 2300 (gh) As of mid-Jan, WBCQ expected to have its 6th transmitter on air this winter (Weiner, WBCQ)

Clearly the most entertaining program on WWRB, something in it for conspiracy theorists as well as kookologists: *The Divided Kingdom*, Tue-Sat 0400, Sat 0300 on 5085. Elizabeth Border has assumed the highest levels of shortwave kookery with her paranoid conspiracy rantings about the New World Order. Especially entertaining is her sock puppet skit featuring dialog between a falsetto-voiced "Barbie" and a low-voiced "Fatherland Security" accompanied by downright scary solemn music. Then there's the Racist Hour, *American Dissident Voices* and *Herald of Truth*, Sat 2300 and Sun 0400 on 5085. Some relief to all the demagoguery are *Mike Gibson Blue Grass Music*, Sunday 0300 on 5085, and *Mike Gibson Gospel Music*, Sat 0200 on 5050, a good cross-section of gospel-oriented country music. [May be all one hour earlier for DST] (Larry Will, RFMA)

Schism at LeSEA broadcasting as two brothers, heirs of the late Lester Sumrall, part ways. In early Feb, Stephen Sumrall resigned from LeSEA Ministries, while Peter Sumrall continued as CEO of LeSEA broadcasting (WNDU-TV via Ulis Fleming) I revisited the WHRI SW site in Noblesville, IN. It was difficult to locate due to a new housing estate built right up to the property. I found that the two net-style log-periodic antennas have been dismantled and removed. The two 100 kW transmitters will be removed and re-installed, one at WHRA near Bangor, Maine, and the other at the station in South Carolina. The callsign of WSHB has been legally changed to WHRI (Adrian M. Peterson, IN, *BC-DX*)

VANUATU The tsunami disaster spurred at least one country to put its national broadcasting service in order. Only half the population could hear the national broadcasting service, because the SW transmitter was allowed to fall into disrepair some years ago. The transmitter was still in operation, but apparently at reduced power. But now, at the insistence of the Prime Minister, they're frantically working to get 7260, the daytime frequency, functioning again properly. After that, nighttime 3945 will also be put back on full power as quickly as possible. Renovation made possible with assistance from the New Zealand Government and Radio Australia (*The Independent*, via Andy Sennitt, *Media Network*)

1-1/2 hours after its "resurrection" reported in the *Vanuatu Daily Post* Feb 8, 7260.2 was heard around 0630 past 0700, but still under the noise. In Pacific islands, things drift along, letting good resources go bad, until a 'wakeup' comes along. Then you never saw so much energy and action (at least as long as the media is paying attention, or it's near election time). A good chance maintenance would have cost a lot less than this crisis fix-up. Australia is in the mode of paying a lot of attention to the Pacific Area now. It's not that difficult to get money, even for non-crises (David Norcross, HI, *World Of Radio*) *Daily Post* (via Mike Terry, Artie Bigley) said 7260 schedule is 2000-0600, but it's usually reported after 0600; they may as well leave daytime frequency on into the night. This gave night frequency as 3940, not 3945 (gh)

VENEZUELA [non] "*Aló, Presidente*" Chávez returned in Jan on the Cuban relay, around 1400-1830 on 11875, 13750 and 17750, but not every week (gh)

WALES [non] Wales R. International, scheduled Fridays 2130-2200 via Austria on 7110, was missing throughout January, either no signal or no modulation while the UK relay on 3955 was audible (Bernie O'Shea, Ottawa, Ont., *DXLD*) And the NAm broadcast, UT Sat 0300 on 6005 from UK, clashes with BBC Ascension (Walt Salmaniw, BC, *DXLD*) One hour earlier for DST, we hope on better frequencies. Remember, most international SW stations change times and/or frequencies March 27 or April 3 for A-05 (gh)

Until the Next, Best of DX and 73 de Glenn!

Gayle Van Horn, W4GVH
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0001 UTC on 4990
SURINAME: Radio Apintie. Vernacular text from announcer to 0026. Choral ballad with brief male voice-over. Poor quality under static, and language is tentative. (Scott Barbour, Intervale, NH) Station logged 0144 with English pop tunes and tentative identification. (Alvin Mirabal, Puerto Rico) 4990, 0130-0312 *Rock of Ages* tune to African high-life music. Station ID to Dutch announcements. Logged 1021-1039 religious format with poor signal quality. (Chuck Bolland, Clewiston, FL/HCDX)

0026 UTC on 5545.65
PERU: Radio San Andreas. Spanish. (Tent) Musical ballads followed by weak talks at 0030, music resuming. Poor quality with bouts of LSB chatter. Tentative on Peru's **LaVoz del Campesino** 6957, 2354-0021; **Radio Maranon** 4835, 1025-1037. (Barbour, NH) **Radio Satelite** 4800, 0233. (Mirabal, Puerto Rico) **Radio Huanta** 4746.5, 0930 with Spanish IDs, time checks and public service announcements. (Fernando Garcia, Baltimore, MD) **Radio Tachna** 9504.76, 1033-1043. (Arnaldo Slaen, Buenos Aires, Argentina) **Radio Imperio** 4386.56, 0405-0455 religious format and "echo" ID; **Radio Victoria** 9720.04, 1045-1058. (Larry Van Horn, NC)

0040 UTC on 7400
BULGARIA: Radio. Radio Bulgaria Calling // 9700. (Bob Fraser, Belfast, ME) 5800, 2205-2235 // 7500. Items on national private sector businesses, Bulgarian Red Cross and Independent Trade Unions. Station ID to talk on Bulgarian music theaters. (Joe Wood, Greenback, TN; Sam Wright, Biloxi, MS)

0125 UTC on 4052.5
GUATEMALA: Radio Verdad. Spanish. Traditional Guatemalan music, SIO 3+53.; 4052, 0210 program *Clube De La Amistad y Filatelia* (Mirabel, PR) Guatemalan's noted; **Radio Cultural** 4780, 1129; **Radio Buenas Nuevas** 4799.8 with Spanish religious format and camp tunes. (Harold Frodge, Midland, MI) 2350-0005. (Wood, TN; 4799, 0127. (Mirabal, PR) **Radio Coatan** 4870, 0015-0035 with ID and religious format. (Gayle Van Horn, NC)

0251 UTC on 3306
ZIMBABWE: ZBC. Guitar music and vocals. Vernaculars over music to anthem chorus, and dance music program. English political pep talk to high-life music. (Harold Sellers, Ontario, Canada/NASWA Flash Sheet)

0327 UTC on 6940
ETHIOPIA: Radio Fana. (Tent) Lite Afro music //6209.9. (Frodge, MI) **Voice of the Tigray Revolution** 6350, 0440-0500 Tigrinya service. Bridges of Horn of Africa music. Signal weak and faded by 0500. (Jim Evans, Germantown, TN/NASWA) **Radio Ethiopia** 7110, 1907-1925. Ahmaric rapid talk and "techno" musical bits // 9704.2. (Barbour, NH)

0402 UTC 3320
SOUTH AFRICA: Channel Africa. Poor signal for English newscast. SA's **Radio Sondergrense** 3320, 0402-0425 in Afrikaans. (Sellers, CAN)

0606 UTC on 6070
CHILE: Voz Christiana. Spanish ID and lively religious music, best to monitor in LSB; 1042-1100. (Frodge, MI) 9780, 0600 with Spanish sign-on routine. (Garcia, MD) Chile's **Radio Esperanza** 6090, 0720-0730 with religious format. (Slaen, ARG)

0615 UTC on 3279.7
ECUADOR: La Voz del Napo. Spanish. Text on history of Catholism. (Slaen, ARG) 3279.54, 1041-1101+ (Frodge, MI) HCJB 12005, 1200 *Morning in the Mountains* to the Americas. (Fraser, ME)

0750 UTC on 5025
CUBA: Radio Rebelde. Spanish. Salsa music to announcement, "ya esta probada la unidad de resistencia de los cubanos" News promo as, "en Radio Rebelde...las noticias." Heard past 1130. (Slaen, ARG) Station audible 2330-2335 with talk on politics and liberty. (Wood, TN) **Radio Habana** 12000 at 1420. (Frodge, MI) 6000 //6060 at 0616; 11760, 2119-2127+ DXers *Unlimited*. (Frodge, MI)

0854 UTC on 5990
BRAZIL: Radio Senado. Portuguese. Sign-on identification and frequency. Local morning show magazine format of chat and announcements to Braz music. (Van Horn, NC) Brazil<s **Radio Gazeta** 15235, 1938-1945. (Slaen, ARG) **Radio Brazil Central** 4985, 2336-2345; **Radio Difusora Roraima** 4875, 2350-0005. (Garcia, MD)

1030 UTC on 4819
HONDURAS: La Voz Evangelical. Spanish Bible readings to Indiana address for response. Station ID at 1058 for "HRVC 1390 kHz/ 4819 onda corta." Christian pops to *La Biblia Hoy* segment. (Garcia, MD) *Radio Luz y Vida* 3250, 0113 with religious format. (Mirabal, PR)

1250 UTC on 9650
CANADA: Radio Korea relay. Report on schooling in South Korea. **Radio Canada Intl** 15140 //11875 at 1806 with *Maple Leaf Mailbag*. (Fraser, ME) **CFRX** 6070, 1729-1740+ //1010 **CFRB**. (Frodge, MI) **China Radio Intl** relay 6115, 0600-0605+; **CKZN** 6160, 2127-2131+. (Frodge, MI) **Radio Sweden**<s Canadian relay 6010, 0246-0252+. (Frodge, MI)

1250 UTC on 9580
AUSTRALIA: Radio. Report on Ghandi and his non-violence policy. (Fraser, ME) 6020, 1320-1334+; 9590, 1438-1445+; 11660, 1536; 11750, 1544 //11660; **Voice Intl** 11840, 1548-1600+. (Frodge, MI) **VL8A Alice Springs** 2310, Interviews, ID and news 1053-1107. (Barbour, NH)

1325 UTC on 9870
NEW ZEALAND: RNZI. Fair signal for segment on Kiribati<s recycling program. (Fraser, ME) Newscast heard on 11980 at 1814. (Frodge, MI) 9870, 141-1427+ *Radio Novel* program to ID; 11980, 1801-1809+. (Frodge, MI)

1426 UTC on 6010
URUGUAY: Emisora de Montevideo. Spanish. Local ads to complete station identification including call sign, location and frequency. Uruguay<s **SODRE** 6125, 2010-2025 with tunes from Credence Clearwater Revival. SINPO 34443. (Slaen, ARG)

1707 UTC on 21470
ASCENSION ISLAND: BBC relay. *Focus on Africa* with remote news segments. (Frodge, MI) 15400, 1837-1847 *African Sports Round Up* with talk on regional soccer match ups. (Wood, TN)

1736 UTC on 15695
USA: WEWN. Religious services in English and Latin // 15745. Station noted splattering from 15645-15720 kHz. **WWCR** 12060 at 1805; 5070, 1136-1158; **WINP** 13570 at 1806-1820. (Wood, TN) **WWRB** 3185 at 0005. (Sellers, CAN) **WBOH** 5920, 2306-2320. (Wood, TN) **AFRTS** (Key West, FL) 5446.6, 1140. (Mirabal, PR)

1841 UTC on 6165
SPAIN: Radio Exterior España. Spanish Latino music to English service at 1906. Possibly from Costa Rica, freq not in PTWBR 2005. Heord on 9680, 2014-2019+. (Frodge, MI)

1930 UTC on 6055
TURKEY: Voice of. Sign-on identification and frequencies to program preview and national news bulletin. 5960 at 2340 on modern Turkish music. (Fraser, ME) 1945-1951, 6055; 6050, 2023. (Frodge, MI)

2013 UTC on 9390
ISRAEL: Kol Israel. Report on ancient Jewish and Egyptian monotheisms. (Fraser, ME) *Weekend Report* 6280 at 2019-2030+. (Frodge, MI)

2100 UTC on 11655
MADAGASCAR: Radio Netherlands relay. Special programming on Prince Berhardt's death //17810 **(Netherlands Antilles)** 9895// 7120 **(Madagascar)** (Fraser, ME) **Radio Nationale Malagasy** 5010, 0320-0342 in Malagasy with news, ID and music. (Van Horn, NC)

2250 UTC on 9435
CZECH REPUBLIC: Radio Prague. Czech. Jazz music program followed by station address quote amid fair signal quality. (Wood, TN) English **Business Report** 7345 //5930 at 2350. (Fraser, ME)

Thanks to our contributors – Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times (or e-mail gaylevanhorn@monitoringtimes.com)
English broadcast unless otherwise noted.

John Figliozzi
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The Spring-Summer Catalog (A05) - Part 1

"All the News That Fits." This is the pithy rejoinder that the editor of the one-time counterculture icon *Rolling Stone* used on the publication's masthead, undoubtedly to tweak *The* "establishment" *New York Times* and, perhaps, to honestly describe his personal editorial methodology. Regardless, it is that motto which most accurately describes this month's column.

This is, first and foremost, a work in progress. It is an attempt to take voluminous information and organize it in the most efficient and useful way possible. The programming schedules can't be reduced to two pages, but I think it can be done in four. Hence, the "Part 1" in the title above. The plan would be to do this twice a year seasonally – in April and November. Possibly we can wrangle an extra two pages so it will not have to be spread over two months in the future. Then again, the effort may just end forever, depending upon your response. Let me know what you think. Is this the kind of information you want to see in this column? Do you find the presentation useful? After all, I'm not (just) doing this for myself!

About the format...

The idea is to eliminate as much repetition as possible. In some cases, this quest has lent itself to one format; in others, another layout. Since international broadcasting encompasses other media beyond shortwave, references and information for them have been included – **sw** is shortwave; **i-net** is internet audio; **sirius** is Sirius Satellite Radio; **wrn-na** is World Radio Network, North America stream (also available on Sirius stream 115); **xmsr** is XM Satellite Radio; **cbco** is CBC Overnight Service. Day of week abbreviations correspond to those used in *MT's Shortwave Guide*, which is where you will find the **sw** frequencies for these programs. All times, except those for **cbco**, are UTC/GMT. " = minutes

The List

AUSTRIA
R. Austria Int. ***http://www.oe1.orf.at***
sw: **Report from Austria** (15") *M 1505, 1545, T-F 1515, T-A 0143.* **Week in Review** w/listener mail (23") *A 1506, S 0133.* **Insight Central Europe** (23") *S 1506, M 0133.*
i-net: 24/7 live stream of OE1 in German, including English segments. Daily audio on-demand.

BELGIUM
RVi ***http://www.rvi.be***
sw: The English Service was to be shut down on March 27. If a last minute reprieve is granted, schedule info can be found on the web site, which is to continue in any event.

CANADA
R. Canada Int. ***http://www.rcinet.ca***
sw: M-F 1200-1500, A/S 1300-1600, D 1900-0000*
***News** - M-F 1200, 1300, 1400, 1900, 2000, 2300. 2100; 1500 (A/S).* **The World at 6**: *2200 M-F.* **The World This Weekend**: *2200 A/S.*
***Magazines**: 1205 M-F* **The Current** (55"). *1310 S* **Sunday Edition** (170"), *M-F* **Sounds Like Canada** (100"). *2130 M-F* **As It Happens** (30"). *2230 M-F* **As It Happens** (90"/W 60"). *2330 W* **Dispatches** (foreign affairs).
***Features** - 1305 A* **The House** (politics-55"). *1405 A* **Vinyl Cafe** (humor/stories). *1430 F* **C'est La Vie** (French Canada). *1445 M-H* **Out Front** (personal views). *1505 A, 2305 A* **Quirks and Quarks** (science). *1905 S* **Tapestry** (spiritual matters-55"), *M-F* **The Roundup** (variety-115"), *A* **Definitely Not the Opera** (pop culture-115"). *2130/2230 S* **Mailbag**, *A* **Madly Off...** (comedy). *2305 S* **Global Village** (world music/culture).
*It was reported in Jan. that RCI was strongly considering moving its 0100-0300 transmission back to 2200-0000. Here, we've assumed they have done so.
i-net: Three live 24/7 audio streams (English, French, Multilingual). English stream does not coincide entirely with sw schedule and includes additional programming. All programs available as audio on-demand w/archive.

CHINA
China R. Int. ***http://www.crienglish.com***
sw: (60") **D 2300*, 0000, 0100, 0300, 0400, 0500, 0600, 1300, 1400, 1500.**
:00 D **News & Reports**; *:10 S** **Report on Developing Countries**; *:15 A** **Cutting Edge** (sci/tech); *:20 S** **CRI Roundup**; *:30 S** **In the Spotlight** (arts/culture), *M** **People in the Know**, *T** **Biz China**, *W** **China Horizons** (outside Beijing), *H** **Voices from Other Lands**, *F** **Life in China**, *A** **Listeners' Garden**; *:55 D* **Learn Chinese Now**. **UTC one day earlier in 2300 broadcast*
(60") **D 1000, 1100.**
***:00 D* Real Time Beijing** (magazine); *:15 S* **China Beat** (popular music), *A* **China Roots** (traditional music); *:55 D* **Learn Chinese Now**.
i-net: 24/7 live audio stream and other services; programs available on-demand.
wrn-na: (:30) **Real Time China** (magazine) *D 0100, 0600, 2000.*

CUBA
R. Havana Cuba ***http://www.radiohc.cu***
sw: (120") **D 0100, 0300, 0500.**
1st 60" – *:00 D* **International News**; *:10 M* **Weekly Review**, *T-S* **National News**; *:15 T-S* **Viewpoint**; *:30 M* **Reports & Music**, *T-S* **News Bulletin**; *:35 T-A* **Time Out** (sports); ***:40 S/W* DXers Unlimited**, *M* **Mailbag Show**, *T/H/F* **Caribbean Outlook**, *A* **Weekly Review**; *:50 M* **Breakthrough** (science report).
2nd 60" – *:60 D* **International News**; *:70 M* **From Habana** (Cuban musicians), *T-S* **National News**; ***:75** T-S* **Reports & Music**; *:90 M* **The Jazz Place** or **Top Tens**, *T-S* **News Bulletin**; *:95 S* **World of Stamps**, *T-A* **Reports & Music**; *:100 S* **Cuban music**.
inet: audio streams not functioning at press time.

CZECH REPUBLIC
R. Prague ***http://www.radio.cz***
sw: (30") **D 1300*, 2000*, 2230*, 0000, 0100, 0300.**
:00 D **News**; *:05 S** **Magazine** [or] **Insight Central Europe**, *M** **Mailbox**, *T-A** **Current Affairs**; *:10 S** **Letter from Prague**, *M** **ABC of Czech** (the language), *W** **Czech Science**, *A** **The Arts**; *:15 S/W** **One on One** (interview) [or] *S** **Insight Central Europe**, *M** **Encore** [or] **Magic Carpet** (both monthly) [or] **Czech Books** (biweekly), *T** **Talking Point** (Czech issues), *H** **Czechs in History** [or] **Czechs Today** (both monthly) [or] **Spotlight** (travelogue), *F** **Business Report**, *A** **Stepping Out** (Prague nightlife). ***UTC one day earlier in 1300, 2000, 2230 broadcasts.***
i-net: live audio streaming and audio and text on demand including archives
wrn-na: D 0200, 0900. Programs are as on **sw**.
cbco: M-F **0505** (local times).

HUNGARY
R. Budapest ***http://www.radiobudapest.radio.hu***
sw: (30") **D 0100, 0230.**
:00 D **News**; *:05 S* **Insight Central Europe**; *M* **Europe Unlimited** (trade) [or] **Heading for Hungary** (travel) [or] **Spotlight** (culture) [or] **And the Gatepost** (letters), *T-F* **Hungary Today** (current events magazine), *A* **The Week**; *:20 A* **DX Corner**.
i-net: on-demand audio stream of daily transmission, with archive.
wrn-na: **D 0330, 2030**. Programs are as on **sw**.

JAPAN
R. Japan ***http://www.nhk.or.jp/nhkworld***
sw: (60") **D 0000, 0100*, 0500, 0600*, 1000, 1100, 1500*, 1700*, 2100*.** (*to wNA only)
***News** - D on the hour.*
***Magazine** - **44 Minutes**: M-F 0115, 0515, 1015, 1715; T-A 0015.*
***Music** - **Songs for Everyone** (pop tune): M-F 0110, 0610, 1010, 1110, 1510, 1710, 2110; T-A 0010.* **Japan Music Scene:** *S 0654, 1054, 2154; M 0054.* **Pop Joins the World** (50"): *S 0110, 0510, 1710, 2110; A 0610, 1110, 1510.* **Japan Musicscape** (30"): *M 0625, 1125, 1525, 2125.* **Japan Music Travelogue** (30"): *W 0625, 1125, 1525, 2125.* **Music Beat** (30") *F 0625, 1125, 1525, 2125.*
***Features** - **Weekend Japanology** (44"): A 2110; S 0610, 1010; M 0010.* **Hello from Tokyo** (listener contact-50"): *A 0110, 0510, 1010, 1710; S 1110, 1510.* **Basic Japanese** (35"): *T 0625, 1125, 1525, 2125.* **Brush Up Your Japanese** (35"): *H 0625, 1125, 1525, 2125.*
i-net: news in English available on-demand and via live stream.

KOREA, REP. (South)
R. Korea Int. ***http://rki.kbs.co.kr***
sw: (60") **D 1200, 0200.**
1200 D **News**; *1210 S* **Korean Pop Interactive** (requests), *M-F* **News Commentary**, *A* **Worldwide Friendship** (letters, DX news); *1215 M-F* **Seoul Calling** (magazine); ***1245 M** Shaping Korea, T* **Made in Korea** (Korean commerce), *W* **Cultural Promenade**, *H* **Korea Today & Tomorrow** (peninsula issues), *F* **Seoul Report** (interviews).

0200 D **News**; *0210 S* **Worldwide Friendship**, *M* **Korean Pop Interactive**, *T-A* **News Commentary**; ***0215 T-A* Seoul Calling**; *0245 T* **Shaping Korea**, *W* **Made in Korea**, *H* **Cultural Promenade**, *F* **Korea Today & Tomorrow**, *A* **Seoul Report**.

i-net: Two live audio streams, some in English w/same program as **sw** but not timed as **sw**. Audio on-demand available w/archive.

wrn-na: (30") **D 0930, 1530, 0230***.
:30 D **News**; *:40 M-F** **News Commentary**; *:45 S** **Korean Pop Interactive**, *M** **Shaping Korea**, *T** **Made in Korea**, *W** **Cultural Promenade**, *H** **Korea Today & Tomorrow**, *F** **Seoul Report**, *A** **Worldwide Friendship**. **UTC one day later during 0230 transmission.*

NETHERLANDS

R. Netherlands ***http://www.rnw.nl***

sw: (60") **D 0000, 0100, 0400, 1100. (120") A/S 1900.**
0000/0100/0400 - *:00 S* **Wide Angle** (in-depth), *M* **Europe Unzipped**; *T-A* **Newsline**; *:22 S* **The Week Ahead** (on RN), *M* **Insight** (commentary); *:30 S* **Amsterdam Forum** (conversations), *M* **Vox Humana** (culture), *T* **Research File** (science), *W* **EuroQuest** (Europe in context), *H* **Documentary**, *F* **Dutch Horizons**, *A* **A Good Life** (development).
1100 *S* **Wide Angle**, *A* **Europe Unzipped**; *M-F* **Newsline**; *1122 S* **The Week Ahead**, *A* **Insight**; *1130 S* **Vox Humana**, *M* **Research File**, *T* **EuroQuest**, *W* **Documentary**, *H* **Dutch Horizons**, *F* **The Good Life**, *A* **Amsterdam Forum**.
1900 *S* **Documentary**, *A* **Vox Humana**; *1930 S/A* **News**; *1935 S* **Wide Angle**, *A* **Europe Unzipped**; *1955 S* **The Week Ahead**, *A* **Insight**. *2000 S* **Vox Humana**, *A* **Amsterdam Forum**; *2030 S/A* **News**; *2035 S* **Wide Angle**, *A* **Europe Unzipped**; *2055 S* **The Week Ahead**, *A* **Insight.**

i-net: 24/7 live audio stream in English; all programs available in audio on-demand w/archive.

wrn-na: (60") **D 1200, 2200, 0400.** Programs for 1200, 2200 as 1100 **sw**; programs for 0400 as 0000/0100/0400 **sw**.

cbco: (55") **D 0105**. Programs as for 0000/0100/0400 **sw**.

RUSSIA

V. of Russia ***http://www.vor.ru/world.html***

sw: (240") **D 0100-0500.**
***News* - on the hour and half hour**.
Features - *0111 S/M* **Moscow Mailbag**, *T-A* **Commonwealth Update**; *0132 S* **Moscow Yesterday & Today**, *M* **Timelines**, *T* **Folk Box**, *W* **Jazz Show**, *H* **Musical Portraits**, *F* **Moscow Calling**, *A* **Christian Message from Moscow**; *0146 F* **Music At Your Request**; *0154 H* **Russia: People & Events.**
0211 M **Sunday Panorama**, *T-S* **News & Views**; *0232 S* **Songs from Russia**, *M/F* **Russian by Radio**, *T* **Kaleidoscope** (Russian events), *W* **Musical Portraits**, *H* **Moscow Yesterday & Today**, *A* **Audio Book Club** (Russian lit.); *0346 S* **You Write to Moscow**; *0354 S/W* **Russia: People & Events.**
0311 S **Music & Musicians**, *M* **This is Russia**, *T* **Musical Portraits**, *W/A* **Moscow Mailbag**, *H* **Science Plus**, *F* **Newmarket**; *0332 M* **Moscow Calling**, *T/H/A* **The River of Time**, *W* **Guest Speaker**, *F* **Russian history/culture**; *0347 W* **Ladies of Character.**
0411 S/M **Musical Portraits**, *T/F* **Moscow Mailbag**, *W/A* **Science Plus**, *H* **Newmarket (business)**; *0430 D* **News in Brief**; *0432 S* **Kaleidoscope**, *M* **Audio Book Club**, *T* **Music Around Us**, *W* **Moscow Yesterday & Today**, *H* **Folk Box**, *F* **Audio Book Club (Russian lit.)**, *A* **Timelines**; *0447 T* **Music At Your Request.**

i-net: Live audio stream of some English content, timed differently from that on **sw**.

wrn-na: (60") **D 2300. News and Views from Moscow** (news and an unspecified compendium of programs).

cbco: **S/M 0205; T-A 0505** (local times).

SLOVAKIA

R. Slovakia Int. ***http://www.rsi.sk***

sw: (30")
0100 *D* **News**; *0105 S* **Front Page Review** (Slovak press), *M* **Weekly Newsreel**, *T-A* **Topical Issue**; *0110 S* **Various features**, *M* **Listeners' Tribune** (letters, magazine, Slovak music), *T* **Insight Central Europe**, *W* **Tourism News** [or] **Environmental Update**, *H* **Business News**, *F* **Culture News** [or] **Back Page News** (the offbeat), *A* **Education, Science and Regional News**.

i-net: Each day's transmission available as audio on-demand, 7 day archive maintained. Transcripts available for each report/program.

wrn-na: (30") **D 1630*; T-A 0030**. Programs are as for **sw**, except one day earlier in 1630 transmission.

SWEDEN

R. Sweden ***http://www.radiosweden.org***

sw: (30") **1230, 1330, 0130*, 0230*.**
*:00 S** **Network Europe** (Europe magazine); *M-F** **News & Reports** - emphasizing M* Culture, T* Knowledge, W* Real Life, H* Lifestyle, F* Debate; *A** **Headset** (music-1st A*), **Sweden Today** (2nd), **In Touch...** (listener contact-3rd), **Studio 49** (topical discussion-4th). *:15 M** **Spectrum** (the arts-1st/3rd M*); *T** **Greenscan** (ecology-1st T*), **Heartbeat** (health-2nd), **S-Files** (things Swedish-3rd), **Edge** (sci-tech-4th); *W** **Sportscan**; *H** **Cooking w/...** (Swedish cuisine-1st H*), **Close-Up** (profiles-2nd), **Nordic Lights** (3rd), **Europefile** (4th).
***UTC one day later during 0130,0230 transmissions.**

i-net: Each transmission and most programs available as on-demand audio. No archive.

wrn-na: (30") **D 1900, 0130*, 0630*** Programs are as **sw.** ***UTC one day later during 0130, 0630 transmissions.**

cbco: (30") **S/M 0305; T-A 0205 (local times).** Programs are as **sw**, but air one day later than listed.

TAIWAN

R. Taiwan Int. ***http://www.rti.org.tw***

sw: (60") 0200, 0300, 0700.
:00 D **News**, *:10 S* **News Talk**, *M* **Taiwan Economic Journal**, *T* **Kaleidoscope** (society), *W* **On the Job**, *H* **Trends**, *F* **Politics Today**, *A* **Bookworm**; *:20 S* **Taipei Magazine**, *M* **Discover Taiwan**, *T* **Mailbag Time**, *W* **Jade Bells & Bamboo Pipes** (traditional music), *H* **People**, *F* **Culture Express**, *A* **Stage, Screen & Studio**; *:30 M* **Asia Pacific** (from R. Australia), *A* **Groove Zone**; *:35 S* **Sound Postcard**, *H* **Wisdom.com**, *F* **New Music Lounge**; *:40 S* **Hakka World** (indigenous culture), *T* **Sound Postcard**; *:45 T* **Let's Learn Chinese**, *W* **Life Unusual** (the offbeat), *H* **Instant Noodles** (the weird).

i-net: All programs available as audio on-demand.

UNITED KINGDOM

BBC ***http://www.bbc.co.uk/worldservice***

sw: **D 1000-1700, 2100-0500** (Americas stream). Streams for other areas sometimes receivable.

xmsr: **24/7** (Americas stream)
***News* - On the hour**, with summary on most half-hours. **Newshour**: *D 1200, 2000*. **The World Today:** *D 0200, 0600, 2200*. **World Briefing**: *D 0400, 0700; A/S 0900; M-F 1000; D 1100, 1700*. **World Update**: *M-F 0900*. **Analysis**: *M/T/H/F 1745; T/W/F/S 0245, 1132; T/W/F 0745*. **From Our Own Correspondent**: (15") *W 1745; H 0245, 0745, 1132*. (24") *S 0306, 0806, 1306, 1806*. **Assignment**: *H 1406, 1906; F 0006, 0506, A 1006*. **World Business Report**: *M-F 0732, 1032, 1732; T-A 0232*. **Instant Guide** (background): *S 0445, 0915; M 0245, 0745*. **Talking Point**: *S 1406; M 0306, 0806*. **Letter**: *A 0645, 0915; S 0432, 1132*. **The Big Question**: *S 1732*.
Magazines - **Outlook**: *M-F 1306, 1806, 2306; T-F 0306, 0806*. **The Music Feature:** *M 1432, 1932; T 0032, 0532*. **Sports International**: *F 1406, 1906; A 0006, 0506*. **The Music Biz**: *H 1432, 1932; F 0032, 0532*. **Science In Action**: *F 1506, 2106; A 0132*. **World Business Review**: *A 0632, 1732; M 0232*. **Global Business**: *A 0932; S 0232, 0732, 1829*. **Pick of the World**: *A 0306, 0806, 1306, 2306*. **Reporting Religion**: *A 0432; S 0832*. **People & Politics**: *F 2232; S 0932*. **Europe Today**: *M-F 1600*. **The Interview** (trends): *A 2232; S 0332, 0632, 1332*.
Info - **Everywoman**: *S 2106; M 0006*. **Documentary**: *S 2306; M 1406, 1906; T 0006*. **Masterpiece**: *T 1406, 1906; W 0006, 0506*. **Changing Series**: *W 1406, 1906; H 0006, 0506, S 1006, 1506*. **What's the Problem?** (advice): *F 1545, 2145; A 0145*. **Health Matters**: *M 1506, 2106; T 0106*. **Go Digital**: *T 1506, 2106; F 0106*. **Discovery** (science): *W 1506, 2106; H 0106*. **One Planet**: *H 1506, 2106: F 0106*. **Heart & Soul** (faith/values): *W 1545, 2145; H 0145*. **The Word/World Book Club**: *H 1532, 2132; F 0132*. **In Praise of God**: *S 1032, 1532*.
Music - **Top of the Pops** (charts): *A 1906, S 0006*. **White Label** (new): *T 1432, 1932: W 0032, 0532*. **Charlie Gillett** (world): *W 1432, 1932; H 0032, 0532*. **Music Programme** (unspecified): *F 1432, 1932; A 0032, 0532*. **In Concert**: *S 0501, 1901*.
Entertainment - **Westway** (drama serial): 1st wkly episode - *W 1532, 2132; H 0132*. 2nd wkly episode - *F 1532, 2132; A 0132*. Combined - *S 2129, M 0029*. **Play of the Week**: *A 2101; S 0101, M 0501*. **The Ticket**: *A 1806; M 0106*. **Rotating Game/Quiz Series**: *S 2332, M 1532, 2132; T 0132*. **Write On**: *A 0345, 0845, 1345, 2345*. **Off the Shelf** (readings): *M-F 0345, 0845, 1345, 1845, 2345*.
Sport - **Sports Roundup**: *D 0720; M-F 1045; A-H 1145: A 1745*. **World Football**: *A 0732, 1032*. **Football Extra**: *F 1145*. **Sportsworld** (live action/reports): (174") *A 1406*; (54") *S 1606*.

sirius: **24/7** (all news stream)
News - **On the hour**, with summaries on the half-hour. **Newshour**: *D 1100, 1900, 2000; M-F 1300*. **The World Today**: *D 2100, 2200, 2300, 0100, 0500, 0600; M-F 0032, 0200, 0432*. **World Briefing**: *D 0000, 0300, 0400, 0800, 1000, 1800; M-F 1200, 1400, 1700; S-F 1500*. **World Update**: *M-F 0900*; **From Our Own Correspondent**: (15") *W 0832, 1445, 1545, 1745, 1845, 2345; H 0345*. (24") *S 0206, 0706, 0906, 1206, 1706*. **Assignment**: *A 0206, 0906, 1706; S 1406*. **World Business Report**: *M-F 1032, 1220, 1732, 1832, 2332; T-F 0332*. **Letter**: *A 0815, 1745, 2245; M 0345, 0832*. **Analysis**: *M/T/H/F: 1445, 1545, 1745, 1845, 2345; T/W/F 0345, 0832, A 0645*. **Talking Point**: *S 1406; M 0706*. **Instant Guide** (background): *A 2232; S 0815, 1030, 1545, 2345*.
Magazines - **Outlook**: *T-F 0705*. **People & Politics**: *F 2132; A 0032, 0432; S 0232, 0832, 1432*. **The Interview** (trends): *A 0232, 0932, 2132; S 0032, 0532, 1232*. **Global Business**: *F 2232; A 0132, 0832, 1832, 2332; S 0332, 0632, 1732*. **Reporting Religion**: *A 0332, S 0132, 0432, 0732, 1832*. **World Business Review**: *A 0532, 0632; S 1532, 2332; M 0332*. **Pick of the World**: *A 0706, 1206*. **Europe Today**: *M-F 1600*.
Sport: - **Sports Roundup**: *D 0020, 0420, 1820; M-F 0845, 1245; A-H 1045; M-H 1532*. **Football Extra** - *F 1045, 1532*; **Sportsworld** (live action/reports): (174") *A 1406*; (54") *S 1606*.
Entertainment: **Write On**: *A 0745, 1245*. **Off the Shelf** (readings): *M-F 0745*.

i-net: two live audio streams (info/entertainment; all news), audio on-demand for all programs w/extensive archives.

[Many local AM/FM stations also carry BBC programming during parts of their broadcast day.]

Part 2 in May. 73!

The QSL Report

Gayle Van Horn, W4GVH
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Period Reporting

One of the more effective approaches to QSLing, with minimal extra expense involved, is the *Period Report*. This involves creating a series of reports encompassing loggings over a number of days or even weeks. It provides the station with useful information and a better indication of how well their signal is received over a longer amount of time, as opposed to a report of single reception.

The best or first logging can be written up in detail in the usual reporting format. Period reporting of programming information should be omitted from the remaining loggings, but they should include time (UTC), date, and any parallel frequencies monitored. The SINPO rating (signal strength, interference, noise, propagation, overall) is important, and should include additional technical observations. Each monitoring session can be from 15-30 minutes, depending on the time you have available.

By using this extended reporting method, you will show the station you have taken an interest in providing them with information, and you have taken the extra time and effort to do so.

Period Reporting has proven to be worth the time in terms of a quicker response rate. These reports usually receive a fuller and quicker response, whereas a single report might have received nothing. Next time you're bandscanning, don't forget about Period Reporting. You may be amazed at the response!

AMATEUR RADIO

Island of Jersey MJ0C (IOTA EU-013), 15 meters SSB. Full data scenery card. Received in 65 days via ARRL bureau. (Larry Van Horn N5FPW, NC)

BELARUS

Radio Station Belarus/Radio Minsk, 7105 kHz. Full data Moskowsky bus station card, (without transmitter site) unsigned. Received in 144 days for a German report. Station address: 4, Krasnaya St., Minsk 220807 Belarus. http://www.tvr.by. (Martin Shoech, Germany/HCDX)

BRAZIL

Radio Trans Mundial relay via Radio Nova Visao, 11735 kHz. Full data Radio Trans Mundial card will illegible signature, plus folding calender and transmitter site post card. Received in two months for an email report to; rtm@transmundial.com.br. Station address: Rua do Manifesto 1373, 04 209-001 Sao Paulo SP Brazil. (Arnaldo Slaen, Buenos Aires, Argentina)

CONGO (REPUBLIC)

Radio Congo, 5985 kHz. Direction Generale-Telediffusion du Congo card signed by Felix Lossombo, plus personal French letter. Card and letter stamped with "Rep. Du Congo-Le Directuer" station seals. Received in 39 days for an English report and one IRC. Station address: Radiodiffusion-Television Congolaise, Boite Postal 2241, Brazzavile, Congo Republique. (Scott Barbour, Intervale, NH)

GERMANY

Radio Traumland 5925 kHz. Full data computerized QSL unsigned. Juelich site noted, plus coordinates, and station's German info sheet. Received in five days for a German report and one US dollar. Station address: Postfach 15, B-4730 Raeren, Belgien Germany. (Shoech, Germany) Radio Traumland (Radio Dream Country), a German station located in Raeren, will verify email reports with email verifications to; radiotraumland@skynet.be . If a paper QSL is desired, please send either one US dollar, one IRC, one Euro, Belgium or German mint postage to; Radio Traumland, Postfach 15, B-4730 Raeren, Belgien, Germany. - gvh

GREECE

ERT SA Macedonian Radio. Full data QSL folder card signed by Tatiana Tsiolo. Received in 89 days. Address on card as; ERT S A Macedonian Radio Station, Sub Direction of Technical Support, PB 11312, 54110 Thessaloniki, Greece. Return address on envelope; Agelaki 14, 54636 Thessaloniki, Greece. (T.R. Rajeesh, Kerala, India/WDX 2504/DXLD)

JAPAN

Radio Nikkei, 9595 kHz. "Start"! Card unsigned. Received in 14 days for an English report and one US dollar. Card mentions merger of Radio Tampa and BSC to Radio Nikkei. Station address: Nikkei Radio Broadcasting Company, 9-15 Akasaka 1-chome, Minato-ku, Tokyo 107-8373 Japan. Station website: http://www.radionikkei.jp (Barbour, NH)

MEDIUM WAVE

Radio Juventus Don Bosco, 1640 kHz AM. Full data card. Received in 50 days for an Spanish report and one US dollar. Station address: Apartado 4848, Santo Domingo, Dominican Republic. (Manuel Mendez, Lugo, Spain/Cumbre DX)

KTOE 1420 kHz AM. Partial data verification on Linder Radio Group letterhead signed by Michael J. Parry-General Manager, plus business card. Received in 92 days for an AM report and one US dollar (returned with reply). Station address: P.O. Box 1420, Mankato, MN 56002. (Patrick Griffith, Westminster, CO)

KZFX 1380 kHz AM. Verification letter signed by Jim Hilliker-Traffic Reporter. Received in 450 days for a taped report. Station address: 903 North Main Street, Salinas, CA 93906. (Patrick Martin, Seaside, OR)

WTRB 1570 kHz AM. Verification letter signed by Don Paris-General Manager, plus coverage map and business card. Received in 330 days for an AM report. One of my better domestic catches at 57 watts! Station address: P.O. Box 410, Ripley, TN 38063-0410. (Martin, OR)

MONGOLIA

The Voice of Mongolia, 12085 kHz. Full data Visit Mongolia card signed by Densmaa-Mail Editor. Received in 18 days for an English report and one IRC. Station address: c/o English Service, P.O. Box 365, Ulaanbaatar 13, Mongolia. Station email: mr@mongo.net. (Mendez, Spain/Cumbre DX)

NETHERLANDS ANTILLES

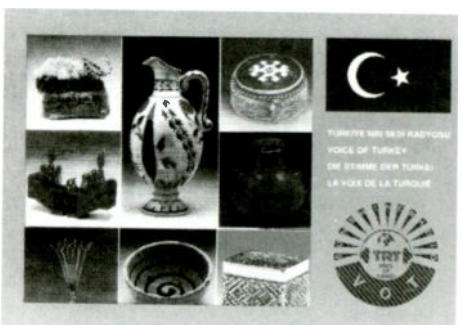
Radio Netherlands-Bonaire relay, 9590 kHz. Partial data Dutch Morning card # 4 unsigned, plus Happy New Years card. Received in 392 days for an English report to the Bonaire facility. Station address: Bonaire Relay, P.O. Box 45, Krakndiji, Netherland Antilles. (Joe Wood, Greenback, TN)

PIRATE

Latvia-Radio Marabu, 9290 kHz. Full data Lighthouse card, signed by Juna Viren, plus info sheet, stickers and personal letter from DJ Volker. Received in ten days for an email report. QSL maildrop: Box 293, Merlin ON N0P 1W0 Canada. Station also verified in 2004 with Friends of Marabu membership form, German info sheet and broadcast schedule. (Barbour, NH)

TURKEY

Voice of Turkey 5960, 9525, 15155 kHz. Full data Turkish Souvenir cards, signed with initials. Received in 35 days for a series of Period Reports conducted over a week. Station stickers, broadcast schedule, pennant, calendar and personal note for my technical reports. Station address: P.O. Box 333, Yenisehir, 06443 Ankara, Turkey. Station website: http://www.trt.net.tr (Frank Hillton, Charleston, SC)



UTILITY

Auckland Volmet, 8828 kHz USB. Full data form letter on Airways New Zealand letterhead with illegible signature. Received in 22 days for a utility report, two IRCs and picture postcard. Station address: P.O. Box 53-093, Auckland, New Zealand. (Bill Wilkins, Springfield, MO)

How to Use the Shortwave Guide

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. On the top half of the page 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:

Day Codes	
s/S	Sunday
m/M	Monday
t/T	Tuesday
w/W	Wednesday
h/H	Thursday
f/F	Friday
a/A	Saturday
D	Daily
mon/MON	monthly
occ:	occasional
DRM:	Digital Radio Mondiale

In the same column ⑤, irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

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
au:	Australia
ca:	Central America
do:	domestic broadcast
eu:	Europe
irr:	irregular (Costa Rica RFPI)
me:	Middle East
na:	North America
pa:	Pacific
sa:	South America
va:	various

MT Monitoring Team

Gayle Van Horn
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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. They are only authorized on a non-interference basis until that date.

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

Note: We've shifted our time headers to Daylight Savings Time, but as some stations observe Savings Time and some don't, and some shift programs and some don't, if you can't find a particular station then check for them in the previous or the following hour.

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

0000	0007	vl	Sierra Leone, SLBS	3316do		
0000	0015	vl	Cambodia, National Radio	11940as		
0000	0015	vl	Croatia, Croatian Radio	7285sa		
0000	0015		Japan, Radio	13650as	17810as	
0000	0030		Egypt, Radio Cairo	7115na		
0000	0030		Thailand, Radio	9680va	13695va	
0000	0030		UK, BBC World Service	3915as	5970as	
			9410me	9740as	11945as	11955as
			15280as	15310as	15360as	17615as
			17790as			
0000	0030		USA, Voice of America	7215va	9890va	
			11760va	11995as	15185va	15290va
			17740va			
0000	0045		India, All India Radio	9705as	9950as	11620as
			11645as	13605as		
0000	0057		Canada, Radio Canada Intl	9880as		
0000	0059		Germany, Deutsche Welle	6030as	7290as	
0000	0059		Spain, Radio Exterior Espana	6055na		
0000	0100		Anguilla, Caribbean Beacon	6090am		
0000	0100		Australia, ABC NT Alice Springs	2310irr	4835do	
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek	4910do		
0000	0100		Australia, HCJB	15525as		
0000	0100		Australia, Radio	9660as	12080as	13630pa
			15240pa	17715as	17750pa	17775pa
			17795as			
0000	0100		Australia, Voice Intl	7355as		
0000	0100		Bulgaria, Radio	7400na	9700na	
0000	0100		Canada, CBC Northern Service	9625do		
0000	0100		Canada, CFRX Toronto ON	6070do		
0000	0100		Canada, CFVP Calgary AB	6030do		
0000	0100		Canada, CKZN St John's NF	6160do		
0000	0100		Canada, CKZU Vancouver BC	6160do		
0000	0100		China, China Radio Intl	6020al	6075as	
			7170as 7180as	7345eu	9570as	11770as
0000	0100		Costa Rica, University Network	5030va	6150va	
			7375va 9725va			
0000	0100		Guyana, Voice of	3290do		
0000	0100		Japan, Radio	6145na		
0000	0100		Malaysia, RTM	7295as		
0000	0100		Namibia, Namibian BC Corp	3270af	3290af	
			6060af			
0000	0100		Netherlands, Radio	9845na		
0000	0100		New Zealand, Radio NZ Intl	17675pa		
0000	0100		Oman, Radio	5970as		
0000	0100		Sierra Leone, Radio UNAMSIL	6137af		
0000	0100		Singapore, Mediacorp Radio	6150do		
0000	0100	vl	Solomon Islands, SIBC	5020do	9545do	
0000	0100	DRM	UK, BBC World Service	6010na		
0000	0100		UK, BBC World Service	5975ca	6010na	
			12095ca			
0000	0100		Ukraine, Radio Ukraine Intl	5910na		
0000	0100		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
0000	0100		USA, KAIJ Dallas TX	5755na		
0000	0100		USA, KTBN Salt Lake City UT	7505na		
0000	0100		USA, KWHR Naalehu HI	17510as		
0000	0100		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na			
0000	0100		USA, WBOH Newport NC	5920am		
0000	0100		USA, WEWN Birmingham AL	5825va	7425va	
			11530va			
0000	0100		USA, WHRA Greenbush ME	7580na		
0000	0100		USA, WHRI Noblesville IN	7315am	7535am	
0000	0100		USA, WINB Red Lion PA	9320am		
0000	0100		USA, WJIE Louisville KY	13595am		
0000	0100		USA, WRMI Miami FL	6870am	9955am	
0000	0100		USA, WRMI Miami FL	6870am	9955am	
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WWCR Nashville TN	3210na	5070na	
			7465na 13845na			
0000	0100		USA, WWRB Manchester TN	5050na	5085na	
			5745na 6890na			
0000	0100		USA, WYFR Okeechobee FL	6065na	9505na	
			11720sa			
0000	0100		Zambia, Radio Christian Voice	4965af		
0005	0030	sm	Austria, Radio Austria Intl	7325sa		
0015	0030	twhfa	Austria, Radio Austria Intl	7325sa		
0030	0100		Australia, Radio	9660as	12080as	13630pa
			15240pa	15415pa	17715as	17750pa
			17775as	17795as		
0030	0100	sm	Austria, Radio Austria Intl	7325am		
0030	0100	mtwhf	Germany, Bible Voice Broadcasting	7105as		
0030	0100	s	Germany, Pan American BC	5945va		
0030	0100		Lithuania, Radio Vilnius	9875na		
0030	0100		Lithuania, Radio Vilnius	9875na		
0030	0100		Sri Lanka, SLBC	6005as	11905as	15745as
0030	0100		Thailand, Radio	5890na	13595na	
0030	0100		UK, BBC World Service	5970as	6195as	
			9740as 11955as	15280as	15310as	15360as
			17615as	17790as		
0030	0100		USA, Voice of America	7215va	9890va	
			15185va	15290va	17740va	
0045	0100	twhfa	Austria, Radio Austria Intl	7325am		
0045	0100		Pakistan, Radio	9340as	11565as	
0055	0100		Italy, RAI Intl	11800na		

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

0100	0115		Italy, RAI Intl	11800na		
0100	0115		Pakistan, Radio	9340as	11565as	
0100	0127		Czech Rep, Radio Prague Intl	6200na	7345na	
0100	0128		Vietnam, Voice of	6175am		
0100	0130		Australia, Radio	9660as	12080as	13630pa
			15240pa	15415pa	17715as	17750pa
			17775as	17795as		
0100	0130	s	Germany, Universal Life	7145as		
0100	0130	twhfas	Serbia & Montenegro, Intl Radio	7115va		
0100	0130		Slovakia, Slovak Radio	7230am	9440am	
0100	0130		Uzbekistan, Radio Tashkent	5975as	6165as	
			7160as			
0100	0156		Romania, Radio Romania Intl	6140na	9510na	
			9615na 11740na			
0100	0157		China, China Radio Intl	6005na	7345na	
			9580na			
0100	0157	DRM	Netherlands, Radio	15525na		
0100	0157		Netherlands, Radio	9845na		
0100	0200		Anguilla, Caribbean Beacon	6090am		
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek	4910do		
0100	0200		Australia, HCJB	15560as		
0100	0200		Australia, Voice Intl	7355as		
0100	0200		Canada, CBC Northern Service	9625do		
0100	0200		Canada, CFRX Toronto ON	6070do		
0100	0200		Canada, CFVP Calgary AB	6030do		
0100	0200		Canada, CKZN St John's NF	6160do		
0100	0200		Canada, CKZU Vancouver BC	6160do		
0100	0200		Canada, Radio Canada Intl	6190am	9755am	
			9810am			
0100	0200		Costa Rica, University Network	5030va	6150va	
			7375va 9725va			
0100	0200		Cuba, Radio Havana	6000na	9820na	
0100	0200		Guyana, Voice of	3290do		
0100	0200		Indonesia, Voice of	9525as	11785pa	15150al
0100	0200		Japan, Radio	6030va	15325as	17560va
			17685pa	17825na	17835sa	17685pa
			17810as	17845as		
0100	0200		Malaysia, RTM	7295as		
0100	0200		Namibia, Namibian BC Corp	3270af	3290af	
			6060af			
0100	0200		New Zealand, Radio NZ Intl	17675pa		
0100	0200		North Korea, Voice of	7140as	9345as	
			9730am	11735am	13760as	15180as
0100	0200		Oman, Radio	11955as		
0100	0200		Sierra Leone, Radio UNAMSIL	6137af		
0100	0200		Singapore, Mediacorp Radio	6150do		
0100	0200	vl	Solomon Islands, SIBC	5020do	9545do	
0100	0200		Sri Lanka, SLBC	6005as	11905as	15745as
0100	0200		UK, BBC World Service	5975ca	6195as	
			9825ca 11955ca	12095as	15310as	15360as
			17790as			
0100	0200		Ukraine, Radio Ukraine Intl	5910na		
0100	0200		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
0100	0200		USA, KAIJ Dallas TX	5755na		
0100	0200		USA, KTBN Salt Lake City UT	7505na		
0100	0200		USA, KWHR Naalehu HI	17510as		
0100	0200		USA, Voice of America	7200va	11705va	
			11820va	17740va		
0100	0200		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na			
0100	0200		USA, WBOH Newport NC	5920am		
0100	0200		USA, WEWN Birmingham AL	5825va	7425va	
			11530va			
0100	0200		USA, WHRA Greenbush ME	7580na		
0100	0200		USA, WHRI Noblesville IN	5835am	7315am	
			7535am			
0100	0200		USA, WINB Red Lion PA	9320am		
0100	0200		USA, WJIE Louisville KY	13595am		
0100	0200		USA, WRMI Miami FL	6870am	9955am	
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WWCR Nashville TN	3210na	5070na	
			5935na 7465na			
0100	0200		USA, WWRB Manchester TN	5050na	5085na	
			5745na 6890na			
0100	0200		USA, WYFR Okeechobee FL	6065na	9505na	
0100	0200		Zambia, Radio Christian Voice	4965af		
0105	0115	vl	Croatia, Croatian Radio	7285na		
0130	0200		Australia, Radio	9660as	12080as	13630pa

			15240pa 17795as	15415pa	17715as	17750pa
0130	0200		Iran, Voice of the Islamic Rep		6120am	9580am
0130	0200		Sweden, Radio	11550va		
0130	0200	twhfa	USA, Voice of America 13740va		7405va	9775va

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

0200	0227		Czech Rep, Radia Prague Intl		6200na	7345na
0200	0227		Iran, Voice of the Islamic Rep		6120am	9580am
0200	0228		Hungary, Radio Budapest		9775na	
0200	0230		Australia, HCJB	15560as		
0200	0230		Austria, AWR Europe	6175me		
0200	0230	mtwfa	Belarus, Radio	5970eu	7210eu	
0200	0230		Serbia & Montenegro, Intl Radio		7130va	
0200	0257		China, China Radio Intl		13640as	11770as
0200	0259		Canada, Radia Canada Intl 9810am		6190am	9755am
0200	0300		Anguilla, Caribbean Beacon		6090am	
0200	0300	twhfa	Argentina, RAE	11710na		
0200	0300		Australia, ABC NT Alice Springs		2310irr	4835do
0200	0300		Australia, ABC NT Katherine		5025do	
0200	0300		Australia, ABC NT Tennant Creek		4910do	
0200	0300		Australia, Radio 15240pa 21725pa	9660as 15415pa	12080as 15515as	13630pa 17750pa
0200	0300		Australia, Voice Intl	7355as		
0200	0300		Canada, CBC Northern Service		9625do	
0200	0300		Canada, CFRX Toronto ON		6070do	
0200	0300		Canada, CFVP Calgary AB		6030do	
0200	0300		Canada, CKZN St John's NF		6160do	
0200	0300		Canada, CKZU Vancouver BC		6160do	
0200	0300		Costa Rica, University Network 7375va 9725va		5030va	6150va
0200	0300		Cuba, Radio Havana	6000na	9820na	
0200	0300		Egypt, Radio Cairo	7260na		
0200	0300		Guyana, Voice of	3290do		
0200	0300		Malaysia, RTM	7295as		
0200	0300		Myanmar, Radio	7185do		
0200	0300		Namibia, Namibian BC Corp 6090af		3270af	3290af
0200	0300		New Zealand, Radio NZ Intl		17675pa	
0200	0300		North Korea, Voice of 15100as		4405as	13650as
0200	0300		Oman, Radio	11955as		
0200	0300		Philippines, Radio Pilipinas 15270as		12015as	15120pa
0200	0300		Russia, Voice of 15475na	7180na 15595na	7350na 17695as	15425na
0200	0300		Sierra Leone, Radio UNAMSIL		6137af	
0200	0300		Singapore, Mediacorp Radio		6150do	
0200	0300	vl	Solomon Islands, SIBC		5020do	9545do
0200	0300		South Korea, Radia Korea Intl 15575na		9560na	11810na
0200	0300		Sri Lanka, SL8C	6005as	11905as	15745as
0200	0300		Taiwan, Radio Taiwan Intl 11875as	15465va	5950na	9680na
0200	0300		UK, BBC World Service 9525ca 9750af 15310as	9825ca 15360as	5975ca 11955as 17790as	6195as 12095ca
0200	0300		USA, AFRTS 6350usb 12133usb	4319usb 12579usb	5446usb 13362usb	5765usb 13855usb
0200	0300		USA, KAIJ Dallas TX	5755na		
0200	0300		USA, KJES Vado NM	7555na		
0200	0300		USA, KTBN Salt Lake City UT		7505na	
0200	0300		USA, KWHR Naalehu HI		17510as	
0200	0300	mtwhf	USA, Voice of America 11820va	17740va	7200va	11705va
0200	0300		USA, WBCQ Kennebunk ME 9330na		5105na	7415na
0200	0300		USA, WBOH Newport NC		5920am	
0200	0300		USA, WEWN Birmingham AL 11530va		5825va	7425va
0200	0300		USA, WHRA Greenbush ME		7580na	
0200	0300		USA, WHRI Noblesville IN 7535am		5835am	7315am
0200	0300		USA, WINB Red Lion PA		9320am	
0200	0300		USA, WJIE Louisville KY		13595am	
0200	0300		USA, WRMI Miami FL	6870am	9955am	
0200	0300		USA, WTJC Newport NC		9370na	
0200	0300		USA, WWCR Nashville TN 5935na 7465na		3210na	5070na
0200	0300		USA, WWRB Manchester TN 5745na 6890na		5050na	5085na
0200	0300		USA, WYFR Okeechobee FL 9505na 11855ca		5985na	6065na
0200	0300		Zambia, Radio Christian Voice		4965af	
0205	0215	vl	Croatia, Croatian Radio		7285na	
02'5	0230		Nepal, Radio 7165as	3230as	5005as	6100as
0230	0258		Vietnam, Voice of	6175am		
0230	0300	s	Belarus, Radio	5970eu	7210eu	
0230	0300		Sweden, Radio	6010na		
0245	0300	twhfas	Albania, Radio Tirana	6115eu	7160eu	
0245	0300		UK, BBC World Service		11865af	
0250	0300		Vatican City, Vatican Radio		7305am	9605am

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

0300	0330	vl	Croatia, Croatian Radio		7285na	
0300	0330		Egypt, Radio Cairo	7260na		
0300	0330		Philippines, Radio Pilipinas		15120as	15270pa
0300	0330	s	Swaziland, TWR	3200af		
0300	0330		Thailand, Radio	5890na	15460na	
0300	0330	a	UK, Wales Radio Intl	6005na		
0300	0330		USA, KJES Vado NM	7555na		
0300	0330		USA, Voice of America 7290af 7340af		6035af 9885af	6080af
0300	0330		Vatican City, Vatican Radio		7360af	
0300	0355		South Africa, Channel Africa		3345af	7390af
0300	0357		China, China Radio Intl 9790na 11770as		7190na 15110as	9690na
0300	0359		New Zealand, Radio NZ Intl		17675pa	
0300	0400		Anguilla, Caribbean Beacon		6090am	
0300	0400		Australia, ABC NT Alice Springs		2310irr	4835do
0300	0400		Australia, ABC NT Katherine		5025do	
0300	0400		Australia, ABC NT Tennant Creek		4910do	
0300	0400		Australia, Radio 15240pa 21725pa	9660as 15415pa	12080as 15515as	13630pa 17750pa
0300	0400		Bulgaria, Radio	9400na	9700eu	
0300	0400		Canada, CBC Northern Service		9625do	
0300	0400		Canada, CFRX Toronto ON		6070do	
0300	0400		Canada, CFVP Calgary AB		6030do	
0300	0400		Canada, CKZN St John's NF		6160do	
0300	0400		Canada, CKZU Vancouver BC		6160do	
0300	0400		Costa Rica, University Network 7375va 9725va		5030va	6150va
0300	0400		Cuba, Radio Havana	6000na	9820na	
0300	0400	vl	Guatemala, Radio Cultural		3300sa	
0300	0400		Guyana, Voice of	3290do		
0300	0400		Japan, Radio	21610pa		
0300	0400		Malaysia, RTM 15295as	6175as	7295as	9750as
0300	0400		Namibia, Namibian BC Corp 6090af		3270af	3290af
0300	0400		North Korea, Voice of 9345as 9730as		3560as	7140as
0300	0400		Oman, Radio	15575as		
0300	0400		Russia, Voice of 12010na 17695as	7150na 15425na	7180na 15475na	7350na 15595na
0300	0400		Sierra Leone, Radio UNAMSIL		6137af	
0300	0400		Singapore, Mediacorp Radio		6150do	
0300	0400	vl	Solomon Islands, SIBC		5020do	9545do
0300	0400		Sri Lanka, SLBC	6005as	11905as	15745as
0300	0400		Taiwan, Radio Taiwan Intl 15320va		5950va	15125va
0300	0400	vl	Uganda, Radio	4976do	5026do	7196do
0300	0400		UK, BBC World Service 7160af 9605as 12035af 15575va	9750af 15280as 17760as	3255af 11760va 15310as 17790as	6005af 11765af 15360as 21660as
0300	0400	vl/ mtwhf	UK, Sudan Radio Service		9625va	
0300	0400		USA, AFRTS 6350usb 12133usb	4319usb 12579usb	5446usb 13362usb	5765usb 13855usb
0300	0400		USA, KAIJ Dallas TX	5755na		
0300	0400		USA, KTBN Salt Lake City UT		7505na	
0300	0400		USA, KWHR Naalehu HI		17510as	
0300	0400		USA, Voice of America		4930af	4960af
0300	0400		USA, WBCQ Kennebunk ME 9330na		5105na	7415na
0300	0400		USA, WBOH Newport NC		5920am	
0300	0400		USA, WEWN Birmingham AL 11530va		5825va	7425va
0300	0400		USA, WHRA Greenbush ME		7580na	
0300	0400		USA, WHRI Noblesville IN 7535am		5835am	7315am
0300	0400		USA, WINB Red Lion PA		9320am	
0300	0400		USA, WJIE Louisville KY		13595am	
0300	0400		USA, WRMI Miami FL	6870am	9955am	
0300	0400		USA, WTJC Newport NC		9370na	
0300	0400		USA, WWCR Nashville TN 5935na 7465na		3210na	5070na
0300	0400		USA, WWRB Manchester TN 5745na 6890na		5050na	5085na
0300	0400		USA, WYFR Okeechobee FL 9985na 11740na		6065na	9505na
0300	0400		Zambia, Radio Christian Voice		4965af	
0300	0400	vl	Zimbabwe, ZBC Corp	5975do		
0330	0358		Hungary, Radio Budapest		9775na	
0330	0358		Vietnam, Voice of	6175am		
0330	0400	twhfas	Albania, Radio Tirana	6115eu	7160eu	
0330	0400		Sweden, Radio	6010na		
0330	0400		UAE, Emirates Radio	12005na	13675na	15400na
0330	0400		UK, BBC World Service 6190af 7160af	9750af	3255af 11760af	6005af 11765af

			12035af	15420af	15575af	
0330	0400		USA, Voice of America 7290af 9885af		6035af	6080af
0345	0400		Tajikistan, Radio	7245irr		

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

0400	0427		Czech Rep, Radio Prague Intl		6200na	7345na
0400	0430		Australia, Radio	9660as	12080as	13630pa
			15240pa	15515pa	17750pa	21725pa
0400	0430		France, Radio France Intl		9555af	9805af
0400	0430		Sri Lanka, SLBC	6005as	11905as	15745as
0400	0430		USA, Voice of America 9575af 9775af	9885af	6080af	7290af
0400	0450		Turkey, Voice of	6020va	7240me	
0400	0456		Romania, Radio Romania Intl 11870va	15250va	6125va	9515va
0400	0457		China, China Radio Intl 9755na		6190na	9560na
0400	0457		Netherlands, Radio	6165na	9590na	
0400	0457	DRM	Netherlands, Radio	15400au		
0400	0459		Germany, Deutsche Welle 9710as		6180af	9545as
0400	0500		Anguilla, Caribbean Beacon		6090am	
0400	0500		Australia, ABC NT Alice Springs		2310irr	4835do
0400	0500		Australia, ABC NT Katherine		5025do	
0400	0500		Australia, ABC NT Tennant Creek		4910do	
0400	0500		Canada, CBC Northern Service		9625do	
0400	0500		Canada, CFRX Toronto ON		6070do	
0400	0500		Canada, CKZN St John's NF		6160do	
0400	0500		Canada, CKZU Vancouver BC		6160do	
0400	0500		Costa Rica, University Network 7375va 9725va		5030va	6150va
0400	0500		Cuba, Radio Havana	6000na	9820na	
0400	0500		Guyana, Voice of	3290do		
0400	0500		Malaysia, RTM 15295as	6175as	7295as	9750as
0400	0500		Namibia, Namibian BC Corp 6090af		3270af	3290af
0400	0500		New Zealand, Radio NZ Intl		15720pa	
0400	0500		Oman, Radio	15575as		
0400	0500		Russia, Voice of 12010na	7150na	7180na	7350na
				15595na	15595na	17695as
0400	0500		Sierra Leone, Radio UNAMSIL		6137af	
0400	0500		Singapore, Mediacorp Radio		6150do	
0400	0500	vl	Solomon Islands, SIBC		5020do	9545do
0400	0500		South Africa, Channel Africa		3345af	
0400	0500	vl	Uganda, Radio	4976do	5026do	7196do
0400	0500	DRM	UK, BBC World Service		6010na	
0400	0500		UK, BBC World Service 6005af 6135am	6190af	3255af	5975am
			11765af	12035af	7160af	11760af
					15420af	15575af
0400	0500	vl/ mtwhf	UK, Sudan Radio Service		9625va	
0400	0500		Ukraine, Radio Ukraine Intl		5910na	
0400	0500		USA, AFRTS 6350usb	4319usb	5446usb	5765usb
			12133usb	7590usb	7812usb	10320usb
				12579usb	13362usb	13855usb
0400	0500		USA, KAIJ Dallas TX	5755na		
0400	0500		USA, KTBN Salt Lake City UT		7505na	
0400	0500		USA, KWHR Naalehu HI		17780as	
0400	0500		USA, Voice of America		4930af	4960af
0400	0500		USA, WBCQ Kennebunk ME 9330na		5105na	7415na
0400	0500		USA, WBOH Newport NC		5920am	
0400	0500		USA, WEWN Birmingham AL 11530va		5825va	7425va
0400	0500		USA, WHRA Greenbush ME		7580na	
0400	0500		USA, WHRI Noblesville IN 7535am		5835am	7315am
0400	0500		USA, WINB Red Lion PA		9320am	
0400	0500		USA, WJIE Louisville KY		13595am	
0400	0500		USA, WMLK Bethel PA	9265eu	9955eu	
0400	0500		USA, WRMI Miami FL	6870am	9955am	
0400	0500		USA, WTJC Newport NC		9370na	
0400	0500		USA, WWCR Nashville TN 5770na	5935na	3210na	5070na
0400	0500		USA, WWRB Manchester TN 5745na	6890na	5050na	5085na
0400	0500		USA, WYFR Okeechobee FL 7355va	9505va	6065va	6855va
				9715va		
0400	0500		USA, WYFR Okeechobee FL		6855va	7355va
0400	0500		Zambia, Radio Christian Voice		6065af	
0400	0500	vl	Zimbabwe, ZBC Corp	5975do		
0405	0415	vl	Croatia, Croatian Radio 12105au	12110au	7285na	9480au
0430	0445		Israel, Kol Israel	6280va	7545va	17600va
0430	0445		Uzbekistan, Radio Tashkent 11905eu		5025eu	7185eu
0430	0457		Czech Rep, Radio Prague Intl		9865as	11600va
0430	0500		Australia, Radio	9660as	12080as	13630pa
			15240pa	15415pa	15515va	17750pa
			21725pa			
0430	0500		Nigeria, Radio/Ibadan		6050da	
0430	0500		Nigeria, Radio/Kaduna		4770do	6090do
0430	0500		Nigeria, Radio/Lagos	3326do	4990do	
0430	0500	mtwhf	Swaziland, TWR	4775af	6120af	
0430	0500		USA, Voice of America 9575af 9775af		6080af	7290af
0445	0500		Italy, RAI Intl	5965af	6000af	7230af

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

0500	0530		Australia, Radio	9660as	12080as	13630pa
			15160pa	15240pa	15515va	17750pa
0500	0530		France, Radio France Intl		11850af	11995af
0500	0530		UK, BBC World Service		9605as	11955as
			15280as	15310as	15360as	15575as
			17760as	17790as	21660as	
0500	0530		Vatican City, Vatican Radio 11625af		7360af	9660af
0500	0555		South Africa, Channel Africa		7240af	11875af
0500	0557		China, China Radio Intl		6190as	9560na
			11750as	11770as	11880as	15350as
			15465as	17505al	17540as	
0500	0559		Germany, Deutsche Welle 12035af	15410af	7285af	9565af
0500	0600		Anguilla, Caribbean Beacan		6090am	
0500	0600		Australia, ABC NT Alice Springs		2310irr	4835do
0500	0600		Australia, ABC NT Katherine		5025do	
0500	0600		Australia, ABC NT Tennant Creek		4910do	
0500	0600		Canada, CBC Northern Service		9625da	
0500	0600		Canada, CFRX Toronto ON		6070do	
0500	0600		Canada, CKZN St John's NF		6160do	
0500	0600		Canada, CKZU Vancouver BC		6160do	
0500	0600		Costa Rica, University Network 7375va 9725va		5030va	6150va
0500	0600		Cuba, Radio Havana	6000na	6060na	9550na
			11760am			
0500	0600	vl	Greece, Voice of	5865eu	7475eu	9420eu
0500	0600		Guyana, Voice of	3290do		
0500	0600		Japan, Radio	5975eu	6110na	7230eu
			15195as	17810as	21755pa	
0500	0600		Malaysia, RTM 15295as	6175as	7295as	9750as
0500	0600		Namibia, Namibian BC Corp		6060af	6175al
0500	0600		New Zealand, Radio NZ Intl		15720pa	
0500	0600		Nigeria, Radio/Ibadan		6050do	
0500	0600		Nigeria, Radio/Kaduna		4770do	6090do
0500	0600		Nigeria, Radio/Lagos	3326do	4990do	
0500	0600		Nigeria, Voice of	15120af		
0500	0600		Oman, Radio	15310as		
0500	0600		Russia, Voice of 12010na	7150na	7180na	7350na
				15595na	15595na	17696as
0500	0600		Sierra Leone, Radio UNAMSIL		6137af	
0500	0600		Singapore, Mediacarp Radio		6150da	
0500	0600	vl	Solomon Islands, SIBC		5020do	9545do
0500	0600	mtwhf	Swaziland, TWR	6120af		
0500	0600	as	Swaziland, TWR	4775af		
0500	0600		Swaziland, TWR	9500af		
0500	0600	vl	Uganda, Radio	4976do	5026do	7196do
0500	0600		UK, BBC World Service 9410eu 11760me	15565eu	6135ca	6195eu
0500	0600	vl/ mtwhf	UK, Sudan Radio Service		11795va	
0500	0600		USA, AFRTS 6350usb	4319usb	5446usb	5765usb
			12133usb	7590usb	7812usb	10320usb
				12579usb	13362usb	13855usb
0500	0600		USA, KAIJ Dallas TX	5755na		
0500	0600		USA, KTBN Salt Lake City UT		7505na	
0500	0600		USA, KWHR Naalehu HI		11565as	17780as
0500	0600		USA, Voice of America 6035af 6105af	7295af	4930af	4960af
					13710af	
0500	0600		USA, WBCQ Kennebunk ME 9330na		5105na	7415na
0500	0600		USA, WBOH Newport NC		5920am	
0500	0600		USA, WEWN Birmingham AL 7570va		5825va	7425va
0500	0600		USA, WHRA Greenbush ME		7580na	
0500	0600		USA, WHRI Noblesville IN		5970am	7315am
0500	0600		USA, WJIE Louisville KY		13595am	
0500	0600		USA, WMLK Bethel PA	9265eu	9955eu	
0500	0600		USA, WRMI Miami FL	6870am	9955am	
0500	0600		USA, WTJC Newport NC		9370na	
0500	0600		USA, WWCR Nashville TN 5770na	5935na	3210na	5070na
0500	0600		USA, WWRB Manchester TN 6890na		5050na	5085na
0500	0600		USA, WYFR Okeechobee FL		6855va	7520na
0500	0600		Zambia, Radio Christian Voice		6065af	
0500	0600	vl	Zimbabwe, ZBC Corp	5975do		
0505	0515	vl	Croatia, Croatian Radio 12105au	12110au	7285na	9470au
0515	0525		Rwanda, Radio	6005da		
0525	0600	vl	Ghana, Ghana BC Corp		3366da	4915do
0530	0545		UK, BBC World Service		6010eu	9815eu
0530	0600		Australia, Radio	9660as	11750as	12080as
			13630pa	15160va	15240as	15415pa
			15515as	17750as		
0530	0600		Thailand, Radio	13780eu		
0530	0600		UAE, Emirates Radio	15435va	17830va	21700va

0530	0600	mtwhf	UK, BBC World Service	6005af	6190af
			7160af 11765af 11940af	15420af	17640af
			17885af		
0530	0600		UK, BBC World Service	9605as	11955as
			15310as 15360as	15575as	17760as
			17790as 21660as		

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

0600	0605	as	South Africa, TWR 11640af		
0600	0620		Vatican City, Vatican Radio	4005eu	5890eu
			7250eu		
0600	0630		France, Radio France Intl	9595af	15155af
0600	0630	as	UK, BBC World Service	6005af	6190af
			11765af 11940af	17640af	17885af
0600	0630		USA, Voice of America	4930af	4960af
			6105af 7295af 9695af	11835af	13710af
0600	0630	mtwhf	USA, Voice of America	11995af	
0600	0635	mtwhf	South Africa, TWR 11640af		
0600	0657		China, China Radio Intl	6115na	7385al
			11770na 11880as	15140as	15350as
			15465as		
0600	0659		Germany, Deutsche Welle	6140eu	7225af
			11785af 15410af		
0600	0700		Anguilla, Caribbean Beacon	6090am	
0600	0700		Australia, ABC NT Alice Springs	2310irr	4835do
0600	0700		Australia, ABC NT Katherine	5025do	
0600	0700		Australia, ABC NT Tennant Creek	4910do	
0600	0700		Australia, Radio 9660as	11880as	12080as
			13630pa 15160va	15240as	15415pa
			15515va 17750as		
0600	0700		Canada, CFRX Toronto ON	6070do	
0600	0700		Canada, CFVP Calgary AB	6030do	
0600	0700		Canada, CKZN St John's NF	6160do	
0600	0700		Canada, CKZU Vancouver BC	6160do	
0600	0700		Costa Rica, University Network	5030va	6150va
			7375va 9725va 11870va		
0600	0700		Cuba, Radio Havana 6000na	6060na	9550na
			11760am		
0600	0700	DRM	Germany, Deutsche Welle	21675af	
0600	0700	vl	Ghana, Ghana BC Corp	3366do	4915do
0600	0700	vl	Greece, Voice of 5865eu	9420eu	15630eu
0600	0700		Guyana, Voice of 3290do		
0600	0700		Japan, Radio 7235eu	11690as	11740as
			11760as 15195as	17870pa	21755pa
0600	0700		Liberia, ELWA 4760do		
0600	0700		Malaysia, RTM 6175as	7295as	9750as
			15295as		
0600	0700		Namibia, Namibian BC Corp	6060af	6175al
0600	0700		New Zealand, Radio NZ Intl	15720pa	
0600	0700		Nigeria, Radio/Ibadan	6050do	
0600	0700		Nigeria, Radio/Kaduna	4770do	6090do
0600	0700		Nigeria, Radio/Lagos 3326do	4990do	
0600	0700		Nigeria, Voice of 15120af		
0600	0700		Russia, Voice of 17665pa	21790pa	
0600	0700		Sierra Leone, Radio UNAMSIL	6137af	
0600	0700		Singapore, Mediacorp Radio	6150do	
0600	0700	vl	Solomon Islands, SIBC	5020do	9545do
0600	0700		South Africa, Channel Africa	7240af	15220af
0600	0700	as	Swaziland, TWR 4775af		
0600	0700		Swaziland, TWR 6120af	9500af	
0600	0700		UK, BBC World Service	9605as	11955as
			15310as 15360as	17760as	17790as
			21660as		
0600	0700		USA, AFRTS 4319usb	5446usb	5765usb
			6350usb 7590usb	7812usb	10320usb
			12133usb 12579usb	13362usb	13855usb
0600	0700		USA, KAIJ Dallas TX 5755na		
0600	0700		USA, KTBN Salt Lake City UT	7505na	
0600	0700		USA, KWHR Naalehu HI	9930as	11565cs
0600	0700		USA, WBCQ Kennebunk ME	5105na	7415na
0600	0700		USA, WBOH Newport NC	5920am	
0600	0700		USA, WEWN Birmingham AL	5825va	7425va
			7570va		
0600	0700		USA, WHRA Greenbush ME	7580na	
0600	0700		USA, WHRI Noblesville IN	7315am	7535am
0600	0700		USA, WJIE Louisville KY	13595am	
0600	0700		USA, WMLK Bethel PA9265eu	9955eu	
0600	0700		USA, WRMI Miami FL 6870am	9955am	
0600	0700		USA, WTJC Newport NC	9370na	
0600	0700		USA, WWCR Nashville TN	3210na	5070na
			5770na 5935na		
0600	0700		USA, WYFR Okeechobee FL	5850eu	7355eu
			9680eu 11530na 11580va		
0600	0700	vl	Vanuatu, Radio 4960do		
0600	0700		Yemen, Rep of Yemen Radio	9780me	
0600	0700		Zambia, Radio Christian Voice	6065af	
0600	0700	vl	Zimbabwe, ZBC Corp 5975da		
0605	0615	vl	Croatia, Croatian Radio	9480au	12105au
			12110au		
0605	0630	as	Austria, Radio Austria Intl	17870me	
0630	0645	as	UK, BBC World Service	9875eu	
0630	0656		Romania, Radio Romania Intl	9565eu	11710eu
0630	0700	vl	Georgia, Radio Georgia	11805eu	
0630	0700		UK, BBC World Service	6005af	6190af
			11765af 11940af	15400af	17640af
			17885laf		
0630	0700		USA, Voice of America	6080af	7295af
			11835af		
0630	0700		Vatican City, Vatican Radio	9660af	11625af
			13765af		
0635	0700	as	Austria, Radio Austria Intl	17870me	
0645	0700	mtwhf	Austria, Radio Austria Intl	17870me	

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

0700	0715	vl	Croatia, Croatian Radio	9470au	12105au
			12110au 13820eu		
0700	0720	as	UK, BBC World Service	6190af	11765af
			11940af 15400af	17885af	
0700	0730		Slovakia, Slovak Radio	13715au	15460au
0700	0730	a	Tibet, Xizang PBS 6110as	9490as	9580as
0700	0759		New Zealand, Radio NZ Intl	15720pa	
0700	0800	s	Albania, TWR 11865eu		
0700	0800		Anguilla, Caribbean Beacon	6090am	
0700	0800		Australia, ABC NT Alice Springs	2310irr	4835do
0700	0800		Australia, ABC NT Katherine	5025do	
0700	0800		Australia, ABC NT Tennant Creek	4910do	
0700	0800		Australia, HCJB 11750au		
0700	0800		Australia, Radio 9660as	11880as	12080as
			13630pa 15160va	15240as	15415pa
			17750pa		
0700	0800		Canada, CFRX Toronto ON	6070do	
0700	0800		Canada, CFVP Calgary AB	6030do	
0700	0800		Canada, CKZN St John's NF	6160do	
0700	0800		Canada, CKZU Vancouver BC	6160do	
0700	0800		China, China Radio Intl	11855as	11880as
			15350as 15465as	17540as	17490al
0700	0800		Costa Rica, University Network	5030va	6150va
			7375va 9725va 11870va		
0700	0800		Eqt Guinea, Radio Africa	15190af	
0700	0800		France, Radio France Intl	11700af	11725af
0700	0800		Germany, Deutsche Welle	6140eu	
0700	0800	DRM	Germany, Deutsche Welle	21675af	
0700	0800		Germany, Overcomer Ministries	6110eu	
0700	0800	vl	Ghana, Ghana BC Carp	3366do	4915da
0700	0800	vl	Greece, Voice of 9420eu	11645eu	15630eu
0700	0800		Guyana, Voice of 3290do	5950da	
0700	0800		Liberia, ELWA 4760do		
0700	0800		Malaysia, RTM 6175as	7295as	9750as
			15295as		
0700	0800		Myanmar, Radio 9730do		
0700	0800		Nigeria, Radio/Ibadan	6050do	
0700	0800		Nigeria, Radio/Kaduna	4770do	6090do
0700	0800		Nigeria, Radio/Lagos 3326do	4990do	
0700	0800		Russia, Voice of 12005pa	12060pa	17665pa
			21790pa		
0700	0800	DRM	Russia, Voice of 15780eu		
0700	0800		Sierra Leone, Radio UNAMSIL	6137af	
0700	0800		Singapore, Mediacorp Radio	6150do	
0700	0800	vl	Soloman Islands, SIBC	5020do	9545do
0700	0800		South Africa, Channel Africa	11825af	
0700	0800		Swaziland, TWR 6120af		
0700	0800		Swaziland, TWR 9500af		
0700	0800		Taiwan, Radio Taiwan Intl	5950na	
0700	0800		UK, BBC World Service	9605as	11955as
			15310as 15360as	17760as	17790as
			21660as		
0700	0800		USA, AFRTS 4319usb	5446usb	5765usb
			6350usb 7590usb	7812usb	10320usb
			12133usb 12579usb	13362usb	13855usb
0700	0800		USA, KAIJ Dallas TX 5755na		
0700	0800		USA, KTBN Salt Lake City UT	7505na	
0700	0800		USA, KWHR Naalehu HI	9930as	11565as
0700	0800		USA, Voice of America	5995af	9700af
			11655af		
0700	0800		USA, WBCQ Kennebunk ME	5105na	7415na
0700	0800		USA, WBOH Newport NC	5920am	
0700	0800		USA, WEWN Birmingham AL	5825va	7425va
			7570va		
0700	0800		USA, WHRA Greenbush ME	7580na	
0700	0800		USA, WHRI Noblesville IN	7315am	7535am
0700	0800		USA, WJIE Louisville KY	13595am	
0700	0800		USA, WMLK Bethel PA9265eu	9955eu	
0700	0800		USA, WRMI Miami FL 6870am	9955am	
0700	0800		USA, WTJC Newport NC	9370na	
0700	0800		USA, WWCR Nashville TN	3210na	5070na
			5770na 5935na		
0700	0800		USA, WYFR Okeechobee FL	6855va	5985va
			9495va 9715va 9985va		
0700	0800	vl	Vanuatu, Radio 4960da		
0700	0800		Zambia, Radio Christian Voice	9865af	
0720	0800	as	UK, BBC World Service	6190af	11765me
			11940af 15400af	17885af	
0730	0800		Bulgaria, Radio 11600eu	13600eu	
0730	0800		Georgia, Radio Georgia	11910eu	
0730	0800	s	Germany, Bible Voice Broadcasting	5945eu	
0730	0800	as	Guam, TWR/KTWR 15255as		

0740	0800	mtwhf	Guam, TWR/KTWR	15225as	
0745	0800	s	Albania, TWR	11865eu	
0745	0800	s	Monaco, TWR	9870eu	

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

0800	0827		Czech Rep, Radio Prague Intl	7345eu	9880eu	
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek	4910do		
0800	0830		Australia, Radio 5995as	9580as	9590as	
			9710as 12080pa 13630pa	15240pa	17750pa	
0800	0830		Myanmar, Radio 9730do			
0800	0857		China, China Radio Intl	11855al	11880as	
			15350as 15465as	17540as	17490al	
0800	0900	mtwhfs	Albania, TWR 11865eu			
0800	0900		Anguilla, Caribbean Beacon	6090am		
0800	0900		Australia, ABC NT Alice Springs	2310irr	4835do	
0800	0900		Australia, HCJB 11750au			
0800	0900		Canada, CFRX Toronto ON	6070do		
0800	0900		Canada, CFVP Calgary AB	6030do		
0800	0900		Canada, CKZN St John's NF	6160do		
0800	0900		Canada, CKZU Vancouver BC	6160do		
0800	0900		Costa Rica, University Network	5030va	6150va	
			7375va 9725va 11870va			
0800	0900		Eqt Guinea, Radio Africa	15190af		
0800	0900	as	Germany, Bible Voice Broadcasting	5945eu		
0800	0900		Germany, Deutsche Welle	6140eu		
0800	0900	DRM	Germany, Deutsche Welle	21675af		
0800	0900	vl	Ghana, Ghana BC Corp	3366do	4915do	
0800	0900	vl	Greece, Voice of 9420eu	11645eu	15630eu	
0800	0900		Guam, TWR/KTWR 15225as			
0800	0900		Guyana, Voice of 3290do	5950do		
0800	0900		Indonesia, Voice of 9525as	11785pa	15150al	
0800	0900	vl/as	Italy, IRRS 13840eu			
0800	0900		Liberia, ELWA 4760do			
0800	0900		Malaysia, RTM 6175as	7295as	9750as	
			15295as			
0800	0900	mtwhf	Monaco, TWR 9870eu			
0800	0900		New Zealand, Radio NZ Intl	9885pa		
0800	0900		Nigeria, Radio/Ibadan	6050do		
0800	0900		Nigeria, Radio/Kaduna	4770do	6090do	
0800	0900		Nigeria, Radio/Lagos 3326do	4990do		
0800	0900	vl	Pakistan, Radio 15100eu	17835eu		
0800	0900		Papua New Guinea, Catholic Radio		4960va	
0800	0900		Papua New Guinea, NBC	4890do		
0800	0900	DRM	Russia, Voice of 15780eu			
0800	0900		Russia, Voice of 12005pa	12060pa	17495pa	
			17525po 17570pa	17665pa	21790pa	
0800	0900		Sierra Leone, Radio UNAMSIL	6137af		
0800	0900		Singapore, Mediacorp Radio	6150do		
0800	0900	vl	Solomon Islands, SIBC	5020do	9545do	
0800	0900	s	South Africa, SW Radio League	9750af	17700af	
0800	0900		South Korea, Radio Korea Intl	9570as	9640eu	
0800	0900	as	Swaziland, TWR 6120af			
0800	0900		Swaziland, TWR 9500af			
0800	0900		Taiwan, Radio Taiwan Intl	9610ou		
0800	0900		UK, BBC World Service	9605os	11955as	
			15310as 15360as	17760as	17790os	
			21660as			
0800	0900	as	UK, BBC World Service	11760me	15575as	
0800	0900		USA, AFRTS 4319usb	5446usb	5765usb	
			6350usb 7590usb	7812usb	10320usb	
			12133usb 12579usb	13362usb	13855usb	
0800	0900		USA, KAIJ Dallas TX 5755na			
0800	0900		USA, KNLS Anchor Point AK	9615as		
0800	0900		USA, KTBN Salt Lake City UT	7505na		
0800	0900		USA, KWHR Naalehu HI	11565as	17780as	
0800	0900		USA, Voice of America	5995af	9700af	
			11655af			
0800	0900		USA, WBCQ Kennebunk ME	5105na	7415na	
0800	0900		USA, WBOH Newport NC	5920am		
0800	0900		USA, WEWN Birmingham AL	5825na	7425na	
			11875na			
0800	0900		USA, WHRI Noblesville IN	5860am	7315am	
0800	0900		USA, WJIE Louisville KY	13595am		
0800	0900		USA, WMLK Bethel PA 9265eu	9955eu		
0800	0900		USA, WRMI Miami FL 6870am	9955am		
0800	0900		USA, WTJC Newport NC	9370na		
0800	0900		USA, WWCR Nashville TN	3210na	5070na	
			5770na 5935na			
0800	0900		USA, WYFR Okeechobee FL	5950af	6855af	
			7455af 9985af			
0800	0900	vl	Vanuatu, Radio 4960do			
0800	0900		Zambia, Radio Christian Voice	9865af		
0805	0815	vl	Croatia, Croatian Radio	12105au	12110au	
0815	0845	wl	Germany, Bible Voice Broadcasting	5945eu		
0815	0850	a	Albania, TWR 11865eu			
0815	0850	a	Monaco, TWR 9870eu			
0815	0900		Guam, TWR/KTWR 11840as			
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek	2325do		
0830	0900		Australia, Radio 5995as	9580as	9590as	
			9710as 12080pa 13630pa	15240pa	15415pa	
			17750po			
0830	0900		Georgia, Radio Georgia	11910eu		

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

0900	0915	a	Germany, Bible Voice Broadcasting	5945eu		
0900	0915	vl	Ghana, Ghana BC Corp	3366do	4915do	
0900	0920	mtwhfs	Albania, TWR 11865eu			
0900	0920	mtwhf	Monaco, TWR 9870eu			
0900	0930		Australia, Radio 9580as	9590as	11880as	
			15240pa			
0900	0930		Guam, TWR/KTWR 11840as			
0900	0945	s	Germany, Bible Voice Broadcasting	5945eu		
0900	0957		China, China Radio Intl	15210pa	17490eu	
			17690pa			
0900	0959	DRM	Germany, Deutsche Welle	21675af		
0900	1000		Anguilla, Caribbean Beacon	6090am		
0900	1000		Australia, ABC NT Alice Springs	2310do	4835irr	
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek	2325do		
0900	1000		Australia, HCJB 11750au			
0900	1000		Australia, Voice Intl 11955as	13685as		
0900	1000		Canada, CFRX Toronto ON	6070do		
0900	1000		Canada, CFVP Calgary AB	6030do		
0900	1000		Canada, CKZN St John's NF	6160do		
0900	1000		Canada, CKZU Vancouver BC	6160do		
0900	1000		Costa Rica, University Network	5030va	6150va	
			7375va 9725va 11870va	13750va		
0900	1000		Eqt Guinea, Radio Africa	15190af		
0900	1000		Germany, Deutsche Welle	6140eu		
0900	1000	vl	Greece, Voice of 9375eu	9420eu	11645eu	
			15630eu			
0900	1000		Guyana, Voice of 3290do	5950do		
0900	1000	vl/as	Italy, IRRS 13840eu			
0900	1000		Malaysia, RTM 7295as	15295as		
0900	1000		New Zealand, Radio NZ Intl	9885pa		
0900	1000		Nigeria, Radio/Ibadan	6050do		
0900	1000		Nigeria, Radio/Kaduna	4770do	6090do	
0900	1000		Nigeria, Radio/Lagos 3326do	4990do		
0900	1000	vl	Pakistan, Radio 15100eu	17835eu		
0900	1000		Papua New Guinea, Catholic Radio		4960va	
0900	1000		Papua New Guinea, NBC	4890do		
0900	1000	DRM	Russia, Voice of 15780eu			
0900	1000		Russia, Voice of 17495pa	17525pa	17570va	
			17665pa			
0900	1000		Singapore, Mediacorp Radio	6150do		
0900	1000	vl	Solomon Islands, SIBC	5020do	9545do	
0900	1000	s	UAE, Radio UNMEE 21460af			
0900	1000		UK, BBC World Service	6190af	6195as	
			9605as 11940af 12095eu	15190ca	15310as	
			15360as 15400af	15485eu	15565eu	
			17640eu 17760as	17790as	17830af	
			17885af 21470af	21660as		
0900	1000	s	UK, BBC World Service	11760me	15575me	
0900	1000		USA, AFRTS 4319usb	5446usb	5765usb	
			6350usb 7590usb	7812usb	10320usb	
			12133usb 12579usb	13362usb	13855usb	
0900	1000		USA, KAIJ Dallas TX 5755na			
0900	1000		USA, KTBN Salt Lake City UT	7505na		
0900	1000		USA, KWHR Naalehu HI	11565as	17780as	
0900	1000		USA, Voice of America	15615me	17555me	
0900	1000		USA, WBCQ Kennebunk ME	5105na	7415na	
0900	1000		USA, WBOH Newport NC	5920am		
0900	1000		USA, WEWN Birmingham AL	5825na	7425na	
			11875na			
0900	1000		USA, WHRI Noblesville IN	5860am	7315am	
0900	1000		USA, WJIE Louisville KY	13595am		
0900	1000		USA, WRMI Miami FL 6870am	9955am		
0900	1000		USA, WTJC Newport NC	9370na		
0900	1000		USA, WWCR Nashville TN	3210no	5070na	
			5770no 5935na			
0900	1000		USA, WYFR Okeechobee FL	5950af	6855af	
			6890af 7455af 9450af			
0900	1000	vl	Vanuatu, Radio 4960do			
0900	1000		Zambia, Radio Christian Voice	9865af		
0905	0915	vl	Croatia, Croatian Radio	12105au	12110au	
0930	1000		Australia, Radio 9580as	9590as	11880as	
			15240po 15415pa			
0930	1000		Georgia, Radio Georgia	11910me		

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

1000	1029		Czech Rep, Radio Prague Intl	21745va	
1000	1030		Australia, Voice Intl 11955as	13685as	
1000	1030		Guam, AWR/KSDA 11870as	11900as	
1000	1030	vl	Libya, Voice of Africa 21695af		
1000	1030		Mongolia, Voice of 12085as		
1000	1030		UK, BBC World Service	6195as	7320eu
			9605as 9740as 12095eu	15310as	15360as
			15485eu 15565eu	17640eu	17760as
			17790as 21660os		
1000	1057		China, China Radio Intl	15210pa	17490pa
			17690pa		
1000	1057		Netherlands, Radio 7315as	9790os	12065as
			13820au		

1000	1059		New Zealand, Radio NZ Intl	9885pa		
1000	1100		Anguilla, Caribbean Beacon	11775am		
1000	1100		Australia, ABC NT Alice Springs	2310do	4835irr	
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek	2325do		
1000	1100		Australia, HCJB 11750au			
1000	1100		Australia, Radio 9580as 9590as 11880as 15240pa 15415pa			
1000	1100		Canada, CFRX Toronto ON	6070do		
1000	1100		Canada, CFVP Calgary AB	6030do		
1000	1100		Canada, CKZN St John's NF	6160do		
1000	1100		Canada, CKZU Vancouver BC	6160do		
1000	1100		Costa Rica, University Network 5030va 6150va 7375va 9725va 11870va 13750va			
1000	1100		Guyana, Voice of 3290do	5950do		
1000	1100		India, All India Radio 7510pa 13710pa 15020as 15235as 15260as 17800pa 17895pa			
1000	1100	vl/as	Italy, IRRS 13840eu			
1000	1100		Japan, Radio 6120na 9695as 11730as 17720me 17585eu 17750pa 21755pa			
1000	1100		Malaysia, RTM 7295as 15295as			
1000	1100		Nigeria, Voice of 11770af 15120al			
1000	1100		North Korea, Voice of 3560as 6185as 6285as 9335as 9850as			
1000	1100		Papua New Guinea, Catholic Radio	4960va		
1000	1100		Papua New Guinea, NBC	4890do		
1000	1100		Singapore, Mediacorp Radio	6150do		
1000	1100	vl	Solomon Islands, SIBC	5020do	9545do	
1000	1100		South Africa, Channel Africa	11825af		
1000	1100	as	UK, BBC World Service 11940as 15190as 15400af 17830af 17885af 21470af			
1000	1100	s	UK, BBC World Service	15575as		
1000	1100		USA, AFRTS 4319usb 5446usb 5765usb 6350usb 7590usb 7812usb 10320usb 12133usb 12579usb 13362usb 13855usb			
1000	1100		USA, KAIJ Dallas TX 5755na			
1000	1100		USA, KTBN Salt Lake City UT	7505na		
1000	1100		USA, KWHR Naalehu HI	9930as	11565as	
1000	1100		USA, Voice of America	15615me	17555me	
1000	1100		USA, WBCQ Kennebunk ME	5105na		
1000	1100		USA, WBOH Newport NC	5920am		
1000	1100		USA, WEWN Birmingham AL 5825na 7425na 11875na			
1000	1100		USA, WHRI Noblesville IN	5860am	9495am	
1000	1100		USA, WRMI Miami FL 6870am	9955am		
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WWCR Nashville TN 5070na 5770na 5935na 9985na			
1000	1100		USA, WYFR Okeechobee FL 5950na 6855na 6890na 7455na 9450na			
1000	1100		Zambia, Radio Christian Voice	9865af		
1030	1045	mtwhf	Ethiopia, Radio 5990af 7110af 9704af			
1030	1045		Israel, Kol Israel 15640va 17535va			
1030	1058		Vietnam, Voice of 9840as 12020as			
1030	1100		Iran, Voice of the Islamic Rep	15460as	15480as	
1030	1100		UAE, Emirates Radio 13675va 15370va 15395va 21605va			
1030	1100	t	UAE, Radio UNMEE 21550af			
1030	1100		UK, BBC World Service 6195as 9605as 9740as 11945as 15285as 15310as 17760as 17790as 21660as			
1030	1100	mthfa	Vatican City, Vatican Radio	5885eu		

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

1100	1104	vl	Pakistan, Radio 15100eu	17835eu		
1100	1127		Iran, Voice of the Islamic Rep	15460as	15480as	
1100	1128		Vietnam, Voice of 7285as			
1100	1130		Australia, Radio 5995as 6020as 9475as 9560as 9580as 9590as 11880as 12080as 15240pa			
1100	1130	vl	Libya, Voice of Africa 17695af	21675af	21695af	
1100	1130		Tibet, Xizang PBS 4920as	6110as	9490as	
1100	1130	t	UAE, Radio UNMEE 21550af			
1100	1130		UK, BBC World Service 6190af 11940af 15400af 17830af 17885af 21470af			
1100	1157		China, China Radio Intl 5960na 13665al 17490na			
1100	1200		Anguilla, Caribbean Beacon	11775am		
1100	1200		Australia, ABC NT Alice Springs	2310do	4835irr	
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek	2325do		
1100	1200		Australia, HCJB 15425as			
1100	1200		Australia, Voice Intl 13635as	13685as		
1100	1200		Canada, CFRX Toronto ON	6070do		
1100	1200		Canada, CFVP Calgary AB	6030do		
1100	1200		Canada, CKZN St John's NF	6160do		
1100	1200		Canada, CKZU Vancouver BC	6160do		
1100	1200		Costa Rica, University Network 5030va 6150va 7375va 9725va 11870va 13750va			
1100	1200		Ecuador, HCJB 12005am	21455am		
1100	1200	vl	Greece, Voice of 9375eu 9420eu 9775eu 15630eu 15650eu			
1100	1200	vl/as	Italy, IRRS 13840eu			
1100	1200	vl	Italy, IRRS 15665va			
1100	1200		Japan, Radio 6120na 9695as 11730as			
1100	1200		Malaysia, RTM 7295as 15295as			
1100	1200		New Zealand, Radio NZ Intl	15530pa		
1100	1200		Nigeria, Voice of 11770af 15120al			
1100	1200		Papua New Guinea, Catholic Radio	4960va		
1100	1200		Papua New Guinea, NBC	4890do		
1100	1200		Singapore, Radio Singapore Intl	6080as	6150as	
1100	1200		South Africa, Channel Africa	11825af		
1100	1200		Taiwan, Radio Taiwan Intl	7445as		
1100	1200	s	UK, BBC World Service	15575as		
1100	1200		UK, BBC World Service 6195va 7320eu 9740as 12095eu 15190va 15310eu 15485eu 15565eu 17640as 17790as			
1100	1200	mtwhf	UK, BBC World Service	17830af		
1100	1200		USA, AFRTS 4319usb 5446usb 5765usb 6350usb 7590usb 7812usb 10320usb 12133usb 12579usb 13362usb 13855usb			
1100	1200		USA, KAIJ Dallas TX 5755na			
1100	1200		USA, KTBN Salt Lake City UT	7505na		
1100	1200		USA, KWHR Naalehu HI	9930as	11565as	
1100	1200		USA, Voice of America	15615me	17555me	
1100	1200		USA, WBCQ Kennebunk ME	5105na		
1100	1200		USA, WBOH Newport NC	5920am		
1100	1200		USA, WEWN Birmingham AL 5825na 7425na 11875na			
1100	1200		USA, WHRI Noblesville IN	7535am	9495am	
1100	1200		USA, WINB Red Lion PA	9320am		
1100	1200		USA, WJIE Louisville KY	7490am		
1100	1200		USA, WRMI Miami FL 6870am	9955am		
1100	1200		USA, WTJC Newport NC	9370na		
1100	1200		USA, WWCR Nashville TN 5070na 5770na 5935na 15825na			
1100	1200		USA, WYFR Okeechobee FL 5950am 6890am 7355am 9555am 11725am 11830am			
1100	1200		Zambia, Radio Christian Voice	9865af		
1130	1145		UK, BBC World Service	7135as	11920as	
1130	1157		Czech Rep., Radio Prague Intl	11640va	21745va	
1130	1200		Australia, Radio 5995as 6020as 9475as 9560as 9580as 9590as 11880as 12080as			
1130	1200	as	Germany, Bible Voice Broadcasting	5945as		
1130	1200		Guam, AWR/KSDA 15260as			
1130	1200		UK, BBC World Service 6190af 11940af 17830af 17885af 21470af			
1130	1200	a	UK, Wales Radio Intl 17625pa			
1130	1200		Vatican City, Vatican Radio 11625af 13765af 15570af			
1145	1155		Rwanda, Radio 6055do			

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

1200	1215	vl	Cambodia, National Radio	11940as		
1200	1230		Australia, HCJB 15425as			
1200	1230		France, Radio France Intl	15275af	21620af	
1200	1230	vl	Libya, Voice of Africa 17695af	21675af	21695af	
1200	1230		Malaysia, RTM 7295as	15295as		
1200	1230		UAE, AWR Africa 15135as			
1200	1230		Uzbekistan, Radio Tashkent 5060as 5975as 6025as 9715as			
1200	1245	w	Germany, Bible Voice Broadcasting	5945as		
1200	1257		China, China Radio Intl 9730as 9795pa 11760pa 11980as 11760pa 13665al 13790eu 17490eu			
1200	1257		Netherlands, Radio 11675na			
1200	1257	as	Netherlands, Radio 15725na			
1200	1259		Canada, Radio Canada Intl	9670as	11730as	
1200	1259	s	Germany, Universal Life	6045me		
1200	1259		New Zealand, Radio NZ Intl	15530pa		
1200	1300		Anguilla, Caribbean Beacon	11775am		
1200	1300		Australia, ABC NT Alice Springs	2310do	4835irr	
1200	1300		Australia, ABC NT Katherine	2485do		
1200	1300		Australia, ABC NT Tennant Creek	2325do		
1200	1300		Australia, Radio 5995as 6020as 9475as 9560as 9580as 9590as 11880as			
1200	1300		Australia, Voice Intl 13635as	13685as		
1200	1300		Canada, CBC Northern Service	9625do		
1200	1300		Canada, CFRX Toronto ON	6070do		
1200	1300		Canada, CFVP Calgary AB	6030do		
1200	1300		Canada, CKZN St John's NF	6160do		
1200	1300		Canada, CKZU Vancouver BC	6160do		
1200	1300		Costa Rica, University Network 9725va 11870va 13750va			
1200	1300		Ecuador, HCJB 12005am	21455am		
1200	1300	vl/as	Italy, IRRS 13840eu			
1200	1300		Nigeria, Voice of 11770af	15120al		
1200	1300		Papua New Guinea, Catholic Radio	4960va		
1200	1300		Papua New Guinea, NBC	4890do		
1200	1300		Singapore, Radio Singapore Intl	6080as	6150as	
1200	1300		South Korea, Radio Korea Intl	9650na		
1200	1300		Taiwan, Radio Taiwan Intl	7130as		
1200	1300		UK, BBC World Service 6190af 11940af 15190va 17830af 17885af 21470af			
1200	1300	mtwhf	UK, BBC World Service	17830af		
1200	1300		Ukraine, Radio Ukraine Intl	15675eu		

1200	1300		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1200	1300		USA, KAIJ Dallas TX	5755na		
1200	1300		USA, KTBN Salt Lake City UT		7505na	
1200	1300		USA, KWHR Naalehu HI		9930as	11565as
1200	1300		USA, Voice of America		6110va	9645va
			9760va 11705va	11715va	15665va	
1200	1300		USA, WBCQ Kennebunk ME		5105na	9330na
			17495na			
1200	1300		USA, WBOH Newport NC		5920am	
1200	1300		USA, WEWN Birmingham AL		5825na	7425na
			11875na			
1200	1300		USA, WHRI Noblesville IN		7535am	9495am
1200	1300		USA, WINB Red Lion PA		9320am	
1200	1300		USA, WJIE Louisville KY		7490am	
1200	1300		USA, WRMI Miami FL	6870am	9955am	
1200	1300		USA, WTJC Newport NC		9370na	
1200	1300		USA, WWCR Nashville TN		5070na	5770na
			5935na			
1200	1300		USA, WYFR Okeechobee FL		6890na	7355na
			11530na	11970na		
1200	1300		Zambia, Radio Christian Voice		9865af	
1215	1300		Egypt, Radio Cairo	17670as		
1230	1245		UK, BBC World Service		15425eu	21640af
			21640af			
1230	1258		Vietnam, Voice of	9840as	12020as	
1230	1259	a	Germany, Universal Life		6045me	
1230	1300		Australia, HCJB	15405as		
1230	1300		Bangladesh, Bangla Betar		4808as	7185as
			9550as			
1230	1300		Bulgaria, Radio	11700eu	15700eu	
1230	1300	h	Germany, Bible Voice Broadcasting		5945as	
1230	1300	vl	Libya, Voice of Africa	21675af	21695af	
1230	1300		Malaysia, RTM	7295as		
1230	1300		Sri Lanka, SLBC	6005as	11930as	15745as
1230	1300		Thailand, Radio	9810va		

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

1300	1315	f	Germany, Bible Voice Broadcasting		5945as	
1300	1329		Canada, Radio Canada Intl		9670as	11730as
1300	1330		Ecuador, HCJB	12005am	21455am	
1300	1330		Egypt, Radio Cairo	17670as		
1300	1330	vl	Libya, Voice of Africa	21675af	21695af	
1300	1356		Romania, Radio Romania Intl		15105eu	17745eu
1300	1357		China, China Radio Intl		7250va	9795pa
			11760pa	11885as	11990na	13790na
			11980as	15180na	15230na	17625na
1300	1357	DRM	China, China Radio Intl		11810va	
1300	1359		Poland, Radio Polonia	9525eu	11850eu	
1300	1400		Anguilla, Caribbean Beacon		11775am	
1300	1400		Australia, HCJB	15405as		
1300	1400		Australia, Radio	5995as	6020as	9475as
			9560as 9580as	9590as		
1300	1400		Australia, Voice Intl	13635as	13685as	
1300	1400		Canada, CBC Northern Service		9625do	
1300	1400		Canada, CFRX Toronto ON		6070do	
1300	1400		Canada, CFVP Calgary AB		6030do	
1300	1400		Canada, CKZN St John's NF		6160do	
1300	1400		Canada, CKZU Vancouver BC		6160do	
1300	1400	mtwhf	Canada, Radio Canada Intl		9515am	13655am
			17820am			
1300	1400		Costa Rica, University Network		9725va	11870va
			13750va			
1300	1400		Germany, Deutsche Welle		6140eu	
1300	1400		Germany, Overcomer Ministries		13810eu	
1300	1400		Malaysia, RTM	7295as		
1300	1400		New Zealand, Radio NZ Intl		9870pa	
1300	1400		Nigeria, Voice of	11770af	15120al	
1300	1400		North Korea, Voice of		4405eu	7570eu
			9325na 11710na	12015eu		
1300	1400		Papua New Guinea, Catholic Radio			4960va
1300	1400		Papua New Guinea, NBC		4890do	
1300	1400		Singapore, Radio Singapore Intl		6080as	6150as
1300	1400		South Korea, Radio Korea Intl		9570as	9770as
1300	1400		Sri Lanka, SLBC	6005as	11930as	15745as
1300	1400		UK, BBC World Service		6190af	11940af
			15190va	15410af	17830af	17885afaf
			skd0204			
1300	1400	mtwhf	UK, BBC World Service		17830af	
1300	1400		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1300	1400		USA, KAIJ Dallas TX	5755na		
1300	1400		USA, KNLS Anchor Point AK		9615as	
1300	1400		USA, KTBN Salt Lake City UT		7505na	
1300	1400		USA, KWHR Naalehu HI		9930as	11565as
1300	1400		USA, Voice of America		6110va	9645va
			9760va 11705va			
1300	1400		USA, WBCQ Kennebunk ME		5105na	7415na
			9330na 17495na			
1300	1400		USA, WBOH Newport NC		5920am	
1300	1400		USA, WEWN Birmingham AL		7425na	9955na
			15745na			
1300	1400		USA, WHRA Greenbush ME		17560na	
1300	1400		USA, WHRI Noblesville IN		9840am	15105am
1300	1400		USA, WINB Red Lion PA		13570am	
1300	1400		USA, WJIE Louisville KY		7490am	
1300	1400		USA, WRMI Miami FL	6870am	15725am	
1300	1400		USA, WTJC Newport NC		9370na	
1300	1400		USA, WWCR Nashville TN		7465na	9985na
			13845na			
1300	1400		USA, WWRB Manchester TN		9320na	12170na
1300	1400		USA, WYFR Okeechobee FL		7355va	7580va
			11830va	11855va	11970va	
1300	1400		Zambia, Radio Christian Voice		9865af	
1305	1330	as	Austria, Radio Austria Intl		6155eu	13730eu
			17855va			
1315	1330	mtwhf	Austria, Radio Austria Intl		17855va	
1315	1330	a	Russia, TWR	7535eu	7560as	
1330	1400		Guam, AWR/KSDA	11980as		
1330	1400	mtwhfa	Guam, AWR/KSDA	15660as		
1330	1400		India, All India Radio	9690as	11620as	
1330	1400		Laos, National Radio	7145as		
1330	1400	mtwhf	Serbia & Montenegro, Intl Radio		11835pa	
1330	1400		Sweden, Radio	7420eu	11550va	15240va
			18960al			
1330	1400	DRM	Sweden, Radio	7240va		
1330	1400		Turkey, Voice of	15155va	15195eu	
1330	1400		UAE, Emirates Radio	13630va	13675va	15395va
			21605va			
1330	1400		UK, BBC World Service		15105af	17810af
1330	1400		Uzbekistan, Radio Tashkent		5060as	5975as
			6025as 9715as			
1335	1400	as	Austria, Radio Austria Intl		6155eu	13730eu
			17855va			
1345	1400	mtwhf	Austria, Radio Austria Intl		6155eu	13730eu
			17855va			

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

1400	1415	h	Germany, Bible Voice Broadcasting		7485as	
1400	1415		Russia, FEBA	9445as		
1400	1415	mtw	UK, BBC World Service		15420af	21490eu
1400	1420		Turkey, Voice of	15155va	15195eu	
1400	1429		Czech Rep, Radio Prague Intl		21745va	
1400	1430		Australia, Radio	5995as	6080as	7240as
			9590as 11750pa			
1400	1430		Australia, Voice Intl	13635as	13685as	
1400	1430	DRM	Canada, Radio Canada Intl		7240eu	
1400	1430	mtwhf	Germany, Deutsche Welle		15725na	
1400	1430	a	Germany, Pan American BC		13820me	
1400	1430	vl	Libya, Voice of Africa	21675af		
1400	1430		Thailand, Radio	9725as		
1400	1457		China, China Radio Intl		7405na	9560as
			9700eu 9795eu	11765eu	13675as	13685af
			17630af			
1400	1500		Anguilla, Caribbean Beacon		11775am	
1400	1500		Canada, CBC Northern Service		9625da	
1400	1500		Canada, CFRX Toronto ON		6070da	
1400	1500		Canada, CFVP Calgary AB		6030da	
1400	1500		Canada, CKZN St John's NF		6160da	
1400	1500		Canada, CKZU Vancouver BC		6160da	
1400	1500		Canada, Radio Canada Intl		9515am	13655as
			17820am			
1400	1500	DRM	China, China Radio Intl		9610va	
1400	1500		Costa Rica, University Network		9725va	11870va
			13750va			
1400	1500		France, Radio France Intl		7180va	17620va
1400	1500	as	Germany, Bible Voice Broadcasting		7485as	
1400	1500		Germany, Deutsche Welle		6140eu	
1400	1500		Germany, Overcomer Ministries		13810eu	
1400	1500		India, All India Radio	9690as	11620as	
1400	1500		Japan, Radio	7200as	9875as	11840pa
1400	1500		Jordan, Radio	11690na		
1400	1500		Malaysia, RTM	7295as		
1400	1500		Netherlands, Radio	9345as	12080as	15595as
1400	1500		New Zealand, Radio NZ Intl		9870pa	
1400	1500		Nigeria, Voice of	11770af	15120al	
1400	1500		Oman, Radio	15140as		
1400	1500		Singapore, Mediacorp Radio		6150do	
1400	1500		South Africa, Channel Africa		11825af	
1400	1500		Sri Lanka, SLBC	6005as	11930as	15745as
1400	1500		Taiwan, Radio Taiwan Intl		15265as	
1400	1500		UK, BBC World Service		6190af	11940af
			15190va	17830af	21470af	21660af
1400	1500	mtwhf	UK, BBC World Service		17830af	
1400	1500		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1400	1500		USA, KAIJ Dallas TX	13815na		
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KTBN Salt Lake City UT		7505na	
1400	1500		USA, KWHR Naalehu HI		9930as	11565as
1400	1500		USA, Voice of America		6110va	7125va
			9645va 9760va	11705va	15425va	
1400	1500		USA, WBCQ Kennebunk ME		5105na	7415na

			9330na 17495na			
1400	1500		USA, WBOH Newport NC	5920am		
1400	1500		USA, WEWN Birmingham AL	9955na	11530na	
1400	1500		USA, WHRA Greenbush ME	17560na		
1400	1500		USA, WHRI Noblesville IN	9840am	15105am	
1400	1500		USA, WINB Red Lion PA	13570am		
1400	1500		USA, WJIE Louisville KY	7490am		
1400	1500		USA, WRMI Miami FL 6870am	15725am		
1400	1500		USA, WTJC Newport NC	9370na		
1400	1500		USA, WWCR Nashville TN 13845na	7465na	9985na	
1400	1500		USA, WWRB Manchester TN	9320na	12170na	
1400	1500		USA, WYFR Okeechobee FL 11855va 13695va	7580va	11615va 17760va	
1400	1500		Zambia, Radio Christian Voice	9865af		
1415	1430		Nepal, Radio 3230as 7165as	5005as	6100as	
1430	1445	as	Germany, Pan American BC	13820me		
1430	1500		Australia, HCJB 15390as			
1430	1500		Myanmar, Radio 5040do	5985do		
1430	1500	DRM	South Korea, Radio Korea Intl	9770eu		
1430	1500		Sweden, Radio 15240eu	18960al		
1445	1500	mtwhfa	UK, BBC World Service 15245as	6140as	7205as	

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

1500	1515	s	Germany, Pan American BC	13820as		
1500	1528	mwhf	Romania, Radio Romania Intl	15725na		
1500	1528		Vietnam, Voice of 9840as	12020as		
1500	1530		France, Radio France Intl	9875eu		
1500	1530		Mongolia, Voice of 12015eu			
1500	1530		Sri Lanka, SLBC 6005as	11930as	15745as	
1500	1530		UK, BBC World Service 11940af 15400af 21490af 21660af	6190af 15420af	11860af 21470af	
1500	1557		Canada, Radio Canada Intl 11730as 11975as	5985as	9635as	
1500	1557		China, China Radio Intl 9435eu 9525eu 9785as	7160eu 13675na	7405na 17730na	
1500	1557		China, China Radio Intl	13685af	17630af	
1500	1557		Netherlands, Radio 9345as	12080as	15595as	
1500	1559		Germany, Overcomer Ministries	13810eu		
1500	1600		Anguilla, Caribbean Beacon	11775am		
1500	1600		Australia, HCJB 15390as			
1500	1600		Australia, Radio 5995as 9590as 11750pa	6080as	7240as	
1500	1600		Australia, Voice Intl 11840as	13635as		
1500	1600		Canada, CBC Northern Service	9625do		
1500	1600		Canada, CFRX Toronto ON	6070do		
1500	1600		Canada, CFVP Calgary AB	6030do		
1500	1600		Canada, CKZN St John's NF	6160do		
1500	1600		Canada, CKZU Vancouver BC	6160do		
1500	1600	DRM	China, China Radio Intl	9610va		
1500	1600		Costa Rica, University Network 13750va	9725va	11870va	
1500	1600	a	Germany, Bible Voice Broadcasting	12005as		
1500	1600		Germany, Deutsche Welle	6140eu		
1500	1600	vl/ as	Greece, Voice of 9420eu 15630eu	9775eu	15485eu	
1500	1600		Guam, TWR/KTWR 12105as			
1500	1600		Japan, Radio 6190as 9875as	7200as	9505na	
1500	1600		Jordan, Radio 11690na			
1500	1600		Malaysia, RTM 7295as			
1500	1600		Myanmar, Radio 5040do	5985do		
1500	1600		New Zealand, Radio NZ Intl	9870pa		
1500	1600		North Korea, Voice of 7570eu 9335na 9990me	3560af	4405eu 11545me	
1500	1600		Russia, FEBA	7340as		
1500	1600		Russia, Voice of 7315as 7350as 12025as	5945as 7415as	6205as 9900as	7260as 11500as
1500	1600	as	Russia, Voice of 12060eu			
1500	1600		Singapore, Mediacorp Radio	6150do		
1500	1600		South Africa, Channel Africa	11825af	17770af	
1500	1600	DRM	Taiwan, Radio Taiwan Intl	9770eu		
1500	1600		UK, BBC World Service 7160as 9740as 15485eu	5975as 12095eu 15565eu	6195as 15190ca 17790as	
1500	1600	mtwhf	UK, BBC World Service	17830af		
1500	1600	vl/ mtwhf	UK, Sudan Radio Service	15530va		
1500	1600		USA, AFRTS 6350usb 12133usb	4319usb 7590usb 12579usb	5446usb 7812usb 13362usb	5765usb 10320usb 13855usb
1500	1600		USA, KAIJ Dallas TX	13815na		
1500	1600		USA, KJES Vado NM	11715na		
1500	1600		USA, KTBN Salt Lake City UT	15590no		
1500	1600		USA, KWHR Naalehu HI	9930as	11565as	
1500	1600		USA, Voice of America 9795va 9825va 15460va	11835va 17715af	13865af 17895af	15255va
1500	1600		USA, WBCQ Kennebunk ME 9330na 17495na	5105na	7415na	
1500	1600		USA, WBOH Newport NC	5920am		
1500	1600		USA, WEWN Birmingham AL	9955na	11530na	
1500	1600		USA, WHRA Greenbush ME	17560na	17650na	
1500	1600		USA, WHRI Noblesville IN	9840am	15105am	
1500	1600		USA, WINB Red Lion PA	13570am		
1500	1600		USA, WJIE Louisville KY	7490am		
1500	1600		USA, WRMI Miami FL 6870am	15725am		
1500	1600		USA, WTJC Newport NC	9370na		
1500	1600		USA, WWCR Nashville TN 13845na	7465na	9985na	
1500	1600		USA, WWRB Manchester TN	9320na	12170na	
1500	1600		USA, WYFR Okeechobee FL 15210va 17760va	11615va	11855va	
1500	1600		Zambia, Radio Christian Voice	9865af		
1530	1545		India, All India Radio 7255va 11740va	9820va	9910va	
1530	1545		UK, BBC World Service	9600as	11685as	
1530	1600	mwh	Germany, Bible Voice Broadcasting	12005as		
1530	1600		Iran, Voice of the Islamic Rep	9610as	9940as	
1530	1600	mtwhf	South Korea, Radio Korea Intl	15725na		
1530	1600		UAE, AWR Africa 15225as			
1530	1600		UK, BBC World Service 15400af 17830af	6190af	11940af 21470af 21660af	
1545	1600	t	Germany, Bible Voice Broadcasting	9460me		
1545	1600	s	Germany, Pan American BC	13820me		

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

1600	1615		Pakistan, Radio 9390va 15725va	11570va	11850va	
1600	1627		Iran, Voice of the Islamic Rep	9610as	9940as	
1600	1628	s	Hungary, Radio Budapest	6025eu	9580eu	
1600	1628		Vietnam, Voice of 7220va 11630va	7280va	9550va	
1600	1629	s	Germany, Universal Life	9495me		
1600	1630		Guam, AWR/KSDA 15480as	15495as		
1600	1630	as	Guam, TWR/KTWR 12105as			
1600	1630	vl	Libya, Voice of Africa 15220af	17840af		
1600	1630	as	Swaziland, TWR 6070af			
1600	1630		UK, BBC World Service 15400af 17830af	6190af 21470af	11940af 21660af	
1600	1635		UAE, Emirates Radio 13630va 21605va	13675va	15395va	
1600	1650		New Zealand, Radio NZ Intl	9870pa		
1600	1657		China, China Radio Intl 9525af 9570af 11900af	7255eu	9435eu 17730na	
1600	1657		China, China Radio Intl 9525eu 9570af 11900af	7255eu	9435eu 17730na	
1600	1659	as	Canada, Radio Canada Intl 17820am	9515am	13655am	
1600	1659		Germany, Deutsche Welle 11695as	6170as	7225as	
1600	1700		Anguilla, Caribbean Beacon	11775am		
1600	1700		Australia, HCJB 15390as			
1600	1700		Australia, Radio 5995as 9475as 9710as	6080as	7240as	
1600	1700		Australia, Voice Intl 11840as	13635as		
1600	1700		Canada, CBC Northern Service	9625dc		
1600	1700		Canada, CFRX Toronto ON	6070dc		
1600	1700		Canada, CFVP Calgary AB	6030dc		
1600	1700		Canada, CKZN St John's NF	6160do		
1600	1700		Canada, CKZU Vancouver BC	6160do		
1600	1700	DRM	China, China Radio Intl	17510va		
1600	1700		Costa Rica, University Network	11870va	13750va	
1600	1700		Ethiopia, Radio 5990af 9560af 9704af	7110af 11800af	7165af	
1600	1700		France, Radio France Intl 15160af	9730af 15605af	11615af	
1600	1700	t	Germany, Bible Voice Broadcasting	9460me		
1600	1700	vl	Greece, Voice of	15485na		
1600	1700		Jordan, Radio	11690na		
1600	1700		Malaysia, RTM	7295as		
1600	1700		North Korea, Voice of 11545va	3560va	9990me	
1600	1700		Russia, Voice of 6005me 7415as 9470me	4940va 6130eu	4965va 7260as	4975va 7290eu
1600	1700		South Korea, Radio Korea Intl	5975va	9870va	
1600	1700		Taiwan, Radio Taiwan Intl	11815as		
1600	1700		UK, BBC World Service 6195as 7160as 15310as 17820eu	3915as 9410eu 15485eu	5975as 11750as 15565eu	15190ca 17790as
1600	1700	mtwhf	UK, BBC World Service	17830af		
1600	1700	vl/ mtwhf	UK, Sudan Radio Service	15530va		
1600	1700		UK, Voice Africa	13820af		
1600	1700		USA, AFRTS 6350usb 12133usb	4319usb 7590usb	5446usb 7812usb	5765usb 10320usb 13362usb 13855usb
1600	1700		USA, KAIJ Dallas TX	13815na		
1600	1700		USA, KJES Vado NM	11715na		
1600	1700		USA, KTBN Salt Lake City UT	15590na		
1600	1700		USA, KWHR Naalehu HI	9930as	11565as	
1600	1700		USA, Voice of America 6160va 7125va 13600af	4930af 9645va 15240af	4960af 9760af 15445af	11835af 15460af

			17715af 17895af		
1600	1700		USA, WBCQ Kennebunk ME 9330na 17495na	5105na	7415na
1600	1700		USA, WBOH Newport NC	5920am	
1600	1700		USA, WEWN Birmingham AL 15695va 15745va	11530va 17595va	13615va
1600	1700		USA, WHRA Greenbush ME	17650na	
1600	1700		USA, WHRI Noblesville IN	9840am	15105am
1600	1700		USA, WINB Red Lion PA	13570am	
1600	1700		USA, WJIE Louisville KY	7490am	
1600	1700		USA, WMLK Bethel PA9265eu		
1600	1700		USA, WRMI Miami FL 9955am	15725am	
1600	1700		USA, WTJC Newport NC	9370na	
1600	1700		USA, WWCR Nashville TN 13845na	9985na	12160na
1600	1700		USA, WWRB Manchester TN	9320na	12170na
1600	1700		USA, WYFR Okeechobee FL 13695va 17690va	6085va 18980va	11830va 21455va
1600	1700		Zombia, Radio Christian Voice	9865af	
1605	1630	as	Austria, Radio Austria Intl	13675na	
1610	1625	mtwhf	Austria, Radio Austria Intl	13675na	
1615	1700	as	UK, BBC World Service 21490af	11860af	15420af
1630	1645	s	Germany, Pan American BC	6015me	
1630	1700		Egypt, Radio Cairo 9855af		
1630	1700	s	Germany, Bible Voice Broadcasting	9460me	
1630	1700		Guam, AWR/KSDA 11980as		
1630	1700		UK, BBC World Service 15400af 15420af 21660af	6190af 17830af	11940af 21470af
1635	1700	os	Austria, Radio Austria Intl	13675na	
1640	1650		Turkmenistan, Turkmen Radio	4930as	
1640	1655	mtwhf	Austria, Radio Austria Intl	13675na	
1645	1700	mwhfa	Germany, Bible Voice Broadcasting	9460me	
1645	1700		Tajikistan, Radio 7245irr		
1651	1700		New Zealand, Radio NZ Intl	9870pa	

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

1700	1710	mtwh	Moldova, Radio PMR 5960eu		
1700	1715	mwf	Germany, Bible Voice Broadcasting	9460me	
1700	1720	f	Moldova, Radio PMR 5960eu		
1700	1727		Czech Rep, Radio Prague Intl	5930eu	15710af
1700	1730		Australia, Voice Intl 11840as	13635as	
1700	1730		Azerbaijan, Voice of 6110me		
1700	1730	DRM/ o	Canada, Voice of NASB	11900sa	
1700	1730		France, Radio France Intl	11615af	15605af
1700	1730		Jordan, Radio 11690na		
1700	1730	vl	Libya, Voice of Africa 11715af 15615af 15660af	11860af	15220af
1700	1730		UK, BBC World Service 12095eu 15565eu	6195eu 17820eu	9410eu
1700	1745	DRM	China, China Radio Intl	12080va	
1700	1745	h	Germany, Bible Voice Broadcasting	9460me	
1700	1745		UK, BBC World Service 6190af 9630af 15400af 21470af	3255af 15420af	6005af 17830af
1700	1750		New Zealand, Radio NZ Intl	9870pa	
1700	1755		South Africa, Channel Africa	15285af	
1700	1757		China, China Radio Intl 9570af 11900af	6100eu	7255eu
1700	1800		Anguilla, Caribbean Beacon	11775am	
1700	1800		Australia, HCJB 15390as		
1700	1800		Australia, Radio 9475as 9710as 11880pa	5995as	6080as 7240as
1700	1800		Canada, CBC Northern Service	9625do	
1700	1800		Canada, CFRX Toronto ON	6070do	
1700	1800		Canada, CFVP Calgary AB	6030do	
1700	1800		Canada, CKZN St John's NF	6160do	
1700	1800		Canada, CKZU Vancouver BC	6160do	
1700	1800	DRM	China, China Radio Intl	17510va	
1700	1800		Costa Rica, University Network	11870va	13750va
1700	1800		Egypt, Radio Cairo 9855af		
1700	1800		Eqt Guinea, Radio Africa	15190af	
1700	1800	as	Germany, Bible Voice Broadcasting	9460me	
1700	1800		Germany, Overcomer Ministries	17550no	
1700	1800	vl	Greece, Voice of 15485na		
1700	1800		Japan, Radio	9535no 11970eu	15355af
1700	1800		Malaysia, RTM 7295as		
1700	1800		Nigeria, Voice of 15120af		
1700	1800		Russia, Voice of 9470me	5910as 9830me	5945as 7415as
1700	1800		Swazilond, TWR 3200af		
1700	1800		Taiwan, Radio Taiwan Intl	11815as	
1700	1800	mtwhf	UK, BBC World Service	17830af	
1700	1800	vl/ mtwhf	UK, Sudan Radio Service	11715va	
1700	1800		UK, Voice Africa 13820af		
1700	1800		USA, AFRTS 6350usb 12133usb	4319usb 7590usb 12579usb	5446usb 7812usb 13362usb 5765usb 10320usb 13855usb
1700	1800		USA, KAIJ Dallas TX 13815na		
1700	1800		USA, KTBN Salt Lake City UT	15590no	
1700	1800		USA, KWHR Naalehu HI	9930as	
1700	1800		USA, Voice of America	4930af	4960af
			13710af 15240af	15455af	
1700	1800		USA, WBCQ Kennebunk ME 9330na 17495na	5105na	7415na
1700	1800		USA, WBOH Newport NC	5920am	
1700	1800		USA, WEWN Birmingham AL 15695va 15745va	11530va 17595va	13615va
1700	1800		USA, WHRA Greenbush ME	17650na	
1700	1800		USA, WHRI Noblesville IN	9840am	15105am
1700	1800		USA, WINB Red Lion PA	13570am	
1700	1800		USA, WJIE Louisville KY	7490am	
1700	1800		USA, WMLK Bethel PA9265eu	15265eu	
1700	1800		USA, WRMI Miami FL 9955am	15725am	
1700	1800		USA, WTJC Newport NC	9370na	
1700	1800		USA, WWCR Nashville TN 13845na	9985na	12160no
1700	1800		USA, WWRB Manchester TN	9320na	12170na
1700	1800		USA, WYFR Okeechobee FL 18980va 21455va	13695va 21680va	17510va
1700	1800		Zambia, Radio Christian Voice	4965af	
1715	1800		China, China Radio Intl	12080va	
1730	1745	f	Russia, FEBA 9840as		
1730	1745		UK, BBC World Service 9685af	3390af	7230af
1730	1745	mtwhf	UK, United Nations Radio 17810af	7170af	9565me
1730	1800		Guam, AWR/KSDA 11560as		
1730	1800		Liberia, ELWA 4760do		
1730	1800	vl	Philippines, Radio Pilipinas 15190pa	11730as	11890as
1730	1800		Slavakia, Slavak Radio	5915eu	6055eu
1730	1800		Swaziland, TWR 9500af		
1730	1800		UK, BBC World Service 6195eu 7190eu 17820eu	5875eu 9410eu	6015eu 12095eu 15565eu
1730	1800		USA, Voice of America	11975af	17895af
1735	1745	vl/th	Paraguay, Radio Nacional	9739sa	
1745	1800		Bangladesh, Bangla Betar	7185as	9550as
1745	1800		India, All India Radio 7410eu 11620eu 15155af	9445af 11935af 17670af	9950eu 13605af 15075af
1745	1800		UK, BBC World Service 15400af	3255af 15420af	6190af 17830af 21470af
1751	1800		New Zealand, Radio NZ Intl	11980pa	

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

1800	1810		Zonzibar, Voice of Tonzania	11734do	
1800	1815	DRM	China, China Radio Intl	12080va	
1800	1815	a	Germany, Bible Voice Broadcasting	7210as	
1800	1827		Czech Rep, Radio Prague Intl	5930va	9415va
1800	1828		Vietnam, Voice of 5955eu	7280eu	11630as
1800	1830		Austria, AWR Europe 9530af		
1800	1830		Egypt, Radio Cairo 9855af		
1800	1830	s	Germany, Bible Voice Broadcasting	6015va	
1800	1830	s	Germany, Universal Life	11840af	
1800	1830	vl	Libya, Voice of Africa 9485af 11860af	11635af	11715af
1800	1830		South Africa, AWR Africa 11925af	3215af	3345af
1800	1830		UK, BBC World Service 15400af 15420af	3255af 17830af	6190af 21470af
1800	1850		New Zealand, Radio NZ Intl	11980pa	
1800	1856		Romania, Radio Romania Intl	5965eu	7130eu
1800	1857		Netherlands, Radio 6020af	9895af	11655af
1800	1859		Canada, Radio Canada Intl 9770af 11875af 15140af	5850af	7185af
1800	1859		Poland, Radio Polonia 7265eu	7270eu	
1800	1900		Anguilla, Caribbean Beacon	11775am	
1800	1900	mtwhf	Argentina, RAE 9690eu	15345eu	
1800	1900		Australia, Radio 9580as 9710as 11880pa	6080as 7240as	9475as
1800	1900		Australia, Voice Intl 11685as		
1800	1900		Bangladesh, Bangla Betar	7185as	9550as
1800	1900		Canada, CBC Northern Service	9625do	
1800	1900		Canada, CFRX Toronto ON	6070do	
1800	1900		Canada, CFVP Calgary AB	6030do	
1800	1900		Canada, CKZN St John's NF	6160do	
1800	1900		Canada, CKZU Vancouver BC	6160do	
1800	1900		China, China Radio Intl	6100eu	12080va
1800	1900	DRM	China, China Radio Intl	17510va	
1800	1900		Costa Rica, University Network	11870va	13750va
1800	1900		Eqt Guinea, Radio Africa	15190af	
1800	1900	as	Germany, Bible Voice Broadcasting	9460me	
1800	1900	as	Germany, Bible Voice Broadcasting 9730me	6015as	7210as
1800	1900		Germany, Overcomer Ministries	17550na	
1800	1900	vl	Greece, Voice of 7430eu	15485eu	
1800	1900		India, All India Radio 7410eu 11620eu 15155af	9445af 11935af 17670af	9950eu 13605af 15075af
1800	1900		Liberia, ELWA 4760do		
1800	1900		Malaysia, RTM 7295as		
1800	1900		Nigeria, Voice of 15120af		
1800	1900		North Korea, Voice of	4405eu	7570eu

			12015eu		
1800	1900	vl	Philippines, Radio Pilipinas 15190pa	11730as	11890as
1800	1900		Russia, Voice of 5910as 7415as 9830me 11510af	5945as	7290eu
1800	1900	as	Russia, Voice of 5950eu	6175eu	
1800	1900		Sierra Leone, Radio UNAMSIL	6137af	
1800	1900		Swaziland, TWR 3200af	9500af	
1800	1900		Taiwan, Radio Taiwan Intl	3965eu	
1800	1900	mtwhf	UK, BBC World Service	17830af	
1800	1900		UK, BBC World Service 12095eu 13700eu	6195eu	9410eu
1800	1900		USA, AFRTS 4319usb 6350usb 12133usb	5446usb 7590usb 12579usb	5765usb 7812usb 10320usb 13362usb 13855usb
1800	1900		USA, KAIJ Dallas TX 13815na		
1800	1900		USA, KTBN Salt Lake City UT	15590na	
1800	1900		USA, KWHR Naalehu HI	9930as	
1800	1900		USA, Voice of America 6035af 11975af 13710af	4930af 15240af	4960af 17895af
1800	1900		USA, WBCQ Kennebunk ME 9330na 17495na	5105na	7415na
1800	1900		USA, WBOH Newport NC	5920am	
1800	1900		USA, WEWN Birmingham AL 15695va 15745va	11530va 17595va	13615va
1800	1900		USA, WHRA Greenbush ME	17650na	
1800	1900		USA, WHRI Noblesville IN	9840am	15105am
1800	1900		USA, WINB Red Lion PA	13570am	
1800	1900		USA, WJIE Louisville KY	7490am	
1800	1900		USA, WMLK Bethel PA 9265eu	15265eu	
1800	1900		USA, WRMI Miami FL 9955am	15725am	
1800	1900		USA, WTJC Newport NC	9370na	
1800	1900		USA, WWCR Nashville TN 13845na	9985na	12160na
1800	1900		USA, WWRB Mancnester TN	9320na	12170na
1800	1900		USA, WYFR Okeechobee FL 15115eu 17510eu	7240eu 17535eu	13695eu 18980eu
1800	1900		Yemen, Rep of Yemen Radio	9780me	
1800	1900		Zambia, Radio Christian Voice	4965af	
1830	1845		Israel, Kol Israel 9390va	11585va	11605va
1830	1845	mt	UK, BBC World Service 7105eu	6050eu	6130eu
1830	1900		Bulgaria, Radio 5800eu	7500eu	
1830	1900		South Africa, AWR Africa	11925af	
1830	1900	mtwhfa	Sweden, Radio 6065eu		
1830	1900		UK, BBC World Service 6005af 6190af 9630af 17830af 21470af	3255af 15400af	5975af 15420af
1840	1854		Rwanda, Radio 6055do		
1845	1900		Congo, RTV Congolaise	4765af	5985af
1851	1900		New Zealand, Radio NZ Intl 15265pa		

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

1900	1915		Congo, RTV Congolaise	4765af	5985af
1900	1928		Vietnam, Voice of 7280eu	11630as	
1900	1930	s	Germany, Bible Voice Broadcasting	6015va	
1900	1930	s	Germany, Universal Life	7105me	
1900	1930	vl	Libya, Voice of Africa 11635af	11715af	
1900	1930		Lithuania, Radio Vilnius	9710eu	
1900	1930	vl	Philippines, Radio Pilipinas 15190pa	11730as	11890os
1900	1945	DRM	China, China Radio Intl	12080va	
1900	1945		India, All India Radio 7410eu 11620eu 15155af	9445af 11935af 17670af	9950eu 13605af 15075af
1900	1957		China, China Radio Intl 9440af 9585af	6100eu	7295af
1900	1959		Germany, Deutsche Welle 13780af 17800af	6180af	11865af
1900	2000		Anguilla, Caribbean Beacon	11775am	
1900	2000		Australia, Radio 6080as 9580as 9710as 11880pa	7240as	9500as
1900	2000		Australia, Voice Intl 11685as		
1900	2000		Canada, CBC Northern Service	9625do	
1900	2000		Canada, CFRX Toronto ON	6070do	
1900	2000		Canada, CFVP Calgary AB	6030do	
1900	2000		Canada, CKZN St John's NF	6160do	
1900	2000		Canada, CKZU Vancouver BC	6160do	
1900	2000		Costa Rica, University Network	11870va	13750va
1900	2000		Eqt Guinea, Radio Africa	15190af	
1900	2000	as	Germany, Bible Voice Broadcasting 9470af	6015va	9460me
1900	2000	vl	Ghana, Ghana BC Corp	3366do	4915do
1900	2000	vl	Greece, Voice of 7430eu	15485eu	
1900	2000		Liberia, ELWA 4760do		
1900	2000		Malaysia, RTM 7295as		
1900	2000		Namibia, Namibian BC Corp 6060af	3270af	3290af
1900	2000		Netherlands, Radio 7120af 17810af	9895af	11655af
1900	2000	as	Netherlands, Radio 15315na	17725na	17875na
1900	2000		New Zealand, Radio NZ Intl	15265pa	
1900	2000		Nigeria, Radio/Ibadan	6050do	
1900	2000		Nigeria, Radio/Kaduna	4770do	6090do
1900	2000		Nigeria, Radio/Lagos 3326do	4990do	
1900	2000		Nigeria, Voice of 15120af		
1900	2000		North Korea, Voice of 3560va 11535eu	7100eu 11910eu	9975eu
1900	2000		Papua New Guinea, Cathalic Radio		4960va
1900	2000		Papua New Guinea, NBC	4890do	
1900	2000		Russia, Voice of 6175eu 7335eu 7400eu	6235eu 11510af	7290eu
1900	2000		Sierra Leone, Radio UNAMSIL	6137af	
1900	2000	vl	Sierra Leone, SLBS 3316do		
1900	2000	vl	Soloman Islands, SIBC	5020do	9545do
1900	2000		South Africa, Channel Africa	3345af	
1900	2000	m	South Africa, SW Radio League	3215af	
1900	2000		Sauth Korea, Radio Korea Intl	5975eu	7275eu
1900	2000	a	Sri Lanka, SLBC 6010eu		
1900	2000		Swaziland, TWR 3200af		
1900	2000		Thailand, Radio 9840eu		
1900	2000	vl	Uganda, Radio 4976do	5026do	7196do
1900	2000	mtwhf	UK, BBC World Service	17830af	
1900	2000		UK, BBC World Service 6005af 6190af 9630af 17830af	3255af 12095af	5975af 15400af
1900	2000		USA, AFRTS 4319usb 6350usb 12133usb	5446usb 7590usb 12579usb	5765usb 7812usb 10320usb 13362usb 13855usb
1900	2000		USA, KAIJ Dallas TX 13815na		
1900	2000		USA, KJES Vado NM 15385na		
1900	2000		USA, KTBN Salt Lake City UT	15590na	
1900	2000		USA, Voice of America 4960af 6035af 13640af 17895af	4930af 9785me 13710af	4940af 11975af 15240af 12015af 15580af
1900	2000		USA, WBCQ Kennebunk ME 9330na 17495na	5105na	7415na
1900	2000		USA, WBOH Newport NC	5920am	
1900	2000		USA, WEWN Birmingham AL 15695va 15745va	11530va 17595va	13615va
1900	2000		USA, WHRA Greenbush ME	17525na	17650na
1900	2000		USA, WHRI Noblesville IN	9840am	15665am
1900	2000		USA, WINB Red Lion PA	13570am	
1900	2000		USA, WJIE Louisville KY	7490am	
1900	2000		USA, WMLK Bethel PA 9265eu	15265eu	
1900	2000		USA, WRMI Miami FL 9955am	15725am	
1900	2000		USA, WTJC Newport NC	9370na	
1900	2000		USA, WWCR Nashville TN 13845na	9985na	12160na
1900	2000		USA, WYFR Okeechobee FL 6085va 13695va 15565va	3230va 17510va	6020va 18980va
1900	2000		Zambia, Radio Christian Voice	4965af	
1900	2000	vl	Zimbabwe, ZBC Corp 5975do		
1905	1915	vl	Croatia, Croatian Radio	6165na	13830na
1915	1925		Rwanda, Radio 6005do		
1915	1930		UK, BBC World Service	15105at	17885af
1915	1945	f	Germany, Bible Voice Broadcasting	7295af	
1915	2000		China, China Radio Intl	12080va	
1925	1945		Armenia, Voice of 4810eu	9965as	
1930	2000	mthf	Belarus, Radio 7105eu	7340eu	
1930	2000		Iran, Voice of the Islamic Rep 9855af 11695af	6110eu	7320eu
1930	2000		Serbia & Montenegro, Intl Radio	6100eu	
1930	2000		Slovakia, Slovak Radio	5915eu	7345eu
1930	2000		Turkey, Voice of 6055eu		
1935	1955		Italy, RAI Intl 6035eu	9760eu	
1945	2000	mtwhfa	Albania, Radio Tirana 6115eu	7210eu	
1945	2000	f	Germany, Bible Voice Broadcasting	7220af	

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

2000	2015	fs	Germany, Bible Voice Broadcasting	7220af	9470me
2000	2020		Turkey, Voice of 6055eu		
2000	2025		Israel, Kol Israel 6280va	9390va	15615va
2000	2027		Iran, Voice of the Islamic Rep 9855af 11695af	6010af	7320eu
2000	2028		Hungary, Radio Budapest	3975eu	6025eu
2000	2030		Australia, Voice Intl 11685as		
2000	2030	vl	Libya, Voice of Africa 11635af	11715af	
2000	2030		Mongolia, Voice of 12015eu		
2000	2030		Papua New Guinea, Cathalic Radio		4960va
2000	2030		Swaziland, TWR 3200af		
2000	2030		USA, Voice of America 11975af 13710af	4940af 15240af	6035af 15580af
2000	2030		Vatican City, Vatican Radio 11625af	7365af	9755af
2000	2050		New Zealand, Radio NZ Intl	15265pa	
2000	2057		China, China Radio Intl 7190al 7285al 9855eu	6100eu 7295eu	5960al 9440eu 9600eu
2000	2057	as	Netherlands, Radio 15315na	17725na	
2000	2059		Germany, Deutsche Welle 15205af	12025af 15410af	13780af
2000	2059	mtwhf	Spain, Radio Exterior Espana	9595af	9680eu
2000	2100		Anguilla, Caribbean Beacon	11775am	
2000	2100		Australia, ABC NT Alice Springs	2310do	4835irr

2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek	2325do		
2000	2100	as	Australia, Radio	6080pa	7240os	
2000	2100		Australia, Radio	9500as	9580as	11650os
			11880po	12080pa		
2000	2100		Canado, CBC Northern Service	9625do		
2000	2100		Canada, CFRX Toronto ON	6070do		
2000	2100		Canado, CFVP Calgary AB	6030do		
2000	2100		Canada, CKZN St John's NF	6160do		
2000	2100		Canada, CKZU Vancouver BC	6160do		
2000	2100		Canada, Rodio Canada Intl	15180am		
2000	2100	DRM	China, China Radio Intl	12080va		
2000	2100		Costa Rica, University Network	13750vo		
2000	2100		Eqt Guinea, Radio Africa	15190af		
2000	2100	vl	Ghana, Ghana BC Corp	3366do	4915do	
2000	2100	vl	Greece, Voice of	15485va	17565va	
2000	2100		Indonesia, Voice of	9525as	11785pa	15150al
2000	2100	vl	Italy, IRRS 5775eu			
2000	2100		Liberia, ELWA	4760do		
2000	2100		Molaysia, RTM	7295as		
2000	2100		Namibia, Namibian BC Corp	3270af	3290af	
			6060af			
2000	2100		Nigeria, Radio/Ibadan	6050do		
2000	2100		Nigerio, Radio/Kaduna	4770do	6090do	
2000	2100		Nigerio, Radio/Lagos	3326do	4990do	
2000	2100		Nigeria, Voice of	15120of		
2000	2100		Papuo New Guinea, NBC	4890do		
2000	2100		Russia, Voice of	6145eu	6235eu	7290eu
			7300eu 7330eu			
2000	2100		Sierra Leone, Radio UNAMSIL	6137af		
2000	2100	vl	Sierra Leone, SL8S	3316do		
2000	2100	vl	Solomon Islands, SIBC	5020do	9545do	
2000	2100		South Africa, AWR Africa	15295af		
2000	2100	vl	Uganda, Radio	4976do	5026do	7196do
2000	2100	mtwhf	UK, BBC World Service	17830af		
2000	2100		UK, BBC World Service	3255af	6005af	
			6190af 9630af	12095af	15400af	17830af
2000	2100		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
2000	2100		USA, KAIJ Dallas TX	13815na		
2000	2100		USA, KJES Vado NM	15385na		
2000	2100		USA, KTBN Salt Lake City UT	15590na		
2000	2100		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na 17495na			
2000	2100		USA, WBOH Newport NC	5920am		
2000	2100		USA, WEWN Birmingham AL	11530va	13615va	
			15695va	15745va	17595va	
2000	2100		USA, WHRA Greenbush ME	17525na	17650na	
2000	2100		USA, WHRI Noblesville IN	9840am	15665am	
2000	2100		USA, WINB Red Lion PA	13570am		
2000	2100		USA, WJIE Louisville KY	7490am		
2000	2100		USA, WMLK Bethel PA	9265eu	15265eu	
2000	2100		USA, WRMI Miami FL	9955am	15725am	
2000	2100		USA, WTJC Newpart NC	9370na		
2000	2100		USA, WWCR Nashville TN	9985na	12160na	
			13845na			
2000	2100		USA, WWRB Manchester TN	9320na	12170na	
2000	2100		USA, WYFR Okeechobee FL	3230va	5810va	
			6020va 7360va	7580va	15115va	15195va
			17510vo	17535va	17575va	
2000	2100		Zambia, Radio Christian Voice	4965af		
2000	2100	vl	Zimbabwe, ZBC Corp	5975do		
2005	2100		Syria, Radio Damascus	12085eu	13610eu	
2015	2100		Chino, China Radio Intl	12080va		
2025	2045		Italy, RAI Intl	6040af	11880af	
2030	2045		Thailand, Radio	9535eu		
2030	2058		Vietnam, Voice of	5955va	7220va	7280va
			9550va 11630va			
2030	2100		Cuba, Radio Havana	9505va	11760va	
2030	2100		Egypt, Radio Cairo	15375af		
2030	2100	vl	Libya, Voice of Africa	11635af		
2030	2100		Sweden, Radio	6065eu	7240eu	9415al
2030	2100		USA, Voice of America	6035af	11835as	
			11975af	13710af	15240af	15580af
2030	2100	as	USA, Voice of America	4940af		
2045	2100		India, All India Radio	7410eu	9445eu	9910eu
			9950eu 11620pa	11715po		
2050	2100		Vaticon City, Votican Radio	4005eu	5885eu	
			7250eu			
2051	2100		New Zealand, Radio NZ Intl	17675pa		

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

2100	2110		Vatican City, Vatican Radio	4005eu	5885eu	
			7250eu			
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek	2325do		
2100	2130		Australia, Radio	9500as	9660as	11650as
			11695pa	12080pa	13630pa	15515pa
2100	2130	s	Belarus, Radio	7105eu	7340eu	
2100	2130		Cuba, Radio Havana	9505va	11760vo	
2100	2130	vl	Libya, Voice of Africa	11635af		
2100	2130		South Korea, Radio Korea Intl	3955eu		
2100	2145	DRM	China, China Radio Intl	12080va		
2100	2145		Nigeria, Radio/Ibadon	6050do		
2100	2157		China, China Radio Intl	7190eu	5960al 7285al	
			9600eu 9855af	11640af	13630eu	13630of
			13660eu			
2100	2157		Czech Rep, Radio Prague Intl	5930va	9430va	
2100	2157	DRM	Netherlands, Radio	15150eu		
2100	2159		Canada, Radio Canada Intl	5890eu	9770eu	
			15180am			
2100	2159		Germany, Deutsche Welle	9615af	13780of	
			15410of			
2100	2200		Anguillo, Caribbean Beacon	11775am		
2100	2200		Australia, ABC NT Alice Springs	2310do	4835irr	
2100	2200		Austria, AWR Europe	9830af		
2100	2200		Canada, CBC Northern Service	9625do		
2100	2200		Canada, CFRX Toronto ON	6070do		
2100	2200		Conoda, CFVP Calgary AB	6030do		
2100	2200		Canoda, CKZN St John's NF	6160do		
2100	2200		Canoda, CKZU Voncouver BC	6160do		
2100	2200		Costa Rica, University Network	13750va		
2100	2200		Egypt, Radio Cairo	15375af		
2100	2200		Eqt Guinea, Radio Africa	15190af		
2100	2200	vl	Ghano, Ghana BC Corp	3366do	4915do	
2100	2200	vl	Greece, Voice of	15485va	17565va	
2100	2200		Guyana, Voice of	3290do	5950do	
2100	2200		India, All Indio Radio	7410eu	9445eu	9910eu
			9950eu 11620pa	11715pa		
2100	2200	vl	Italy, IRRS 5775eu			
2100	2200		Japan, Radio	6035pa	6090eu	6180eu
			11855af	17825na	21670pa	
2100	2200		Liberia, ELWA	4760do		
2100	2200		Malaysia, RTM	7295as		
2100	2200		Namibia, Namibian BC Corp	3270af	3290of	
			6060af			
2100	2200		New Zealand, Radio NZ Intl	17675po		
2100	2200		Nigeria, Radio/Kaduna	4770do	6090do	
2100	2200		Nigeria, Radio/Lagos	3326do	4990do	
2100	2200		North Koreo, Voice of	4405eu	7570eu	12015eu
2100	2200		Papua New Guinea, NBC	4890do		
2100	2200		Sierra Leone, Radio UNAMSIL	6137af		
2100	2200	vl	Sierra Leone, SLBS	3316do		
2100	2200		South Africa, Channel Africa	3345af		
2100	2200		Syria, Radio Damascus	12085eu	13610eu	
2100	2200		UK, BBC World Service	3255af	3915as	
			5965as 5975ca	6005af	6110as	6190of
			6195va 9410eu	9605af	12095ca	15400af
2100	2200		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
2100	2200		USA, KAIJ Dallas TX	13815na		
2100	2200		USA, KTBN Salt Lake City UT	15590na		
2100	2200		USA, Voice of America	4930af	4960of	
			6035af 11975af	13710af	15580af	
2100	2200		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na 17495na			
2100	2200		USA, WBOH Newport NC	5920am		
2100	2200		USA, WEWN Birmingham AL	11530va	13615va	
			15695va	15745va	17595va	
2100	2200		USA, WHRA Greenbush ME	7570na	9455na	
			17525na	17650na		
2100	2200		USA, WHRI Noblesville IN	9840am	15665am	
2100	2200		USA, WINB Red Lion PA	13570am		
2100	2200		USA, WJIE Louisville KY	7490am		
2100	2200		USA, WMLK Bethel PA	15265eu		
2100	2200		USA, WRMI Miami FL	9955am	15725am	
2100	2200		USA, WTJC Newport NC	9370na		
2100	2200		USA, WWCR Nashville TN	9985na	12160na	
			13845na			
2100	2200		USA, WWRB Manchester TN	9320na	12170na	
2100	2200		USA, WYFR Okeechobee FL	5810va	7360va	
			7580va 15565va	17510va	17535va	17575va
2100	2200		Zambia, Radio Christian Voice	4965af		
2100	2200	vl	Zimbabwe, ZBC Corp	5975do		
2110	2130	mtwhf	UK, BBC World Service	11675ca	15390ca	
2115	2157		China, China Radio Intl	21080va		
2115	2200		Egypt, Radio Cairo	9990eu		
2130	2145	tf	UK, BBC World Service	11680ca		
2130	2156		Romania, Radio Romania Intl	6015eu	6055eu	
			7145eu 9540na			
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200		Australia, ABC NT Tennont Creek	4910do		
2130	2200		Australia, Radio	9660as	11650as	12080as
			13630po	15515pa		
2130	2200		Guam, AWR/KSDA	11980os	12010as	
2130	2200		Turkey, Voice of	9525as		
2130	2200	f	UK, Wales Radio Intl	3955eu	7110pa	
2130	2200		Uzbekistan, Radio Tashkent	5025eu	7185eu	
			11905eu			

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

2200	2205		Syria, Radio Damascus	12085eu	13610eu
2200	2220		Turkey, Voice of	9525as	
2200	2228		Hungary, Radio Budopest	6025eu	12010af
2200	2230		India, All India Radio	7410eu	9445eu 9910eu

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			9950eu 11620pa	11715pa		
2200	2230	vl	Italy, IRRS 5775eu			
2200	2230		Liberia, ELWA	4760do		
2200	2230		Papua New Guinea, NBC	4890do		
2200	2230		Serbia & Montenegro, Intl Radio	6100eu		
2200	2230		USA, Voice of America	11835as		
2200	2245		Egypt, Radio Cairo	9990eu		
2200	2257		China, China Radio Intl	7170eu		
2200	2257	DRM	Netherlands, Radio	15525no		
2200	2259		Canada, Radio Canada Intl	15180am		
2200	2259	DRM	Canada, Radio Canada Intl	9800na		
2200	2259		Germany, Deutsche Welle	6180as	6225as	
2200	2259	as	Spain, Radio Exterior Espana	9595af	9680eu	
2200	2300		Anguilla, Caribbean Beacon	6090am		
2200	2300		Australia, ABC NT Alice Springs	2310do	4835irr	
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, ABC NT Tennant Creek	4910do		
2200	2300		Australia, Radio	13620as	13630pa	15230pa
			15240pa	15515pa	21740pa	
2200	2300		Bulgaria, Radio	5800eu	7500eu	
2200	2300		Canada, CBC Northern Service	9625do		
2200	2300		Canada, CFRX Toronto ON	6070do		
2200	2300		Canada, CFVP Calgary AB	6030do		
2200	2300		Canada, CKZN St John's NF	6160do		
2200	2300		Canada, CKZU Vancouver BC	6160do		
2200	2300		Costa Rica, University Network	13750va		
2200	2300		Eqt Guinea, Radio Africa	15190af		
2200	2300	vl	Ghana, Ghana BC Corp	3366do	4915dc	
2200	2300		Guyana, Voice of	3290do		
2200	2300		Malaysia, RTM	7295as		
2200	2300		Namibia, Namibian BC Corp	3270af	3290af	
			6060af			
2200	2300		New Zealand, Radio NZ Intl	17675pa		
2200	2300		Nigeria, Radio/Ibadan	6050do		
2200	2300		Nigeria, Radio/Kaduna	4770do	6090do	
2200	2300		Nigeria, Radio/Lagos	3326do	4990do	
2200	2300		Sierra Leone, Radio UNAMSIL	6137af		
2200	2300	vl	Sierra Leone, SLBS	3316do		
2200	2300	vl	Solomon Islands, SIBC	5020do	9545do	
2200	2300		Taiwan, Radio Taiwan Intl	9355eu		
2200	2300		UK, BBC World Service	5965as	6195va	
			7105as 9605af	9740as	11955as	12095ca
			15400af			
2200	2300		Ukraine, Radio Ukraine Intl	4840eu		
2200	2300		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
2200	2300		USA, KAIJ Dallas TX	13815no		
2200	2300		USA, KTBN Salt Lake City UT	15590na		
2200	2300		USA, KWHR Naalehu HI	11565as	17510as	
2200	2300		USA, Voice of America	7215va	9890va	
			15185va	15290va	15305va	17740va
2200	2300		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na 17495na			
2200	2300		USA, WBOH Newport NC	5920am		
2200	2300		USA, WEWN Birmingham AL	9975va	11530va	
			15695va	15745va		
2200	2300		USA, WHRA Greenbush ME	7570na	9455na	
			17650na			
2200	2300		USA, WHRI Noblesville IN	7535am	9455am	
2200	2300		USA, WINB Red Lion PA	13570am		
2200	2300		USA, WJIE Louisville KY	13595am		
2200	2300		USA, WRMI Miami FL	9955am	15725am	
2200	2300		USA, WRMI Miami FL	9955am	15725am	
2200	2300		USA, WTJC Newport NC	9370na		
2200	2300		USA, WWCR Nashville TN	7465na	9985na	
			12160na	13845na		
2200	2300		USA, WWRB Manchester TN	9320na	12170na	
2200	2300		USA, WYFR Okeechobee FL	5810va	9690va	
			11740va	21525va		
2200	2300		Zambia, Radio Christian Voice	4965af		
2205	2230		Italy, RAI Intl	11895as		
2230	2257		Czech Rep, Radio Prague Intl	5930va	7345va	
2230	2259		Canada, Radio Canada Intl	6160as	7195as	
			9730as			
2230	2300	mtwhfa	Albania, Radio Tirana	7120eu		
2230	2300	as	Australia, HCJB	15525as		
2230	2300		Guam, AWR/KSDA	11850as	15320as	
2230	2300	vl/fs	Italy, IRRS 5775eu			
2230	2300		Papua New Guinea, NBC	9675do		
2230	2300		Sweden, Radio	6065eu		
2230	2300		USA, Voice of America	9545va	9785va	
			11935as	13755va		
2245	2300		India, All India Radio	9705as	9950as	11620as
			11645as	13605as		

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

2300	0000		Anguilla, Caribbean Beacon	6090am	
2300	0000		Australia, ABC NT Alice Springs	2310do	4835irr
2300	0000		Australia, ABC NT Katherine	5025do	
2300	0000		Australia, ABC NT Tennant Creek	4910do	
2300	0000	as	Australia, HCJB	15525as	
2300	0000		Canada, CBC Northern Service	9625do	
2300	0000		Canada, CFRX Toronto ON	6070do	
2300	0000		Canada, CFVP Calgary AB	6030do	
2300	0000		Canada, CKZN St John's NF	6160do	
2300	0000		Canada, CKZU Vancouver BC	6160do	
2300	0000		Costa Rica, University Network	13750va	
2300	0000		Cuba, Radio Havana	9550na	
2300	0000		Egypt, Radio Cairo	7115na	
2300	0000	vl	Ghana, Ghana BC Corp	3366do	4915do
2300	0000		Guyana, Voice of	3290do	
2300	0000		India, All India Radio	9705as	9950as	11620as
			11645as	13605as		
2300	0000		Malaysia, RTM	7295as		
2300	0000		Namibia, Namibian BC Corp	3270af	3290af	
			6060af			
2300	0000		New Zealand, Radio NZ Intl	17675pa		
2300	0000		Papua New Guinea, NBC	9675do		
2300	0000		Sierra Leone, Radio UNAMSIL	6137af		
2300	0000	vl	Sierra Leone, SLBS	3316do		
2300	0000		Singapore, Mediacarp Radio	6150do		
2300	0000	vl	Solomon Islands, SIBC	5020do	9545do	
2300	0000		UK, BBC World Service	5975ca	6195eu	
			12095ca			
2300	0000		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7590usb	7812usb	10320usb
			12133usb	12579usb	13362usb	13855usb
2300	0000		USA, KAIJ Dallas TX	13815na		
2300	0000		USA, KTBN Salt Lake City UT	15590na		
2300	0000		USA, KWHR Naalehu HI	11565as	17510as	
2300	0000		USA, Voice of America	7215va	9890va	
			11995as	15185va	15290va	15305va
			17740va			
2300	0000		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na			
2300	0000		USA, WBOH Newport NC	5920am		
2300	0000		USA, WEWN Birmingham AL	7425va	9975va	
			11530va	15695va		
2300	0000		USA, WHRA Greenbush ME	7570na	9455na	
			17650na			
2300	0000		USA, WHRI Noblesville IN	7315am	7535am	
2300	0000		USA, WINB Red Lion PA	9320am		
2300	0000		USA, WJIE Louisville KY	13595am		
2300	0000		USA, WTJC Newport NC	9370na		
2300	0000		USA, WWCR Nashville TN	5070na	7465na	
			9985na 13845na			
2300	0000		USA, WWRB Manchester TN	5050na	5085na	
			5745na 6890na			
2300	0000		USA, WYFR Okeechobee FL	5985am	11740am	
			11855am	15170am	15400am	
2300	0000		Zambia, Radio Christian Voice	4965af		
2300	2306		Nigeria, Radio/Lagos	3326do		
2300	2330		Australia, Radio	9660as	12080as	13620as
			13630pa	15230pa	15240pa	17795pa
			21740pa			
2300	2330		Germany, Deutsche Welle	9800na		
2300	2330	DRM	Sweden, Radio	9800va		
2300	2330		UK, BBC World Service	3915as	5965as	
			6195as 9740as	11945as	11955as	15280as
2300	2330		USA, Voice of America	6180va	7205va	
			9780va 11655va	15150va		
2300	2350		Turkey, Voice of	5960va		
2300	2356		Romania, Radio Romania Intl	6135eu	6180eu	
			7105eu 9610na			
2300	2357		China, China Radio Intl	5975as	5990na	
			6040na 7180as			
2300	2359		Germany, Deutsche Welle	6070as	9815as	
			12035as			
2315	2330	vl	Croatia, Croatian Radio	7285so		
2330	0000		Australia, Radio	9660as	12080as	13620as
			13630pa	15230pa	15415pa	17750pa
			17795pa	21740pa		
2330	0000		Lithuania, Radio Vilnius	7325na		
2330	0000		UK, BBC World Service	3915as	5965as	
			6170as 6195as	9740as	11945as	11955as
			15280as			
2330	0000		USA, Voice of America	6180va	7130va	
			7205va 9620va	9780va	11665va	11805va
			13640va	15150va	15205va	
2330	2357		Czech Rep, Radio Prague Intl	5930va	7345va	
2330	2358		Vietnam, Voice of	9840as	12020as	
2335	0000	as	Austria, Radio Austria Intl	9870sa		
2340	0000	mtwhf	Austria, Radio Austria Intl	9870sa		

Thank You ...

Additional Contributors to This Month's Shortwave Guide:

Rich D'Angelo, *NASWA Flash Sheet*; *BCL News; Cumbre DX;* Glenn Hauser, Enid, OK/*DX Listening Digest*, Anker Petersen, Denmark; Daniel Sampson/*Prime Time-SW*; *DX Window; Observer*, Bulgaria; ODXA/DX Ontario; Larry Van Horn N5FPW, MT Asst. Editor; Loyd Van Horn W4LVH/ WWNC, Asheville, NC; *Hard Core DX; NASWA Journal; WWDX.*

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Code Names Uncovered

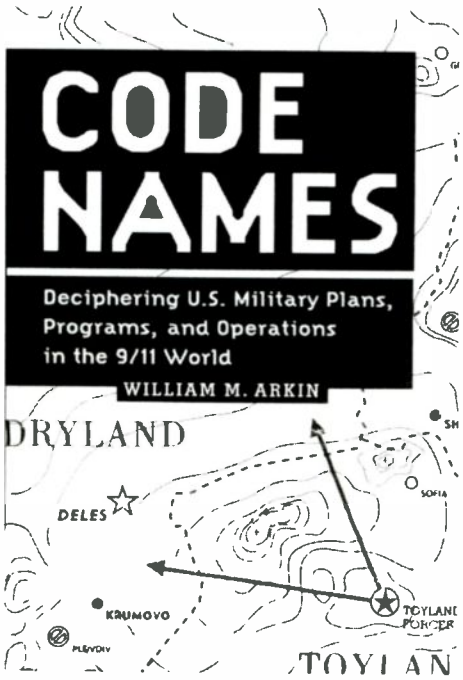
What do you think of when you hear the words "Desert Storm" or "Desert Shield?" Why, operations in Iraq, of course. What you may not realize is that they are only two of *thousands* of code words used by our government on a daily basis. Fortunately, a new book has just been released that throws back the curtains of government secrecy to uncover the hidden world of these classified code words.

Written by veteran military-affairs journalist William M. Arkin of *Nuclear Battlefields* fame, *Code Names* identifies more than 3,000 code names and details the plans and missions for which they stand. And what is more interesting, some of these code words included in the book are still classified, like "Polo Step."

Polo Step

"Polo Step" is secret Pentagon code for classified material that is more sensitive than "Top Secret." When Arkin first publicly mentioned "Polo Step" in a 2002 column in the *Los Angeles Times*, Defense Secretary Donald Rumsfeld was apparently furious and ordered an investigation into the leak. Over 1,000 officials, military personnel, and contractors were ultimately interviewed, and the investigation even had its own code name, "Seven Seekers."

This naming of military operations and exercises is not new. It actually began back in World War II. Before then, operations were named for colors (i.e. Operation Indigo). As the need for operational security increased, this practice was expanded and the War Department increased the size and scope of the code words they used for military operations. Lists of well over 10,000 common words were compiled and blocks of code words were assigned to various military commands.



After the war, with the creation of a permanent military and intelligence establishment, code word naming conventions followed the basic wartime principles. Unclassified and classified code words are used for operations, plans and programs.

Today, according to Arkin, there are three distinct types of code names:

Nicknames. A combination of two separate unassociated and unclassified words (i.e. Polo and Step) assigned to represent a specific program, activity, exercise or classified special access program.

Code words. A single classified word (*e.g.*, Byeman) assigned to represent a specific special access program or portion of a program.

Exercise terms. A combination of two words, normally unclassified, used exclusively to designate a test, drill or exercise (*e.g.*, Red Flag, Red Horse, etc.).

In 1975, the Joint Chiefs of Staff introduced the computerized code word, nickname, and exercise term system (NICKA), which automated the assignment of names for the Department of Defense (DoD). The NICKA system assigns each DoD command a series of two letter alphabetic sequences, requiring each "first word" of a nickname to begin with a letter pair from the series they have been assigned.

For instance, the North American Aerospace Defense Command (NORAD) has the following known alphabetic series: AM-AR, EA-FF, JM-JR, VG-VL. Various NORAD regions have used call words out of the alphabetic first word series above to identify their regions over a variety of radio and wireline circuits over the past few years. Examples of these call words include:

First call word	NORAD region
Fencing, View, Village	Alaska
Fabric, Facility, Factor, Feather	Canada
Fare, Feed	Canada, west
Farm, Feature	Canada, east
Falcon, Fancy, Vigil	Continental United States
Fall, Felix, Ferry	Continental US, northwest
Famous, Feast, Fertile	Continental US, northeast
Federal, Fell	Continental US, southeast
Vine, Visor	NORAD HQ, Cheyenne Mountain

While some radio monitors may have never heard of some of the call words above, some first words have been in the public domain for years. The following U.S. Air Force first words have been published in the public domain:

Cobra	Air Force intelligence first word. (e.g., Cobra Ball, Cobra Dane, etc.)
Commando	Pacific Air Force first word (has since been broadened and probably reassigned). Commando Solo is an EC-130 aircraft that conducts psychological operations and civilian affairs broadcast missions.
Compass	Air Force Research and Development first word. A well known example from this series is Compass Call, an EC-130H aircraft information warfare platform (also known as Rivet Fire).
Coronet	Air Force first word designating a fighter of bomber deployment and tanker support assets.
Hammer	Air Force Communications Command first word (e.g., Hammer Ace)
Pacer	Air Force Material Command first word. This first word involves a mind boggling array of logistics related programs.
Pave	Air Force Research and Development first word. Research and development first word related to weapons and radar systems.
Phoenix	Air Mobility Command first word.

Recently, while searching the internet, I ran across the "Phoenix" first word series in an Air Mobility Command (AMC) instruction available in the public domain.

Phoenix Banner	AMC aircraft/aircrews that support the President.
Phoenix Copper	AMC aircraft/aircrews that support the Secret Service.
Phoenix Jewel	AMC exercise designed to test connectivity of AMC assets.
Phoenix Push	AMC aircraft/aircrews that support a high level mission involving senior Air Force officials and DoD leadership, US Congress, and national or international media.
Phoenix Raven	Security teams for AMC mis-

	sions operating in high risk environments.
Phoenix Scorpion	AMC airlift associated with the logistics buildup in Southeast Asia (aka Iraq)
Phoenix Silver	AMC aircraft/aircrews that support the Vice President.
Phoenix Tent	AMC forces mobilization.

Another Air Force first word series that should be familiar to military monitors is "Prime." Probably the most notable nickname from this series is "Prime Beef," a program associated with the Air Force base, specifically the Base Engineer Emergency Force (BEEF).

You will find the code words and nicknames above and much more in Arkins new book, *Code Words*. This 624 page hardback book is published by Steelforth in January 2005 and is a "must have" for the library of every active military monitor. You can find it at better bookstores everywhere or online from Amazon.com. Look for ISBN number 1586420836.

❖ NORAD Combat Air Patrols

We continue to see reports from various major sporting events and public gatherings of NORAD combat air patrol aircraft guarding the skies over these activities. If you have one of these events scheduled within a hundred miles or so of your location, you might want to monitor the following 50 hot NORAD frequencies for activity:

VHF High band (AM mode) 138.000 138.025 138.200 138.225 139.295 148.125
UHF Mil aircraft (AM mode)

225.000	225.600	225.800	228.400
228.800	228.900*	234.600*	234.700
235.900*	238.400	243.500	252.000*
254.200*	255.800	256.600	259.600
260.900*	262.150	262.400	262.800
265.400*	271.000*	276.400	276.650
277.600	279.400	282.600*	285.900
288.400	293.600*	295.800	298.300
318.400	320.600*	320.900*	324.000
328.000*	358.850	360.700	362.300
364.200 (AICC)		386.000	387.000
387.800			

* indicates a primary frequency

And remember, be sure to pass along what you hear via the email address in the masthead of this column in care of *Monitoring Times*.

❖ VMFA-312 Squadron Common Found

After a long search, southeast *Milcom* monitor Mac McCormick has found the squadron common frequency for the Checkerboards of VMFA-312 based out of MCAS Beaufort, South Carolina. And it falls within one of my published 25 kHz spacing spectrum holes – 299.275 MHz (Check Ops). You should watch the following frequencies for additional activity from this unit:

301.950 320.900 321.900 MHz.

An F-22 Raptor over Edwards AFB (DoD photo)

Callsigns that have been associated with this unit include: AB-2## (Carrier Air Wing 1 tail code and aircraft side numbers) and Check 6#.

❖ Raptors on the Air

If you are looking for active frequencies for F-22 Raptors and you are in the southeast US, you might want to check out 292.700 MHz. This is the operations frequency for the 325FW/43FS squadron based out of Tyndall AFB in Florida. The base uses the callsign "Hornet Ops."

❖ VAW-78 Decommissioning

According to the March 2005 issue of *Combat Aviation* magazine, VAW-78 based out of the Naval Air Station (NAS) Norfolk, Virginia, will be decommissioned by the time this magazine gets into your hands (March 31, 2005). The four E-2C aircraft assigned to the squadron will be transferred to the Night Wolves of VAW-77 based out of NAS Atlanta, Georgia.

If you are in the southeast United States, be sure to program the VAW-77 frequencies and watch for increased activity in the near future:

285.100	VAW-77 squadron common
304.100	VAW-77 air-to-air

❖ Other Military News Shorts

- In 2005, the Air Force 419 Fighter Wing will relinquish its F-16C aircraft, but continue to fly the fighters as an associate unit with the co-located 388 FW at Hill AFB in Utah. The Virginia Air National Guard (ANG), the 192nd FW at Richmond, will "partner" with the 1 FW at Langley AFB as it transitions to the F-22 Raptor.
- The Arizona ANG (162nd ARW) recently received its first two KC-135Rs (68-8023 and 59-1500) at Phoenix Sky Harbor Airport
- The Pennsylvania ANG (193rd SOW) has unveiled its new EC-130J Commando Solo III at Harrisburg International Airport. The unit hopes to replace all its EC-130Es with the "J" models by 2006.
- The Naval Research Laboratory (NRL) Flight Support Detachment at NAS Patuxent River, Maryland, was redesignated as Scientific Development Squadron One (VXS-1) on Dec 13, 2004. This unit flies four NP-3Ds aircraft.
- The Marine Corps has recently taken delivery of the first of 20 KC-130J tankers, which have been assigned to VMGR-252 at MCAS Cherry Point, North Carolina.
- The Minnesota National Guard has announced plans to build a new Aviation Support Facility at St Clair Regional Airport to support six UH-60 helicopters of the 1,256th Medical Company (Med Coy) as well as six CH-47Ds to be assigned to a new unit. The Minnesota Guard recently retired the last of their UH-1Hs, and the last six UH-1s assigned to the Colorado National Guard 2-135th AVN at Buckley ANGB were recently retired. The Army Aviation Center at Fort Rucker, Alabama, also sent its last UH-1Hs helicopters to the Draughton-Miller Airpart in Temple, Texas. More than 200 Hueys are stored in Temple.

Thanks to Ron Perron for passing this news from *Combat Air* along to our *Milcom* readers.

And that will do it for another month. Until next time, 73 and good hunting.

Ron Walsh, VE3GO
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Atlantic Seaboard State-by-State

Since the beginning of 2005, we've been looking at the best AM DX bets for logging each of the 50 states and ten provinces. This month, we're moving down the East Coast a bit. Some of the Mid-Atlantic states should be nearly trivial to log (at least if you live east of the Rockies). Others are difficult everywhere. They're all worth a try.

New York:

New York has more 50,000-watt non-directional stations than any other state. New York City's WFAN-660 (all sports), WABC-770 (talk), and WCBS-880 (news) should all be audible most nights anywhere east of the Rockies. From Upstate, WGY-810 (Schenectady) and WHAM-1180 (Rochester) should also be audible just about everywhere. WCBS is probably, by a small margin, the easiest of the batch; their all-news format includes frequent IDs. But IDs won't be a problem on any of these stations.

There are several more 50,000-watt stations that, while directional, are widely heard outside the Empire State. NYC's WOR-710, WINS-1010, WEPN-1050, WBBR-1130, and WQEW-1560 are all frequent DX visitors here in Tennessee. WWKB-1520 (Buffalo) is also often strong. WDCD-1540 (Albany) is 50,000 watts, but highly directional to the northeast. Unless you're in New England, this one is rare DX.

New Jersey:

The first expanded-band station on the air was in the Garden State. This is the only way many DXers have managed to put New Jersey in their logs. The state now has two expanded-band stations – WWRU-1660 and WTTM-1680 – both with ethnic programming. They should certainly stand out on the dial, but you'll have to carefully monitor across the top of the hour to get a conclusive ID. A Seattle station on 1680 is occasionally reported with ethnic programming targeting the same nationalities as WTTM, so you can't claim New Jersey based on format alone.

I've heard regular-band station WVNJ-1160 in Milwaukee at sunrise; this may be a decent shot. WWJZ-640 may also be worth an attempt. They're 50,000 watts daytime, though directional and not particularly favoring the west. They're a Radio Disney station, which will make them difficult to identify.

Pennsylvania:

The Keystone State isn't as easy to log as New York, but it's not much harder. There are two 50,000-watt non-directional stations: WPHT-1210 Philadelphia and KDKA-1020 Pittsburgh, both news/talk. KYW-1060 Philadelphia (news) is directional but not very much so; it should be audible throughout much of the country. Daytime-only station WWII-720 near Harrisburg may run only 2,000 watts, but it's been fairly widely heard at sunrise. Pittsburgh's WJAS-1320 does surprisingly well for its crowded regional channel.

Maryland:

By far your best shot at Maryland is Baltimore's 50,000-watt WBAL-1090. Unfortunately, this station is required to protect Arkansas' KAAY from interference. This means WBAL must switch to a highly directional antenna at sunset, cutting off most coverage to the west. Unless you live to the north and east of Baltimore, your best bet is to catch WBAL in the period between sunrise in Baltimore (when WBAL switches to non-directional operation) and sunrise in Little Rock (when KAAY switches to non-directional operation and clobbers WBAL).

WCAO-600 has also been heard here. WWLG-1370 has recently changed frequency from 1360 and increased power to 50,000 watts daytime, 7,700 watts night, making it the second most powerful station in the state. They're also highly directional, but the pattern should make reception possible at sunrise at locations southwest of Baltimore.

Delaware:

Most of us will probably require a "DX Test" to hear Delaware. There are only ten AM stations in the state. With a single exception, they're all either daytime-only, flea-powered at night, or highly directional to the southeast. Judging from the antenna patterns, your best bet for Delaware would be WAMS-1260, whose directional pattern is not particularly restrictive and favors the northwest. Unfortunately, according to the NRC *AM Radio Log*, WAMS went off the air in February 2004. If they didn't return by February of this year, they're gone for good.

Probably your next best bet is WDOV-1410 Dover. They're 5,000 watts directional, favoring the southeast. But the daytime pattern is not particularly restrictive, and the station should be audible to the west at sunrise.

District of Columbia:

Of course, the District is not a state. Still, many DXers would like to add it to their logs. (Radio hams often count the District for Maryland. That practice would certainly make Maryland easier to log on the AM band!) All-news WTOP-1500 is Washington's most powerful station. WTOP is directional fulltime, favoring the southeast, but the pattern is not particularly strict. Especially around sunrise and sunset, this station can be heard at a considerable distance from the Capitol.

Another 50,000-watt station in the nation's capital is WTEM-980. They're 50,000 watts during the daytime only (reducing to 5,000 at night) but their all-sports format is still easily heard here in Tennessee.

Five more states and a District heard from. Or at least, so we hope. Next time, we move on to Dixie where the AM dial holds few slam-dunks but also few impossible dreams.

❖ IBOC experiences

Digital radio, also known as "HD Radio" and "IBOC" (In Band On Channel), is probably the hottest topic in DX circles these days. I've been able to briefly sample IBOC's effects while traveling through cities (i.e., Chicago) where IBOC stations are operating, but I've had to rely on others' reports for more comprehensive information... until now.

Late in 2004, two Nashville stations began IBOC operation. WQZQ-102.5 transmits a 100,000-watt analog signal from a tower roughly 25 miles west of my home. Their digital signal certainly does trash 102.3 and 102.7. However, both on my home stereo and my car radio, 102.1 and 102.9 are free of IBOC interference. (Ironically, neither frequency is "DXable", because of a translator relaying WQZQ on 102.1 and WQZQ's sister station WBUZ on 102.9.) If IBOC is widely deployed, it will make FM DX-ing more difficult but by no means impossible.

The other Nashville station running IBOC is WLAC-1510. And the interference story is a *lot* worse here. On my car radio, WLAC-IBOC trashes the entire band between 1490 and 1530 with a loud, pulsating buzz. While riding through Columbia, Tennessee, WJJM-1490 in the next

Best Bets for the Atlantic Seaboard States:

New York:	WCBS-880, WABC-770, WFAN-660, WGY-810, WHAM-1180
New Jersey:	WWRU-1660, WTTM-1680, WVNJ-1160
Pennsylvania:	WPHT-1210, KDKA-1020, KYW-1060
Maryland:	WBAL-1090, WWLG-1370
Delaware:	WDOV-1410
Washington DC:	WTOP-1500, WTEM-980

county suffers from severe interference; the IBOC buzz is also loud in Lebanon, Tennessee, where a permit (not yet built) exists for new station WCKD-1490. If I owned the WCKD permit, I think I'd return it to the FCC – if IBOC is allowed to continue, the Lebanon station's coverage will be severely limited.

Luckily for the DXer, IBOC operation is not currently allowed at night. However, most stations are allowed to operate their IBOC digital signal between 6am and 6pm local time. This means IBOC can trash the productive sunrise and sunset DXing periods. If IBOC is widely deployed – and nighttime operation permitted – AM DXing will become extremely difficult if not impossible.

But I don't think that will happen. Many smaller stations can't afford the IBOC equipment and licensing fees. And receiver prices are still sky-high. At this point in AM stereo's development, an AM stereo receiver could be purchased for less than $100. I'm not aware of any IBOC receivers selling for less than $1,000. If AM stereo failed in the marketplace with receivers on sale for less than $100, it's hard to see where IBOC will succeed at ten times the price.

❖ Only in Washington...

DXers frequently complain of "cookie-cutter formats," radio programming in one city that sounds exactly like programming in every other city. There is one station in suburban Washington, DC about which such a complaint won't hold water...

The former WPLC on 1050 kHz had been a business news station. The type of business conducted in Washington, however, is rather different from that conducted in Chicago, New York, Houston, or any other American city. WPLC's owners, recognizing this difference, have adopted a format of all federal government information. And with it, they've adopted new call letters: WFED. Strangely enough, this unusual format is not completely new. At one time, a low-power TV station on channel 28 carried federal government information, all the time.

❖ New targets

The "DX Tour" of the United States started in New England, so it'll take awhile to reach Texas. But we'll jump the gun a bit and mention a new DX target on the air in the Lone Star State. KTXV-890 is located in Frankston, near Jacksonville in northeast Texas. The station carries a Hispanic format, and broadcasts with 250 watts daytime only.

KTXV will be a difficult catch for most DXers. But it'll be easier than the other new station this month... KAGV-1110 has begun operation in Big Lake, Alaska. Big Lake is near Anchorage, in south-central Alaska. KAGV runs 10,000 watts fulltime and carries religious programming.

❖ Lost towers

When we get around to California, one of the first stations on the list will be KFI-640, Los Angeles. If you were to be DXing right now, however, KFI might be well down the list. Around Christmas, a small airplane knocked

Popular Nashville country-music station WSIX originally broadcast from this Springfield, Tennessee, service station.

down the KFI tower, in an industrial area. The pilot and his passenger unfortunately lost their lives in the crash.

KFI has a backup tower at a different location and returned to the air almost immediately. But the new tower isn't as efficient as the original and reportedly can't be operated at the station's full 50,000 watt power. Rumors suggest local authorities may not allow KFI to rebuild at the original site. But finding another site for a 760-foot tower in Southern California will not be easy. It may take awhile for KFI to return to full power.

In Chambersburg, Pennsylvania, WCBG-1590 is no more. Early in 2004, the city began construction on a water tower adjacent to the WCBG transmitter site. The work came to a halt when workers began being "zapped" by WCBG RF energy picked up by the water tower. The city asked WCBG to reduce power during the day – but any reduction sufficient to allow safe construction work would ruin the station's coverage. They attempted to forcibly acquire the land under the towers through the powers of eminent domain, but the station fought their offer in court. Finally, the city reached an agreement to purchase the land from the station for $590,000. The station has left the air, moving their programming to co-owned WHGT-1380. The WCBG license is still valid, and the station *could* return to the air if a new transmitter site could be found – but I don't expect that to happen.

❖ X-band activity

FCC regulations allow for the temporary operation of portable AM transmitters for measurement of ground conductivity. Accurate conductivity figures assist in determining the best location for a new AM station. Such temporary stations are pretty rare these days. But one did operate for about six weeks around the first of the year.

WB3XNN operated on 1620 kHz from Milford in extreme northeastern Pennsylvania. The station was authorized for 1,000 watts to a 50-foot top-loaded tower. Operation was between roughly 9:15am and 2:45pm (not the best hours for DXers <grin>!). Programming was mostly dead air, with hourly identificaion announcements. If you happened to hear WB3XNN, you can get a QSL from Dave Schmidt, c/o Digital Radio Engineering, 2927 US Route 6, Slate Hill, NY 10973.

❖ IRCA

I occasionally mention the National Radio Club in this column, but have been somewhat remiss lately in mentioning the existence of the other club for AM DXers in North America. The International Radio Club of America (IRCA) also offers information for DXers and a regular publication. The club has an extensive website on **http://www.ircaonline.org** . They also offer an online version of their printed bulletin. Send a 37-cent stamp (two IRCs for non-US addresses) to IRCA, 3410 Marion St. SE, Albany OR 97322-3871 for a sample issue.

❖ Till next month

There have been a couple of discussions on **http://www.radio-info.com** lately about places where there used to be a radio station but isn't anymore. My contribution is shown in the picture on this page. WSIX Radio used to broadcast from this former service station, across the street from the Robertson County Courthouse.

Hearing anything interesting? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to *dougsmith@monitoringtimes.com*. Good DX!

Ron Walsh VE3GO
ronwalsh@monitoringtimes.com

Marine Radio Springs into Life

When this is read in April, the marine radio will have begun to get active here in Southern Ontario. The ice will have almost disappeared from the lakes, the lake vessels will have started their season, icebreakers will be busy, and the St. Lawrence Seaway will be open to traffic. I will have spent a week monitoring in Myrtle Beach, SC, and the VHF bands will be active. With the shorter hours of darkness, shortwave monitoring will be less exciting. I have some marine radio license courses to teach and have recertified as a volunteer examiner.

There is little VHF activity here as the winter weather shuts down most activity. A few local ferries, that operate with the assistance of bubble systems, traverse the frozen lake or river channels. This is a system of pipes that allows compressed air to be carried along the bottom of the channel. It escapes through small holes and keeps the water churning. This, along with frequent ferry traffic keeps the channel open, even though the rest of the area is frozen solid.

There is still some Coast Guard communications between the Rescue Centre in Trenton, Ontario, and their aircraft. They use channel 82A, 157.125 MHz. This is a good channel to monitor in all Canadian Marine Areas

However, the winter season here has produced some excellent marine radio traffic. Propagation on the lower shortwave frequencies has been good and there has been some marine activity on the amateur radio bands as well.

❖ Canadian East Coast

My modest antennas and R-5000 receivers captured some interesting transmissions. I heard Labrador, Port Aux Basques, Fundy and Halifax Coast Guard Radio Stations on 2182 kHz. I also monitored weather forecasts and notices on 2598 and 2749 kHz. Gale warnings and other information were interesting to monitor. The Maritime Provinces had several storms this season.

I also monitored Halifax Military with rescue 323. A marine rescue was taking place and they were proceeding to assist the vessel. They had communications on 5717, 6694 and 3047 kHz. A Phone Patch to RCC (Rescue Coordinating Centre) was heard on 3047 kHz.

I also had some interesting long wave reception. I was checking my receiver on the local airport beacon, YGK on 263 kHz. As I was tuning around, the VLF frequencies yielded several beacons from eastern Canada. I do not have a very good LF antenna but the reception was particularly strong on Dec.5. I have listed the beacons heard and plan to attempt to QSL these signals. Identifying beacons is one place where understanding CW is still necessary.

BC	414 kHz	Baie Comeau, PQ
ML	392 kHz	Charlevoix, PQ
YMW	365 kHz	Maniwaki, PQ
YWA	518 kHz	Petawawa, Ont.
YY	340 kHz	Mont Joli, PQ

It is worth checking out the VLF every once in a while, as you might just hear some unusual DX. I plan to install a better listening antenna this spring.

For those who live on the Bay of Fundy, the traffic control is on VHF channels 11 (156.55 MHz), 12 (156.6 MHz) and 71 (156.575 MHz).

❖ United States

I had the usual US Coast Guard monitoring CAMSLANT Chesapeake and other stations on 5696 and 8983 kHz. However, on a few occasions I was able to monitor the CAMSPAC Point Reyes California on 5696 kHz. This was a pleasant surprise, as West Coast stations are rare here. Again, an antenna improvement should allow a few more intercepts next winter.

4125 kHz was also active. Conversations between several tugs and barges were heard. Also copied, as an example, was the *Dreamcatcher* contacting the Coast Guard in St. Petersburg, Fla. I also heard a few stations on emergency channel 2182 kHz as well.

❖ Amateur Radio

I have had some interesting marine related contacts on the amateur bands. VA3RJD, Ron, was still active on the *Algosteel*. In December and January, the ship ran from as far east as Port Cartier, PQ, to as far west as Chicago. Ron could be heard on 80 and 40 meters. I also had a quick contact with Peter, PE5YRH on the *Statengracht*. This was on 7.055 MHz LSB. The vessel was in the Gulf of St. Lawrence, heading to the United Kingdom.

Many marine mobiles were also copied on the MMSN (Maritime Mobile Service Net) 14 300 USB. This is always a good source of marine info. For those of you who have poor HF antennas, the MMSN is now available by streamed audio over the Internet. In fact, this service comes from the famous marine communications station WLO in Mobile, Alabama. They use a Japan Radio Company NRD 535D receiver and loop antennas.

You can connect by bringing up the site **http://www.mmsn.org** and clicking on the Listen Live Button. If you click on Stream Information, you will find details of the system and a couple of hints if you have problems. This net is run by a very well organized group of dedicated amateurs.

14,300 USB is a good frequency to monitor. The MMSN (1700 to 0100 UTC) follows the Intercontinental Traffic Net on the same frequency. At 1700 UTC, on Saturday, the USCG Net takes over the frequency for an hour. The net uses 14,300 until 1800 UTC and then continues on 14,327. At the same time, they use 14,052 for a CW net. I have checked in several times, as a member of the Canadian Coast Guard Auxiliary and enjoyed the contacts.

The Transprovincial Net meets on 7.055 MHz from 1200 to 2200 UTC daily. This is an informal net and uses different controllers every hour. The controls are all Canadian, but anyone who can use this frequency is welcome. At 2100 (1600 EST), Dave VA3SWO is the net control, from Amherstburg, Ont. Dave is a former sailor on the Great Lakes and we encourage any amateurs with marine interests to join in at that time. Leonard, VA3LVN, a former mate and pilot, myself VE3GO, and others check in to chat or pass on marine information.

The Islands on the Air group is active on the amateur bands. For example, I worked Chuck, ND7K at Vaca Key, in the Florida Keys, on 14,262 USB. The 30 meter band has provided some interesting amateur CW contacts with a marine flavor. A January contact with VE1OK, John, in North Sydney, NS, was interesting as he grew up "just a stone's throw" from the now defunct marine station VCO. We had quite a chat about the old 2 MHz transmissions.

❖ 5 MHz Beacons

With the Marine Transmissions and possible amateur transmissions on the 5 MHz band, I was

The Cedarglen transits the Welland Canal upbound in late December 2004.

Three tugs Stormount, Vigilant I and Vac at Port Weller Drydocks assist in moving freighters in and out of the drydock, as well as breaking ice during the winter

interested to hear of some beacons operating in this frequency range. The beacons are located in the UK.

GB3RAL is operating on 5.290 MHz in the CW range and produces a 1500 Hz tone when you tune to 5.2885 in the SSB mode. The station transmits right on the hour and repeats every 15 minutes. There is a series of nine dashes. This station is located in the Rutherford Laboratory in Oxfordshire. The station only uses 10 watts to a dipole antenna.

GB3WES, Westmoreland, and GB3ORK in the Orkney Islands follow at one minute intervals (1 and 2 minutes after the hour).

These beacons will be useful to forecast signal propagation on 5 MHz and also provide a good DX catch for SWLs. Reports are requested. Information on the stations can be obtained at **http://www.g4zfq.homepages.wight365.net/gb3ral.htm** or you can put any of the calls into Google or similar search engine.

❖ Great Lakes VHF

Just a reminder: As the Great Lakes open up for the season, the VHF channels come alive with radio traffic. If you live near any of the lakes or connecting rivers, you can hear a great deal of communication. Channels 11, 12, 13 and 14 are used for traffic control. They alternate as you go up the Seaway system from east of Gulf of St. Lawrence to Thunder Bay. Canadian Marine weather broadcasts and notice to shipping are broadcast on channels 21B and 83B 24 hours a day. The USCG uses channel 22A for their information broadcasts.

Shipping should get going in early March and the icebreakers can provide some interesting communications in the Sault Ste. Marie area as well as the upper parts of Lake Michigan, St. Claire River, Detroit River, and western Lake Erie areas.

Chan	Freq	Chan	Freq
11	156.550 MHz	12	156.600 MHz
13	156.650 MHz	14	156.700 MHz
21B	161.650 MHz	83B	161.775 MHz
22B	157.100 MHz		

❖ Marine Radio License Changes

I have been a volunteer examiner for Canadian Marine Radio Licences for the past 10 years. (I am also a volunteer amateur radio examiner.) I just received word that the course for the Restricted Operator's Certificate (pleasure craft marine radio operators), Marine (ROC-M), has been changed. We now are to add two hours to discuss the GMDSS (Global Marine Distress and Safety System). This involves DSC (Digital Selective Calling) and other new communication innovations in the marine radio system. People who already hold a marine restricted license can write a shorter test to upgrade their certificate.

It is significant to note that US and Canadian pleasure craft operators need a radio operaters certificate but do not need a marine station license (with a call sign) when they operate in Canadian or US territorial waters. However, they do need a station license when they go outside these waters.

I would appreciate hearing from anyone who has the details about US marine radio operators certificates and exams.

❖ Old-Timer on the Air

The operators at historic station KPH were on the air, Dec.31, using the old marine frequencies. Restored by the Maritime Radio Historical Society, the famous station at Point Reyes, California, goes on the air one night a year. (See **http://www.radiomarine.org/kph-proj.html**) They were also operating amateur station K6KPH from the site. Announcements were made on 500 kHz CW and bulletins on 426 kHz CW.

Propagation and lack of time did not allow me to hear any signals, but I will surely watch for any further operations as I want a QSL from this historic marine station. If any of the readers copied the station I would appreciate them letting me know.

❖ Appeal for Frequencies and Information

I am attempting to write a column which appeals to all marine radio monitors. To do this, I need information about the radio traffic and frequencies you monitor in your area.

VHF radio channels and uses from your local are very important, as I have no way of monitoring these frequencies here. I will be happy to print the channels and information for particular ports, etc. I would appreciate information from along the Mississippi River and the West Coast of North America. Any worldwide information would also be greatly appreciated.

HF voice and digital frequencies would also add a great deal to the column. People in many areas would like to try to monitor these communications. Perhaps we can set up regular contacts with people in different areas of the world who can provide such information. Information from shipboard personnel would also be of great use.

I would also like have some pictures of ship equipment, station sites, etc. to provide information to the readers.

You can contact me at the email address at the top of the column or mail me your information at: Ron Walsh, VE3GO, 869 Haverhill Drive, Kingston, Ontario Canada K7M 4V1

Please let me know what you listen to so I can produce a more varied column for the readers.

❖ Reading the Mail

Al Bauernschmidt, N3KPJ, sent me a letter about the old *Popular Electronics* SWL callsigns I mentioned in the last column. He was WPE3CKW. He also mentioned the N8F operation commemorating the loss of the *Edmund Fitzgerald*. I do hope to operate from that station next November. I thank him for his positive comments about the column. Al say he operates on 28 450 USB occasionally, so look for him there.

Monitoring Times also received good comments from the control station for the USCG Amateur Radio Net. Comments, information and suggestions are very much appreciated.

Station N8F operated from Whitefish Point in commemoration of the wreck of the Edmund Fitzgerald.

❖ Home Station

As the snow begins to disappear and the temperature rises, plans are taking shape to improve the monitoring station here. A commercially made sloper for low frequency listening, new VHF antennas, new cables to all antennas, a new HF amateur vertical, and a backup antenna are all being contemplated here. New shelves are being prepared to organize the radio desk. I also have a replacement for my antenna tower to install. Hopefully I can get this all done before next winter's good DX season.

Again, I am on the air in the early mornings, and late afternoon on 3755 kHz LSB, on 7055 LSB around 1600 EST, and 14,300 at various times. I will be happy to have a chat with other amateurs on any available frequency.

73's and smooth sailing.

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.

Open the Door to Good DX

As most of you know, the *Below 500 kHz* column is not generally a construction column. We'd rather focus on the fun and novelty of tuning this often-misunderstood band. Once in a while, however, we do present projects that are of direct interest to longwave listeners, and which are likely to improve LW reception.

This month, I am pleased to share a project from reader Lou Rossetti, N1PUX (MA). Lou recently built a simple, inexpensive loop antenna for NDB reception, and I believe other readers will find the design very interesting. It's a twist on the traditional box-frame loop made with a plastic or wooden frame. My thanks to Lou for contributing the details of his project to *Below 500 kHz*.

Antenna Description

The "door" antenna uses about 200 feet (61 m) of insulated #22 AWG, hookup wire (Radio Shack P/N 278–1215, or similar) wound around a standard household closet door. Closet doors are typically a little over six feet (1.83 m) tall and 2 feet (0.61 m) wide. Masking tape is used to hold the turns of wire to the closet door. While it may not be a "pretty" arrangement, the tape provides an easy way to secure the wire, and allows the antenna to be removed at will.

The loop described here is a transformer-coupled type as discussed in the late Joe Carr's *Loop Antenna* book (see references below). It consists of 12 turns of wire and presents a total inductance of about 660 uH. Figure 1 shows the overall wiring diagram for this antenna.

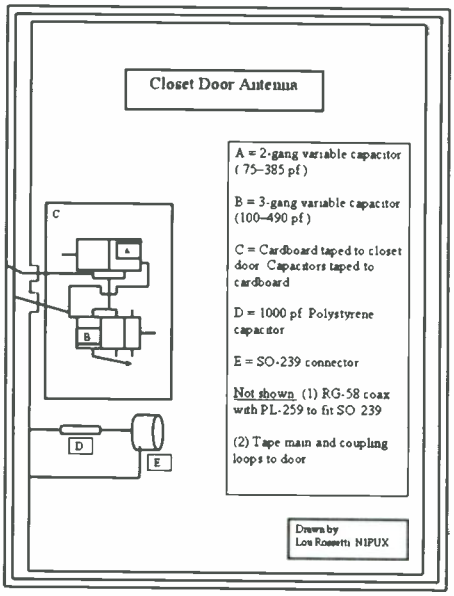
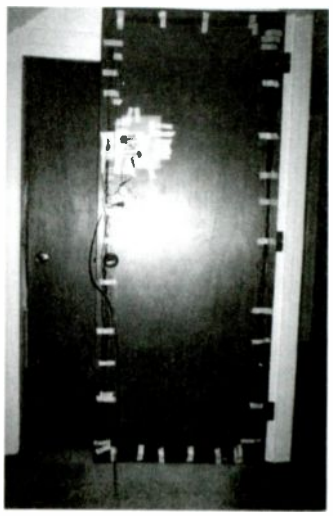


Figure 1. Wiring Diagram for the "Door" Loop antenna

Construction Details

The main loop is wound around the closet door 12 times using masking tape to hold the windings in place. A small piece of tape applied every few turns will make the job easier. If desired, a wide piece of tape can also be applied over the entire winding for extra security. Masking tape is easy to remove from the closet door, and yet holds the antenna securely when it is in use. (Note: Tape left on the door too long may be difficult to remove – use caution if this is a concern.)



The main loop is terminated with two variable capacitors removed from old AM broadcast sets. One is a 3-gang variable with a capacitance of 100 to 490 pf, and the other is a 2-gang variable with a capacitance measuring 75 to 385 pf. The capacitors are mounted on pieces of cardboard to prevent scratches on the closet door, and the cardboard is held to the door with masking tape.

To boost the capacitance to approximately 875 pf, the capacitors are connected in parallel by soldering a "bridge" across their stator plates. The minimum (open-plate) capacitance of this arrangement is about 175 pf. (Capacitance measurements were made with a Wavetek/Meterman 27XT Multimeter.)

To enable reception above 500 kHz, the capacitance of the antenna will likely need to be lowered. This can be done by cutting the stator jumper and using an alligator clip to make or break the connection as needed. Alternatively, a small switch can be installed for this purpose. Using data from Carr's *Loop Antenna* book, the tuning range of this antenna is calculated to be approximately 200 to 530 kHz (with cut).

The coupling ("pick-up") loop consists of two turns of the same insulated wire used for the main loop. A different color of wire may be helpful in distinguishing it from the main loop, but this is not necessary. The coupling loop is terminated in an SO-239 chassis antenna connector (also isolated from the closet door by cardboard to prevent scratches).

It was found that a 1000 pf polystyrene capacitor added to the center post of the SO-239 connector aided in coupling the small loop at resonance. A length of RG-58 coax was used to connect the coupling loop to the 50-ohm antenna input on the receiver. Similar types of coaxial cable may also be used.

Using the Antenna

Tune the antenna to resonance by adjusting the variable capacitors for a peak in background noise. Ordinarily, the peak on loop antennas will be rather sharp, so you'll want to re-adjust the capacitors if you make a large move in frequency.

With the antenna peaked, the door can be moved as needed to change its directivity pattern. Using this technique, it should be possible to separate multiple signals on the same frequency – especially U.S. and Canadian beacons, which typically use different ID tones (Canada 400 Hz; U.S. 1020 Hz). By simply changing the position of the door, you can peak up a desired signal, or null out a "pest" station.

First-time or casual DXers should find this antenna very useful for getting started on the beacon band. The antenna has been up for several months at N1PUX's location and he finds it to be a strong performer. Best of all, the antenna can be easily taken down, moved to another location or stored away as needs dictate.

For more information on loop antennas, Lou suggests going online and entering the phrase "small receiving loop antennas" in your favorite search engine. Additional references used in the construction of this antenna are listed below.

That's it for now. Best LW DX!

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(David Barts 3/16/95 article, no longer on http://www.hard-core-dx.com).
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OUTER LIMITS

THE CLANDESTINE, THE UNUSUAL, THE UNLICENSED

George Zeller
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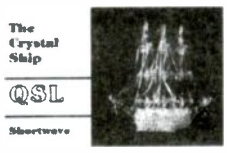
The Crystal Ship Returns

In recent months, there have been a number of high quality active pirate broadcasters who have returned to the shortwave bands after a long absence. These pirates use good production techniques and long ago established a reputation for being among the most entertaining broadcasts on the shortwave radio bands. In fact, their entertainment value rivals that of any shows that are audible on licensed North American stations today. One of them is the **Voice of Layringitis,** where Genghis Huxley, Cowboy Stanley Huxley, and a whole cast of Huxley characters create some of the best satire and parody shows that have ever been on the radio.

A second 1980s pirate, **The Crystal Ship,** has also returned to the North American pirate bands after a long absence. This one, hosted by "The Poet," often has a greater degree of political content than is produced by most North American pirates. It first went on the air in 1982. But, since 1983 the station has been inactive until now. The Poet says that he uses a now-antique Knight T-150A transmitter for nostalgia purposes. He notes that he normally uses oddball frequencies such as 6855 and 4070 kHz, proving that it pays to tune around when searching for pirate broadcasts. He uses the same QSL that he always used in the old days, as we see here this month.



Sometimes, in order to confuse the Federal Communications Commission, the station operates through relays by other pirates. The poet notes that the FCC issued a press release about their operations that were targeted for a bust back during the 1980s at a time when they had not been on the air for at least two years. So, beware of false information that is sometimes released by the FCC.

❖ KBFR and KNOZ Silenced

As we often point out in this column, pirate radio broadcasting is still not authorized by the United States government and the FCC. This month we have news of two more pirate busts, both of FM pirates. **KBFR** had been operating for years on 93.5 MHz with a Boulder Free Radio slogan. Following their second FCC bust, station personnel have announced that they have left the air for good. Their **http://www.kbfr.org** web site now shows only the tombstone that we see here this month.

The FCC added another notch in their belt when they busted **KNOZ**, a Sacramento, CA, pirate that had been operating on 95.5 MHz with a hip hop and rap pirate. According to the *Sacramento News and Review*, station personnel blamed the bust on engineers at Salem Communications Inc., a large, national religious broadcasting network. Salem, who has licensed stations in its network, allegedly did not like the competition on the FM band from a pirate.

❖ Radio Insurgente Mystery

We have previously mentioned the new Mexican clandestine Radio Insurgente. Many DXers, including expert DXer Jerry Berg from Massachusetts, have been unsuccessfully looking for this one's alleged shortwave broadcasts on 6000 kHz. The programs are archived on the Radio Insurgente web site at **http://www.radioinsurgente.org/index.php?name=archivo** The internet broadcasts do mention the shortwave broadcasts, but no DXers have so far reported them. If you hear them, let us know!

❖ What We Are Hearing

Monitoring Times readers heard one and a half dozen different North American pirates this month. You can hear them, too, if you use some simple tips: Pirate radio stations never use regular announced schedules, but shortwave pirate broadcasting increases noticeably on weekends and major holidays. You sometimes have to tune your dial up and down through the pirate radio band to find the stations, but the primary North American pirate frequency of 6925 kHz, plus or minus 30 or 40 kHz remains the best place to scan for the pirates. More than 90% of all North American shortwave pirate broadcasts are heard there.

Grasscutter Radio- They promote pirate radio and they play rock music. Note their revised e-mail address. (Uses grasscutterradio@yahoo.com e-mail)

Ground Zero Radio- Dave Gunn's pirate normally features a mix of rock music and comedy. (Elkhorn)

Ironman Radio- Scruffy Swab has been combining rock and blues music programs lately. (Belfast)

Indira Calling- They remain one of the best known of the All India Radio pirate parodies. (Providence)

James Bond Radio- This relatively new pirate still mystifies us. They mix their music, much of it from old James Bond movies, with a synthesized voice that says only, "Bond, James Bond." (none)

KIPM- Alan Maxwell's original and extremely complex dramas may be the only Existentialism programming on the radio today. (Elkhorn)

Radio Free Euphoria- Drug advocacy is always Captain Ganja's main pirate radio format. (Belfast)

Smooth Blues Radio- Mississippi blues music defines both their programming and their alleged transmitter location. (None)

Sunshine Radio. The young boy who operates this rock music station is a fairly active pirate. (None, but announces the grasscutterradio@yahoo.com e-mail address)

The Crystal Ship- Our feature station this month remains active. (Belfast and tcsshortwave@yahoo.com e-mail)

Undercover Radio- Rock music, parody, and comedy are featured here by Dr. Benway, who broadcosts "from the middle of nowhere." (Merlin and uses undercoverradio@mail.com e-mail)

UNID- A new pirate has been using these old call letters, but it is not clear if the new version is the same as the classic 1980s pirate. Of course, the call letters are a radio abbreviation for unidentified, but this one actually uses the call letters. (None known)

Voice of Captain Ron Shortwave- The Captain is still broadcasting with a rock music format. (Uses captainronswr@yahoo.com e-mail)

Voice of Laryingitis- Another classic pirote has returned, and they were active this month. (None, try Belfast)

WEAK- Leonard Longwire's ancient rock oldies come to us from Chicago. (Uses weakradio69@yahoo.com e-mail)

WHGW- Although they sometimes produce their own programs, they usually relay old time radio shows and recorded comedy. (Uses whgw6925@myway.com e-mail)

WHYP- James Brownyard's well produced mix of rock music, pirate comedy, and archived weather for Lake Erie cities still dominates pirate radio today. (Providence)

WMFQ- The purpose of this one is the promotion of QSLs. The call letters stand for their profane slogan of QSL promotion. (Providence)

WSPY- Spy numbers transmissions, telephone tones, and rock are the staples on this one. (None)

❖ QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or $2 US to foreign locations, especially in Europe where the value of the US dollar is plunging rapidly. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses: PO Box 1, Belfast, NY 14895; PO Box 69, Elkhorn, NE 68022; PO Box 28413, Providence, RI 02908; and PO Box 293, Merlin, Ontario N0P 1W0. Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletins for submitting pirate loggings with a hope that pirates might QSL the logs remain *The ACE* ($2 US for sample copies via the Belfast address above) and the e-mailed *Free Radio Weekly* newsletter, still free to contributors via *niel@ican.net*. The Free Radio Network web site, another outstanding source of content about pirate radio, is found at **http://www.frn.net** on the internet, and a few pirates will occasionally QSL a web site report left on the FRN.

Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month's valuable contributors: Artie Bigley, Columbus, OH; Jerry Berg, Lexington, MA; Jerry Coatsworth, Merlin, Ontario; Rich D'Angelo, Wyomissing , PA; Harold Frodge, Midland, MI; William T. Hassig, Mt. Prospect, IL; Bob Hinton, Boulder, CO; Chris Lobdell, Stoneham, MA; Leonard Longwire, Chicago, IL; Greg Majewski, Oakdale, CT; Larry Magne, Penn's Park, PA; Lee Reynolds, Lempster, NH; Martin Schoech, Eisenach, Germany; John Sedlacek, Omaha, NE; and Niel Wolfish, Toronto, Ontario.

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

T.J. "Skip" Arey, N2EI
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Ham Software Free for the Asking

As I keep telling everyone who reads my columns (or stands near me for more than about 5 minutes) the amateur radio fraternity is like no other. So many folks put so many of their skills and abilities out there for their brother and sister hams, just for the privilege of advancing the ham radio art. Nowhere in the hobby does this spirit run more freely than in the area of ham radio software.

It's kind of neat to have been in a position to watch the interrelationship of ham radio and the computer hobby evolve. Old Uncle Skip has been part of this revolution from the start. I still prize my original plans to build a *TV Typwriter* designed by Don Lancaster back in 1973. Nobody had any idea where this thing was going. In those heady days during the birth of the personal computer movement, everybody pretty much shared software with one another.

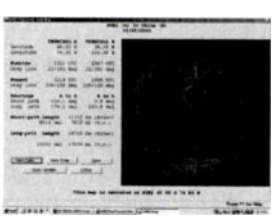
Some were copyrighted but seldom were any fees involved. As a matter of fact, one of the first guys to get into the business of charging folks for software he held the rights to was a fellow by the name of Bill Gates. And we all know where he ended up! I sometimes think that if Gates had been a ham, his life, and ours, might have been quite different. That is because, in ham radio circles, there are still lots of folks who write really great code, expecting nothing but the respect of their peers in return. Dozens of these programs can be found on the Internet. And since I usually make use of the April column to concentrate on book and software materials, let's make this month a *Freeware Extravaganza*! Everything you need for great radio hobby software support is often just a few mouse clicks away.

W6ELProp ™ (Version 2.20)

http://www.qsl.net/w6elprop/

As I said at the outset. I go back to the roots of the personal computer revolution. I recall typing in and debugging the now classic Basic (remember Basic?) propagation program Mini-Muff. We thought we had master control of the sky and the sun. Things sure have come a long way since those days.

Whether you are a ham or a shortwave listener, there is no better freeware program available for sky-wave propagation prediction…period! Sheldon Shannon's program (first released in 2001) predicts propagation quality between any two points on the planet on any frequency between 3 and 30 MHz. Now in its 12th iteration, the program is a bulletproof essential tool for anyone battling the vagaries of pushing a radio signal to the farthest reaches of the world. The program is offered for free to anyone with non-commercial intentions. Its functionality rivals many commercial products written for use in the same task.



W6ELProp runs under the Microsoft Windows operating system. All Windows versions from 95 through XP are supported. 2 MB of RAM and 2 MB of disk space are required. An 800 x 600 256 color monitor is recommended but not required. (I suppose there are still a few *green screens* out there.) The program does really benefit from color settings.

The download of the program, available at the above site and many other freeware sites, is a self extracting executable file. Getting set up is simply a matter of loading and running this file. The W6ELProp Icon will be installed on your Windows desktop. When you run the program you will initially be asked to establish a *Default Terminal* (usually your QTH).

The program has many useful features, but my personal favorite operating modes are the mapping tools. It's as simple as entering the callsign prefix of the DX entity you are looking to work and W6ELProp pops up a map: rectangular, Great Circle or frequency based on solar index numbers maps are all easily generated by the program. Unlike many of my friends, I have never been able to memorize the over three hundred callsign prefixes. Not to worry, W6ELProp includes a useful atlas tool to help folks like me figure out who I'm hearing and who I want to shout at in the heat of a contest. Non-ham users will appreciate the ability to modify the default frequencies and constants to cover the shortwave broadcast or utility frequencies.

MorseCat (Version 1.1.7a) by Gerald Holler DK5CI

http://www.morsecat.de/

Okay, you've jumped into the amateur radio hobby but still haven't joined me down on the lower end of 40 meters where we talk in dits and dahs. While learning Morse is no longer essential to get into the ham radio game, it is still required for license upgrades. When I started out the process of becoming a ham I had to learn CW using a scratchy old Ameco Morse Code vinyl LP. The 33-1/3 rpm disk had about 1/2 hour of training on each side. I pretty much memorized the thing the second or third time through, so it wasn't all that helpful. But, since I was already a fairly dedicated SWL, I discovered the ARRL on air code practice sessions and that helped a lot. I went on to learn ham CW procedure through the patient efforts of a couple of great fists in the West Jersey Radio Club.

Today, anyone wanting to master Morse Code need only download any one of several great Morse Code training programs for the Internet. One of the most popular freeware pieces out there today is MorseCat.

Gerald DK5CI has performed a great service putting this program out for general use by the ham radio community. Unless you are someone who works or plays with computer programming, you may not fully appreciate how difficult it can be to bring together a good CW program. All CW programs have to account for the operational processing speed of the computer they are running on. Since this can vary greatly between a wheezing old 386 or a fire-breathing, over-clocked, dual Pentium 4, some allowances for, and assistance with configuration is essential. Not all CW programs get this quite right across the wide number of platforms that are used in the PC world. Mr. Holler has hit all the right marks with his excellent program.

The program teaches the beginner all the basic characters, number and prosigns across a series of 18 lessons. Once you have mastered the character set, you can use the program to advance your skills to dizzying heights. The program will send code at any speed from 2 through 120 words per minute – a speed far in excess of the 75.2 wpm record set by Ted "Mac" McElroy on July 2, 1939. (A record that has yet to be formally broken!)

The program will allow you to learn code by the Farnsworth method, whereby you adjust the speed of the characters and the character spacing independently. This method is considered the best way to build speed, even for a beginning student.

MorseCat will run on any Microsoft Widows version from 3.1 through XP. Some features are dependent on the computer system's sound card features, so you may run into some issues depending on your personal system. I have run the program successfully on several machines and not run into any problems.

The program also allows you connect a key in parallel to joystick button #1 or to the parallel port to test your sending ability. Again, this feature is somewhat local system dependent. But if your goal is to use the program for purposes of passing the 5 wpm code exam, sending is not required. If this feature does work on your system, the unique oscilloscope control in Send mode allows you to analyze dot-/dash-ratio of your sent characters. The program also allows for automatic speed variation as well as setting variable dot, dash, pause ratios. All useful tools for taking your CW skills to higher speeds.

On the whole, MorseCat is one of the best ham radio freeware programs available today.

Ham Graphics

http://www.qrz.com/download/artwork/index.htm

You may recall a number of issues back I talked about using your word processing program to generate your own QSL cards. It's a lot of fun (and a big money saver) to make up your own cards. You can also generate custom cards for special events or contests. To make personal card making more interesting, the Worldwide Web is a great source of amateur radio artwork. A number of sites offer freeware graphics that can be downloaded to provide eye catching detail to any home brew QSL card. The site listed above has dozens of graphics (in the .gif file format) to get you started.

DIGIPAN (Version 2.0)

http://www.digipan.net/

Have you tried PSK31 yet? This digital mode has grown in popularity over the last few years. It is relatively easy to set up by way of a simple interface between your transceiver and your computer's sound card. The program of choice for most folks dipping their toe in the digital radio communication waters remains DigiPan.

DigiPan stands for *Digital Panoramic Tuning*, which describes the program's "waterfall display" tuning system perfectly. Instead of tuning to a single frequency, the computer's soundcard interface allows for digital audio processing of a segment of the band a number of Hz wide. What makes PSK31 such a revolutionary mode is its ability to have a number of discrete signals within that small processed band segment. (The 31 in PSK31 stands for a mere 31 Hz.) The mode is highly efficient at both low power and under conditions of high QRN.

The newest version of the software allows for simultaneous tuning of all stations visible on the displayed frequency range. This makes identifying stations for potential QSOs a breeze. DigiPan requires a 266 MHz or faster Pentium CPU and it needs to run on Windows 95 or a newer version of Windows.

Many resources are available online to describe the proper way to interface almost any transceiver to the computer's soundcard. While coverage of all the interface possibilities would take up several columns, I can assure you that a bit of poking around the web and a few minutes with a soldering iron and some audio quality coax will get you QRV in this digital mode.

Setting up the software is a simple matter of establishing your personal settings and callsign. Once this is done, you can just dive in and get on the air *keyboard to keyboard*, so to speak. As you become more proficient at how communications are handled between hams in the PSK31 world, you can easily generate stock messages (What old time RTTY ops used to call *Brag Tapes*) to make things flow more easily. What gives me a kick when playing PSK31 with a software package such as Digipan is being able to carry on QSOs with a number of other hams all at the same time.

PSK31 is just the tip of the digital radio communications iceberg. The ham radio freeware world also can provide you with programs allowing you to use your transceiver and PC to use many other new digital modes, such as PKK31's bigger, faster brother PSK63. This mode, which can also be examined at the same Web site mentioned above, can display up to 24 simultaneous signals. In this case, the 63 in PSK63 stands for 63 Hz, still 1/5 the bandwidth of a common RTTY signal.

I've talked about only four freeware experiences you can have on the Internet. There are literally hundreds. And all the stuff out there isn't just for Microsoft Windows users. Many excellent programs are written for the Apple systems and even the diminutive PalmOS. And let's not forget the cutting edge work begin done by our Penguin friends, the Linux folks. The spirit of amateur radio is alive and well in the freeware movement.

Have fun. I'll see you on the bottom end of 40 meters.

UNCLE SKIP'S CONTEST CALENDAR

Missouri QSO Party
1800 UTC, Apr 2 - 0500 UTC, Apr 3 and
1800 UTC-2400 UTC, Apr 3

QCWA QSO Party
1800 UTC, Apr 2 - 1800 UTC, Apr 3

ARS Spartan Sprint
0100 UTC - 0300 UTC, Apr 5

ARCI Spring QSO Party
1200 UTC, Apr 9 - 2400 UTC, Apr 10

Georgia QSO Party
1800 UTC, Apr 9 - 0359 UTC, Apr 10 and
1400 UTC-2359 UTC, Apr 10

Michigan QSO Party
1600 UTC, Apr 16 - 0400 UTC, Apr 17

Florida QSO Party
1600 UTC, Apr 23 - 0159 UTC, Apr 24 and
1200 UTC-2159 UTC, Apr 24

Nebraska QSO Party
1700 UTC, Apr 23 - 1700 UTC, Apr 24

Clem Small, KR6A
clemsmall@monitoringtimes.

Antenna Types: Loop and Dielectric Antennas

As you probably know, Heinrick Hertz was the first to convincingly demonstrate electromagnetic (EM) waves to the scientific world. In fact, EM waves, which we often refer to as "radio waves," were once commonly known as "Hertzian waves." In this series on antenna types we've discussed how most of today's antenna types are either direct, or evolved descendants of the early antennas devised by Hertz. The dielectric lens and loop antenna which we discuss this month are no exception to this rule.

❖ Lenses for Antennas?

Maxwell, in predicting the existence of EM waves, had indicated that light consisted of EM waves. Thus Hertz understood that the EM waves which he had discovered were the same kind of waves as light waves, and they differed from light only in their wavelength. So it is no surprise that, borrowing from optical theory, he incorporated into his antenna systems prisms or lenses. These lenses were made of dielectric material, and could bend or focus radio waves just as glass lenses bend and focus light waves. The lenses for Hertz's antennas were made of dielectric material such as pitch.

Various antennas, such as the one shown in fig. 1A, descend from this work. Because of their size relative to their wavelength, dielectric antennas are practical only at microwave frequencies. A variety of different designs have been developed for constructing dielectric antenna lenses, and they find application in GPS receivers, wireless laptop computers, and other devices. And there is also a number of different designs for constructing antenna lenses from conductors such as shaped metal strips!

❖ Hertz's Loop Antenna

For reception of the waves generated by his spark-gap transmitter, Hertz often utilized a half-wavelength of wire shaped into a rectangular loop. His primitive, but effective detector was a tiny gap in the wire of the loop (fig. 1B). Each time he produced EM waves nearby, sparks would leap across the gap in the loop. The sparks were often so tiny that he had to use a magnifying glass to see them.

Not all loop antennas have the exact circuit of Hertz's half wavelength loop. Examples of non-Hertz loops include half wavelength "loops" with a second opening or break in the conductor directly opposite the feed point break; loops having elements formed from a full wavelength of wire; small loops with elements shorter than 1/10th wavelength; and small tuned loops such as table-top loops.

❖ Let's Make a Half-Wavelength, Hertz Loop Antenna

The appeal of the Hertzian loop presented below is its relatively small size, a somewhat directive pattern, and the ease of positioning that pattern to reject interference or reduce ghosting if used for reception of TV signals. The loop described below is intended for use near the receiver with only a short length of coaxial feed line. Obviously, then, it will usually be an indoor antenna.

Here are the steps for making your Hertzian half-wavelength loop antenna.

1. The loop is a resonant antennas, so decide the frequency at which you want the loop to function best. If you're going to use the loop for TV reception you can find the frequencies of TV channels at: **http://www.chem.hawaii.edu/uham/catvfreq.html**

2. Your loop can be designed for any commonly-utilized frequency; however, the resulting loop diameter increases as design frequency is lowered. So such loops are more practical at UHF and VHF frequencies than at HF or lower. At UHF and VHF it is convenient to use a 4-to-1 TV antenna-to-coax balun of the kind that are available in variety stores and merchandise marts as well as electronic-parts supply stores. There can be significant difference between baluns, so if you have more than one, compare their performance. This can be important if you are dealing with weak signals.

3. It is convenient to use a coax patch-cable as feed line with this antenna (fig. 1C). These cables have a male F-connector on each end, and are most often used as the cables used to connect TVs to VCRs or to CD players. You will also need an F-female to F-female adapter to plug this cable to the antenna balun (fig. 1D).

4. Use a reasonably large-diameter bare wire, such as number 12 house-wiring wire, for the loop element. Calculate the length of wire you will need from one of the following equations:

Length (inches) = 5904/freq (MHz)
or:
Length (centimeters) = 15000/frequency MHz

For example, a loop for UHF TV channel 56 (use 725 MHz) would be 5904/725=8.14 inches, or 15000/725=20.69 cm.

It's best to form the wire into a square or a circular shape. Before you decide to

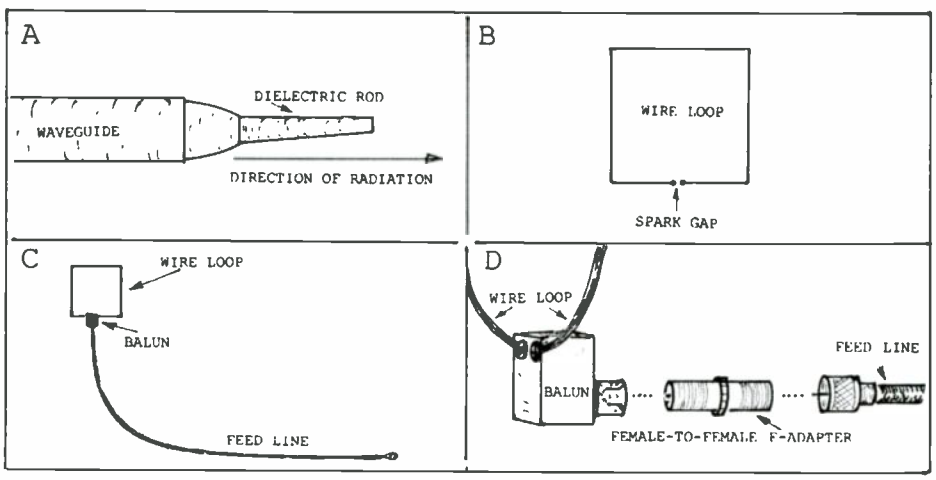


Fig. 1. a microwave dielectric-lens antenna (A), a Hertz-loop antenna (B), the loop antenna described in the text (C), and detail of the loop's connections (D).

This Month's Interesting Antenna-Related Web site:

On this site you will find many antenna topics covered:
http://www.ac6v.com/antprojects.htm

This next one is a Navy course in wave propagation, transmission lines and antennas:
http://www.cs.tcd.ie/Stephen.Farrell/ipn/background/US-Navy-NEETS/Module10-14182.pdf

Here's a short history of wireless communications:
http://www.sapiensman.com/old_wires/radiotelephony.htm

make a loop, you may want to have an idea of the size it would be at a certain frequency. To find this size, first calculate the loop's length. Then, if you make your loop in a circular form, use the following equation to determine loop size:

Loop diameter (inches or centimeters) = wire length/3.14

If you make your loop square, then its width and length will each be equal to wire length divided by 4.

5. Attach the loop's ends to the screw-terminals of the balun (the high-impedance winding), and use the F-adapter to attach the cable to the balun's coax socket (low-impedance winding) as in fig. 1D.

6. When using the loop, tune your receiver to the frequency or channel for which you designed the loop. EM waves are bent or reflected by many objects and surfaces inside a building, and the best orientation of the loop cannot be predicted in advance. So move the loop around in space, and rotate it also to get the best reception. You may find that the loop works OK on other frequencies than the one for which it was designed, especially when signals are strong.

7. Some convenient mounting procedures are: hanging the loop on a wall; mounting it on a small, non-conductive (wood, plastic, etc.) stand; or suspending it from the ceiling.

RADIO RIDDLES

Last Month:

I asked: "Typically, dielectrics (insulators) neither conduct electricity well, nor respond much to magnetic fields. So, since antennas function via electrical and magnetic phenomena, dielectrics have no function in antenna design other than to insulate conductors, or hold them in place. Right?"

Wrong! Obviously, from the discussion above, we know that dielectric materials can act as lenses for EM waves, and are useful in microwave-antenna design for bending or focusing the signals.

This Month:

The discovery of the principles of the Yagi-Uda beam antenna excited workers in radio technology. Its potential for high gain levels and sharp radiation-reception patterns gave antenna designers a much needed tool for producing highly useful, modest-sized antennas at wavelengths even as long as those on the HF band. Does this antenna, so apparently different from Hertz's antennas, owe any debt at all to Hertzian antennas? If so, then which ones? If not, then why not?

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

Marc Ellis
marcellis@monitoringtimes.com

Wrapping up the NC-57 Project

Last month, we were finally able to restore our National NC-57 to working condition and to begin the alignment procedure. We got as far as tweaking the i.f. stages, leaving the r.f. and oscillator adjustments for this month.

In order to carry out those adjustments on the NC-57, it's necessary to feed a test signal into the front end of the receiver via the antenna terminals. But when a set is designed primarily for use with an outside antenna, it's important that it "sees" an impedance similar to that of such an antenna when receiving the test signal. The manufacturer's alignment instructions often suggest simply feeding the signal through a 300-ohm resistor or a small capacitor.

❖ Building a Dummy Antenna

However, with radios designed for higher performance, such as the NC-57, the manufacturer will usually specify that the signal be fed through a "standard dummy antenna," sometimes referred to as an "RMA (Radio Manufacturer's Association) dummy antenna." I've never had one of these in my shop – but I've been working with so many communication receivers since writing for *Monitoring Times*, that I thought it was high time I had one. I put one together for myself, and so can you of you wish. It's very easy.

The circuit, which I'm showing here, is extremely simple and requires just a few small parts. The required 20 microhenry r.f. choke might be hard to find commercially, but it is easy to construct. One source specifies 49 turns of No. 30 enameled wire close-wound on a 1/2"-diameter plastic tube. Winding length should be approximately 1/2 inch.

I wasn't able to get my hands on a proper plastic tube in time for this article, but I did have some 1/2" wooden dowel stock on hand, which I felt would serve just as well. I took the precaution of baking the dowel in a 200-degree oven for a couple of hours after cutting it to length and drilling the mounting holes and the holes for the coil leads. I also substituted No. 28 wire, which I already had, for the specified No. 30. It took a bit of pushing and shoving to get this slightly larger wire into the suggested 1/2" coil length – but it worked out.

Before mounting the completed choke, I sprayed it liberally with clear lacquer to prevent water vapor from being absorbed by the wood core. The choke was mounted, on spacers, inside a small project box. Also mounted in the box was a terminal strip to accommodate the component interconnections.

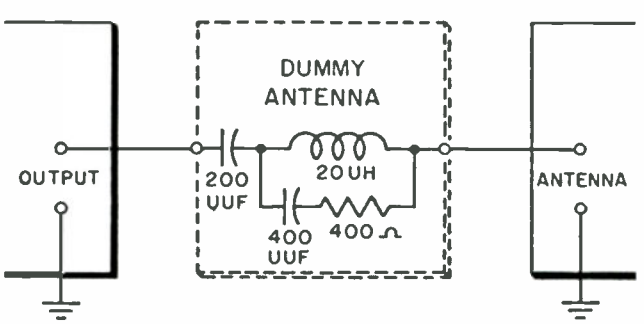
Leads to connect with the receiver antenna and ground terminals were brought out through a grommet at one end of the box and terminated in small spring clips. A bare screw to accommodate the signal generator ground clip and a binding post for the generator's hot lead were provided at the other end of the box. And that's all there was to it. I made one small departure from the schematic, running a connection, through the box, to ground the signal generator to the receiver.

This is a very worth-while one-evening (or less) project, and I highly recommend it to everyone who plans to work with communication receivers.

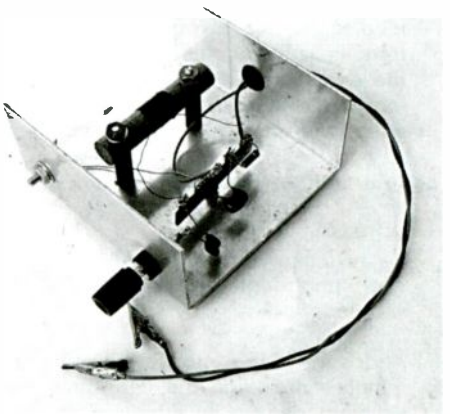
❖ Oscillator and R.F. Adjustments

With the modulated test oscillator connected to the receiver antenna terminals through the dummy antenna, alignment of the receiver's r.f. and oscillator circuits was a quick and straightforward procedure. All of the adjustment trimmers are conveniently located in a group under the receiver chassis. For each test frequency, there is an oscillator trimmer to be adjusted so that the dial frequency agrees with the signal generator frequency; then two r.f. trimmers are adjusted for maximum output at the test frequency. The second r.f. trimmer is usually the front-panel antenna trimmer.

Only one test frequency (at the high end of the band) is used for bands B (13.5 - 35.0 MHz), C (4.65 - 13.5 MHz) and D (1.9 - 4.65 MHz). Separate test frequencies for the high and low ends of the band are used for bands A (35.0 - 55.0 MHz) and E (0.54 - 1.6 MHz). As with the previous i.f. stage adjustments, I relied on an a.c. voltmeter connected (via a .01 uf capacitor) to the plate of the 6V6 audio output tube to provide output level indications.



Schematic of standard dummy antenna, showing its connection between signal generator (left) and receiver.



Completed dummy antenna with cover removed. See text for details.

❖ Refinishing the Cabinet Lid

The final loose end on this project was the badly scarred cabinet lid. Though other areas of the cabinet had their dings and scratches, I had decided to leave those alone (except for treating with a rubbing compound/wax). But the lid had apparently suffered from having heavy objects dragged across it for years and was definitely not fit to be seen.

After my first attempt at repainting the lid, I was very happy indeed that I had decided to leave the rest of the cabinet alone. It's not that it wasn't a great paint job. First, I treated the lid with a liquid sanding solution to give the new paint a grip, then sprayed with "Light Machine Gray" enamel paint from the Rustoleum "Professional" line. This was the closest color I could find at the local home center store and – in the store – it looked pretty close.

The paint laid down perfectly on the lid's metal surface and dried to a nice even gloss. But when I slipped the lid in place atop the cabinet, I could see that I had made a big mistake. The new grey didn't match the old grey at all and the perfect finish clashed with the somewhat battered finish on the rest of the cabinet.

The lid seemed to be screaming "I have

With restoration complete, the NC-57 is buttoned up in its cabinet once more.

been repainted to cover God knows what by an amateur with terrible taste in paint selection." Last weekend, I attended a radio meet and saw a very nice Hammarlund receiver that had been treated the same way. Its gray front panel had been left original, but the entire cabinet had been sprayed with a generic grey similar to mine.

It was a nice paint job too, but obviously not original. The effect just cheapened the set and made it look tampered with. I'll bet it would have looked better with the original finish, perhaps polished and touched up a bit.

But getting back to my own problem, I decided I would have to repaint. I visited an auto store touch-up paint department, where there would be a much wider color choice, bringing with me a piece of the radio cabinet for reference. There was nothing that exactly matched, but I eventually selected a gray with a greenish cast that seemed to be at least in the same ballpark as that of the original cabinet paint. It was "Plasti-Kote Car Color" acrylic lacquer and the shade was GM-7203.

Spraying over the original finish, I was just beginning to admire the new color when I noticed that it was wrinkling and loosening in several spots. Checking the fine print on the can (I needed to use a magnifying glass along with my normal specs), I was informed that such wrinkling might take place over repainted surfaces but not over original paint.

Using lacquer thinner, mineral spirits and fine steel wool I was eventually able to scrub away the new and previous coats, leaving what remained of the original finish. This time, the paint adhered properly. Readers who look at the result in color on "MT Express" will see that I still don't have an exact match. But the new paint doesn't look incongruous next to the old paint and its mild hammertone finish softens the previous "too perfect" look.

❖ Our Next Project

Well, we've been concentrating on receiver restorations for awhile, so how about a change of pace? It's been some time since we worked on a test instrument and I have a very useful one in mind; it's the r.f./a.f. signal tracer. In preparation for this project, I've picked up two different signal tracers commonly found at antique radio meets and hamfests. One is a Heathkit IT-12; the other an Eico 147-A. Both Heathkit and Eico made various models of this ubiquitous instrument over the years, but they are all quite similar in concept and design.

Normally, I recommend looking for instruments designed for the radio service trade rather than for hobbyists. But there is no commonly available service instrument of this type, while the Eico and Heath units are easy to find and entirely satisfactory. Battleship construction is not essential in a signal tracer and there are no calibration issues to worry about.

The Eico and Heathkit units I've selected are very similar in concept and design. Both are essentially high-gain amplifiers whose output is fed to an output transformer, speaker, and magic-eye output indicator. The signal from a broadcast station or modulated r.f. generator can be fed to the input of the amplifier through an r.f. probe containing a crystal detector – and hence will be audible through the speaker and give a visible indication on the magic eye tube.

Straight audio signals go into the amplifier from a plain probe, and will also be heard in the speaker and be visible on the magic eye tube. In the case of both instruments, one can separate the output transformer and speaker from the amplifier and connect directly to the output transformer primary. One can also separate the speaker voice coil from the output transformer secondary and connect directly to the voice coil.

So how does one use these devices to trouble-shoot an inoperative radio? Well, you could feed a modulated test signal into the radio, then touch the tracer's r.f. probe, in sequence, to the grid and plate of the set's r.f. amplifier (if present), mixer, and i.f. amplifier or amplifiers to check for the presence of a signal. If the signal disappears at any point, you have found the location of the fault in the radio. Diagnose by checking voltages at the problem tube.

If the signal is present at all those points, you could switch to the audio probe and check the plate of the detector tube as well as the grid and plate of the audio output tube and the secondary of the output transformer. Signal still present? The set's speaker could be dead. You verify this by clip-leading the radio's output transformer secondary to the voice coil of the tracer's internal speaker. Does the radio play through the tracer's internal speaker? If so, you've found the trouble.

Now there are various other quick and dirty ways of finding a defective stage in a radio receiver. For instance, working backwards through the set, you could inject appropriate audio or modulated r.f. signals from your signal generator into various stages to see where the signal disappears. One can even (also working backwards) simply touch a metal screwdriver to the various tube grids; if the stage is passing a signal, you get a hum.

But one thing these signal tracers offer that can't be duplicated by the simpler methods is an indication of whether the stage being tested is providing normal gain. We'll deal with that issue next time, when we get one of these units into operation and put it through its paces.

The Heathkit and Eico units sell for an average price of 10 or 15 dollars – though the test probes are often missing, requiring you to make your own. This is not a difficult task. More next time!

Next month we'll take a look at signal tracers, using the Heathkit IT-12 (left) and the Eico 147-A (right) as examples.

MT REVIEW

Tivoli 'Model Satellite' Sirius Table Radio

By John Figliozzi

Tivoli Audio has introduced what it terms "the world's first satellite table radio designed exclusively for home use with Sirius Satellite Radio." Promotional material from Tivoli describes the partnership between itself and Sirius as an effort "to bring to market elegantly simple, yet technologically sophisticated satellite radios for home use."

Designed by Tivoli's CEO Tom DeVesto and based on the company's popular and award-winning Model One, Two and Three table radios engineered by the late, legendary Henry Kloss, the radio is indeed eye catching. It's also more compact than one initially expects, measuring only 8-3/8" W x 4-1/2" H x 5-1/4" D and weighing in at a mere 3.7 pounds. But how does it work and sound?

Tivoli supplied me with one of its two prototype radios over last summer's Independence Day weekend and I put it through its paces. (The prototype differed in some minor respects – mostly cosmetic – from the finished unit now provided by Tivoli.) In short, I was quite impressed; but it was obvious that some shortcomings were still to be addressed before the radio would be ready for general release around the first of the year.

❖ The Tivoli Look

As with all of Tivoli's line, the design is straightforward and handsome with a rich wood cabinet – in this case, cherry. The audio is true and powerful, something that is all the more impressive when one beholds the size of the instrument that's producing it.

This is a three band radio – AM, FM and Sirius. It resembles most the Model Three clock radio, with a top mounted speaker and a screen display replacing the analog clock. The display is surrounded by a number of small silver function buttons. To the right of the display (when facing the radio) are a remote control signal receive port, a light sensor and two LEDs, one green that glows to indicate that the radio is turned on and one amber that glows according to the relative strength of the AM or FM radio signal being received.

Above and below the LEDs are two "champagne-toned" knobs. The upper one raises and lowers the volume of the audio; the lower one selects the band (Sirius, FM, AM in that order left to right) or an auxiliary audio source if one is used. My prototype also used this knob to turn the radio on and required the user to rotate through the FM and AM bands if one wanted to choose Sirius. It appears from Tivioli's supplied photos that production models will not be hampered as such.

On the right side of the radio's "beige metallic" faceplate is a simple, smooth as silk, geared down five-to-one ratio, analog FM and AM tuning knob. As with all Tivoli Audio products, there is no treble or bass control on offer. That is in keeping with the company's commitment to simple operation. The Sirius display, however, provides something of a challenge to that tradition.

The display carries only the time – in a choice of numerical digital or digital analog clock format – and the date, when the Sirius band is not selected or the unit is turned off. Time can be in a 12 or 24 hour arrangement and the initial setting asks for time zone and whether DST is in effect. Once set, the clock is self-correcting if one decides to disconnect the radio from mains and move it to another location. The display on the production model is a "cool blue." Other time-related features include an alarm, program alert time, auto shutdown and a 20 minute lull to sleep mode.

❖ In Sirius Mode

When Sirius is selected, the display (at least on the prototype) looks identical to the one adorning the Audiovox line of Sirius receivers. The screen on the prototype was most visible only from a straight-on angle. One hopes that the display on the production version will be visible from a wider perspective. There are settings for display contrast, dimming, auto-dimming, along with a choice of four print font types.

The display gives the user feedback on the many options available when accessing the Sirius band. There are four banks (A, B, C and D) of memory with five in each, giving up to 20 presets. One can engage an auto search mode or "clear all" function in conjunction with those presets. Streams can be locked out as a parental security feature. A user also can add or skip presets from auto search. A tone to confirm that a function has been implemented can be utilized or deactivated.

There are other helpful features as well. Each of the now over 120 individual Sirius satellite program streams can be directly tuned. The user can also carousel in either direction through each stream or through the dozen or so stream categories (e.g.: pop, rock, jazz, news, sports, etc.) in sequence. As an aid to antenna placement, there's a ten step signal strength indicator that can be dialed up. There's also a ten step general volume control feature that adjusts modulation levels to maximize audio fidelity and avoid distortion. All of these functions can be controlled directly by use of buttons surrounding the Sirius display screen or by using the supplied remote control device.

❖ Impressive Sound

One need not fear weak or distorted audio in a Tivoli engineered radio. A heavy magnet, long throw, three inch driver is allied to a multi-stage frequency contouring circuit that adjusts the speaker's output over half octave increments. Tivoli claims this approach produces "musically accurate total balance and bass response." Hearing is believing, I say, and I was more than impressed. Even at full volume, there was absolutely no hint of distortion and the radio was easily heard in my back yard to a range of up to 100 feet, even over the din of the interstate traffic through the woods behind my house.

Instead of a standard off-the-shelf integrated circuit, Tivoli uses state-of-the-art discrete-component FM tuner

technology featuring GaAs MES-FET mixers, originally developed for cellular telephones. Without making this an technical training exercise, let's just say that the technology as implemented by Tivoli provides for superb FM reception and increased clarity of closely spaced stations. Tuning through the FM band accurately is greatly assisted by the combination of a large geared down 5:1 tuning analog tuning knob and a variably lit amber tuning indicator.

❖ Options

While this table radio works and sounds fine all on its own, the rear of the set features inputs for other compatible Tivoli Audio components including a companion speaker, a CD player and a subwoofer that can turn the unit into a small, diverse and powerful audio entertainment center. There also are inputs for the 12 volt adapter, the supplied satellite antenna and an FM external antenna for enhanced reception in weak signal areas. In my experience, use of some sort of external antenna appears advisable – even the supplied short length of insulated wire – as only the strongest stations locally (within 25 miles of my listening location) gave optimum results. A jack for headphones (not supplied), a time set button, plus switches optimizing the radio for use of the internal or external FM antenna and monoraul or stereo (with optional companion speaker) output round out the roster of back side controls and inputs.

As good a performer as the Tivoli Model Satellite Sirius table radio is, there are some relatively minor concerns. One is heat. The Sirius microprocessors generate a considerable amount of it. The incorporated heatsink appears adequate to dissipate it, but one wonders if the life of the unit as a whole might eventually be affected. (I own several other Sirius receivers – some for nearly two years now – and can report that similar heat generation hasn't been a problem for them yet. In any event, the Model Satellite carries a one year warranty.)

Another concern is AM/MW performance. One should not purchase this radio expecting a DX machine on that band. To be perfectly frank, AM/MW performance (at least without use of the supplied "AM loop" antenna, which was not available for this review) is substandard, with only local stations showing up and skywave reception at night wholly unimpressive. Apparently, ALL of the effort with this model has gone into FM and satellite reception.

Finally, the satellite receiver components of the unit generate considerable "hash" in the proximity of the unit itself. Therefore, it is recommended that the supplied external AM and FM antennae be located as far away from the unit as possible.

❖ The Verdict

With those minimal caveats, the Tivoli Model Satellite Sirius table radio – retailing for $299.95 – is an impressive looker and performer and can be heartily recommended for those seeking truly superior audio as well as impressive FM and Sirius satellite reception in a deceptively small and attractive case. Packed with the unit are a short length of insulated wire to serve as an external FM antenna, a Sirius satellite antenna, a simple external AM loop antenna, a power supply and a remote control with battery.

For more information on the Tivoli Model Satellite and a pdf file of the receiver's owner's manual, refer to **http://www.tivoliaudio.com**. For more information on Sirius Satellite Radio, as well as this and other Sirius-inspired products (an entirely new line went on sale for the holidays), refer to **http://www.sirius-radio.com**.

Four-Forty and More for Very Few Pfennigs

By Alan Bosch

The antennas described here were born after an e-mail exchange with Al Lowe/ N0IMW of Arrow Antennas, who graciously explained how his excellent OSJ coax-fed open stub J-poles work – and why they are so broadbanded.

That was the "Eureka!" moment. Why not build one and see if it might cover both the 440 and GMRS/FRS bands? It would certainly be a useful item for Amateur Radio Emergency Service types working with local Citizens Emergency Response Teams.

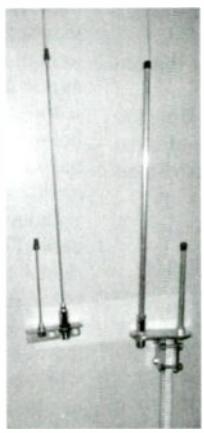
Below are two versions: one junkbox special made from chunks of an old K-40 whip and a piece of 1-inch aluminum angle, good for portable use and light enough to be installed on a collapsible mast; and one much more elegant unit made of 3/8-inch aluminum rod and a heavy dipole bracket, suitable for base installation.

Both rely on the equation that a quarter-wave equals 2808 divided by the desired frequency in MHz.

They are tuned to 455 MHz to straddle the range from 442-468 and snag the repeaters in both bands, which means a stub a smidge over 6 inches long (6.17, to be exact) and a radiator 3 times that. I rounded them up to 6-1/4 and 18-3/4 inches, to favor 440 a bit. Happily, this configuration is not picky: both resonate between 1.2 and 1.5:1, depending on the band and which segment you're checking. (Make sure the feed line drops straight away from their mounts for at least a couple feet.)

Now for construction –

Construction is a cinch, since each version has under half a dozen parts: the two elements, a mounting bracket, a 3/8x24-to-SO-239 mount adaptor (Lakeview-Hamstik's #275 **http://www.hamstick.com**; 864-226-6990), and a washer or two. (Don't forget to allow for the length of the elements' anchors when you're cutting them, and be careful with any washers so you don't create a short to ground.)



As for the junquebox version, the aluminum angle is 4" long and needs be drilled with its 3/8" radiator and stub holes 2" apart. While you're at it, make two more holes in the other portion of the angle for a standard 1-1/4" mast clamp, centering them on the radiator hole. Attach the radiator with one of the SO-239 adaptors, using a star washer underneath to make it snug, and the stub with a 3/8x24 mobile mount nipple. (The rod tips are wire nuts stuck on with cyanoacrylate gel.)

As for the elegant version, be prepared to thread the aluminum rod with a 3/8x24 tap you can also get at the hardware store, cutting the threads down 3/4". That's surprisingly easy to do, provided you go slowly and keep the tap plumb on the rod. The dipole bracket I used for mounting is from Eagle1 Communications (*eagle1com@adelphia.net*; 304-264-9069). It comes with two 3/8x24 mounts, pointed in opposite directions. You can either flip the grounded one and use it for the stub, or anchor that with two hex nuts like I did.

Finally, there are at least three ways to install this J-pole: on a mast, from the ceiling or a tree with nylon line, and – the light one, anyway – on a window using the suction cup hooks from sun-catchers at the base, the top of the stub, and 2/3 of the way up the radiator. (Be sure to get cups with liftoff tabs, or they can be the very devil to detach.)

So, go ahead and roll your own and add another arrow to your emcomm quiver.

Small Space FM Reception Solutions: Terk's Artful Indoor Antennas

By Ken Reitz

Office workers and apartment dwellers can face a daunting challenge trying to pick up AM and FM signals where they live and work. At work, signals bounce crazily off dozens of tall buildings, creating a bouquet of multi-path distortion. Banks of fluorescent lights flicker and sputter, computers and monitors of every age and condition, packed side by side and wall to wall, create a din of RF hash which might have made Marconi think twice about bothering at all with his invention.

An on-line computer might be a good FM solution, but not everyone working in a cubicle will have a high speed line or a computer with speakers. And, having a satellite radio boom-box on your desk a la those XM commercials is not as easy as it seems. Many desks and cubicles aren't close enough to a window to allow the satellite signal near the antenna, even if you felt comfortable keeping a pricey item like that on your desk.

In the apartment, space is at a premium, and often without a balcony or other way to set up an outdoor FM antenna. And, it's often impossible to get an adequate signal from either of the two satellite radio services. In both cases, office workers and apartment dwellers have to make the best of a bad situation.

❖ Radios for Work While You Work

The first step is to try to get a radio which will work in either or both situations, so, it's back to the store for a suitable radio, but which one? Here are some things to look for in a good desktop radio for work.

Portability. The radio should be able to be stuffed into a locked desk drawer or popped easily into a tote bag or back pack.

Cheap but not junk. It should be inexpensive enough so that you won't get hysterical if it's lost or stolen.

Antenna friendly. It should have an external antenna connection (screw terminals, FM coax connection or small antenna jack).

Among the likely candidates are the old faithful GE Superadio ($60); the Sangean ATS505P ($110); or the Grundig Yacht Boy 400 PE ($130). These radios are available at most electronic retail outlets or through the Grove mail order catalog.

❖ Help for the Desktop Radio

Many small AM/FM radios have either inadequate power cord antennas or dinky telescoping whips which are usually the first things to break. If you can't put up an effective outdoor antenna, you have to do whatever you can to improve reception. That's where two products from Terk Technologies might help.

I've got to hand it to the design team at Terk. Their desk top, indoor FM antennas are truly works of art. With glowing LEDs, imaginative shapes, and attractive finishes, the AM/FM Q and the AM/FM Pi-B are worth the price as object d'art. But, how do they perform?

First, let's be under no illusions: no antenna that sits on your desktop will replace an outdoor multi-element antenna. Second, the AM portions of these antennas are small non-tunable loops which do help to bring in AM signals but are no match against larger tunable AM loop antennas such as the Select-A-Tenna or the Radio Shack AM loop antenna (no longer in production).

Both Terk antennas feature individual AM and FM antenna leads and are powered by wall cube style power supplies (included). Both come with a 1:1 75 ohm balun. Both units feature a built-in antenna amplifier with an unobtrusive gain control on the back. The Terk Q also has an antenna tuner in addition to the amplifier. The amplifiers on each are active only on the FM band.

The Terk Pi-B

The Terk Pi-B looks like a 5-1/2" diameter graphite black disc balanced on a small, round, brushed aluminum base. An LED at the bottom of the disc, which indicates when the unit is plugged in the wall, casts an purplish light on the aluminum surface. An outer loop with only a small gap between it and the disk is the AM part of the antenna. The AM receive position is tipped 90 degrees away from the FM antenna. When you do this, the LED turns from purple to blue. I found the AM antenna of marginal use.

On the FM band the Pi-B's gain control, hidden on the backside at the top of the disc, could remove FM hiss from a weak signal and make it listenable. Further, setting the antenna as high above the radio as possible and rotating it for strongest signal, helps turn a poor signal into one that you could listen to for hours without straining your ears. The "B" in the model name indicates the color black. An identical model called the Pi-W was made in white but is no longer available.

Did that thing just land on your desk? It's Terk's Pi-B AM/FM desktop antenna. The "disk on-edge" silhouette, perched on a brushed aluminum base, has an eerie light from its LED which will get stares and comments from fellow workers. Retail: $44.95 (Courtesy Terk Technologies)

The Terk Q

The Terk Q is essentially an amplified, tunable, FM antenna just 5" by 5-1/2". The FM antenna sits off-center on a heavy brushed aluminum foot with rubber, non-slip, and non-marring strips on the bottom. The black rippled piece of plastic behind the gray FM antenna is the unamplified, non-tunable AM antenna.

The execution of the design of the Terk Q antenna is beautifully done. The unit is very well built and looks like it could take a tumble off your desk and not even blink its little LEDs. There are eight of them in a bright green hue at the lower left of the antenna. As with the Pi-B, the Q's AM antenna works best when pushed down 90 degrees to the FM antenna. I found it brought marginal improvement and couldn't compare to the Radio Shack loop.

A design from the future for a technology out of the past. It's the Terk Q AM/FM desktop antenna with modern, understated styling and packed with unseen features Retail: $69.95. (Courtesy Terk Technologies)

When the amplifier is turned off, there is only one red LED which indicates the portion of the band to which the antenna is tuned. Control of both the amp and the tuning is done with two small thumb wheels which are hidden on the lower right hand side of the antenna.

As the amp is turned on, the LEDs get brighter to indicate how much gain is being used. With the tuning control turned off, all LEDs turn red to indicate "wide band" mode. In this mode the antenna cannot be tuned to peak the signal. You would use this mode in an environment where signals are fairly strong to begin with.

Bottom Line

Of the two, the Terk Q is the better performer. Success with these antennas depends on your own location and assorted local reception difficulties. Remember these tuning tips: Place these antennas as far away as possible from stereos, TV sets, and other sources of high density electric fields to avoid amplifying the noise and not the signals, and carefully rotate the antenna for best signal. Buy only from a company with a good return policy in case it provides no improvement for your situation.

Both antennas come with a small sheet with operating instructions and tips on better reception. Both are available from Universal Radio (800-431-3939 or **http://www.universal-radio.com**). These antennas are made in China.

Jock Ellitott
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The Kestrel 4000 –
A Weather Station You Can Put in Your Pocket

Recently I read an excellent book called *Deep Survival, Who Lives, Who Dies and Why* by Laurence Gonzales. His book is definitely not about how to rub two sticks together, start a fire, and save your life. Instead, it's about a lot of survival-related stuff, including the neuro-physiology of why we take risks, why some people ignore clear signs of imminent danger, why some folks with no experience and no equipment survive and why others with superb training perish. It is one of the best books I have read in quite some time, and I commend it to you highly.

One of the more fascinating aspects of *Deep Survival* is that sometimes experienced outdoorspeople will ignore clear signs of imminent danger and go ahead and do things that get them killed. For example, a snowmobile search and rescue team that insists on "high-marking" on a dangerous slope when they were told explicitly about the avalanche danger. Or the expert river runners who died when they insisted on running a river that was flooding well above safe levels. Sometimes folks just ignore the clear signs: Bad Things will happen if you do this.

But we modern folks often don't know how to read nature. We aren't the woodsrunners of 250 years ago, who could "read sign" simply by paying attention to the natural environment. Sometimes the thing we need to pay the most attention to is the weather. That's why I think the Kestrel 4000 Pocket Weather™ Tracker™ is a really worthy piece of gear – especially as we head into severe storm season.

❖ Kestrel 4000 Pocket Weather Tracker

The Kestrel 4000 is literally a pocket-sized weather station. It measures altitude, barometric pressure, pressure trend, relative humidity, heat stress index, dewpoint, wet bulb temperature, density altitude, wind chill, air temperature, water temperature, snow temperature, current wind speed, average wind speed, and maximum wind gust. It weighs 3.6 ounces, and measures 5 inches by 1.8 inches by 1.1 inches. Powered by two AAA batteries, the Kestrel 4000 will run over 400 hours on one set of fresh alkaline cells and will last about 24 months between battery changes while stored.

Further, the Kestrel 4000 is not only waterproof but it floats, and it comes in olive drab or safety orange (so you can see to fish it out of the water).

It can internally store 250 data points and will operate in one of five different languages: English, French, Spanish, German, and Italian – you choose. With an optional interface, you can upload data from the 4000 to your computer.

On the top of the Kestrel 4000 is a cover that you flip open to expose the impeller for wind speed measurements. To the left of that are sensors for temperature and humidity. In the center of the face of the Kestrel 4000 is a backlit liquid crystal display.

There are just eight buttons on the face of the 4000. The lower left button turns the unit on and off. The upper left button stores data. The upper right button is for the display's backlight. The UP and DOWN buttons are used to select the measurement you want to view: temperature, barometric pressure, and so forth. The LEFT and RIGHT buttons are used to select the view of the data that you want to see. Finally a button in the middle of the UP, DOWN, LEFT and RIGHT buttons is the ENTER key.

❖ The Kestrel in Action

So here's how it all works. Assuming the unit has been taken through its brief initial set-up, suppose you turn the Kestrel 4000 on and find yourself looking at the temperature screen. Press the UP button, and you can view wind speed. Press DOWN, and wind chill pops up. Press either the UP or DOWN button continuously, and you can cycle through all the measured parameters.

The Kestrel 4000 literally puts a weather station into your pocket.

But let's go back to the temperature screen for just a moment. Let's say it says 65.9 degrees F. Press the RIGHT button, and immediately you'll see the readings for minimum, average, and maximum for the data since the last time the Min/Max/Avg log was cleared. (The Min/Max/Avg log can be reset at anytime without losing any stored data.) Press the RIGHT button again, and you'll see a chart that graphically displays the temperature history for the stored data (ranging from the last 8 minutes to the last 4 months, depending on how often the Kestrel is storing data).

That's all there is to operating the Kestrel 4000. Further, from any "view" (basic measurement, min/max/average or chart), you can jump to the same view of another measurement. So if you want to compare how temperature is tracking over time with how barometric pressure is tracking over time, you can do so with just a few button pushes. You can also create your own user-defined screens where you can view three parameters of your choice at the same time.

❖ Bottom Line

In my view, the Kestrel 4000 is an excellent and essential piece of gear for serious outdoors folk, search and rescue teams, and the like. Use it wisely, and it could keep you out of harm's way. The SRP of the Kestrel 4000 is $329 and seems worth every penny.

For more information, visit **http://www.nk-home.com**, call 800-784-4221 or 610- 447-1555, or write Nielsen-Kellerman, 21 Creek Circle, Boothwyn, PA 19061.

What's so Super about the Super-909?

By Jim Clarke, NR2G

While listening to my favorite shortwave broadcast one evening, the usual group of timed advertisements interrupted the show. One of the items advertised that night was a radio called the Super-909. My ears perked up as the announcer described the modifications involved in transforming a Sangean ATS-909 into a Super-909. Boasting fantastic audio, beautiful backlighting, better sensitivity and selectivity, among other things, I thought it was worth going to the company's web site, **http://www.radiolabs.com,** to see what it was all about.

The RadioLabs company, based in Fortuna, California, specializes in radios, radio modifications, antennas, and features the Super-909 on their web site's homepage. The specifics of the Super's modifications are listed in Table 1.

Table 1. Super-909 Modification Summary

Green display LEDs replaced with blue
Tuning knob detents removed
Tuning mute disabled (eliminates "chuffing")
Increased sensitivity
Upgraded IF filters
Upgraded speaker
Modified audio passband
Gold RCA antenna jack added to back panel

I've had a few portables in my time, so I was curious to see not only how well the ATS-909 performs, but just how much better the Super-909 really is. So, I contacted Chris at RadioLabs, and expressed my interest in doing a comparative review of the two radios for *Monitoring Times*. To my delight, he agreed to send one of each, and, just in time for Christmas, they both arrived.

Since the ATS-909 has been around for more than seven years, and has had numerous reviews written on it (reviewed in *MT* by Lawrence Magne, Sep 1996), I am going to concentrate on comparing the two radios with respect to the list of modifications carried out by RadioLabs. Additionally, from this point on, I will refer to the Super-909 as S909, and the ATS-909 as A909.

❖ Display Backlighting

RadioLabs swaps out the stock green display LEDs with a set that has a cool blue color. The blue seems more readable to me, and it also appears to be a little brighter. The contrast also looks better in low ambient room light or total darkness.

❖ Tuning Detents

The A909 has a detented tuning knob. Whether this is good or bad depends on what you personally feel more comfortable with. I prefer no detents, but the negative side of the trade-off is accidentally changing the frequency by bumping into the tuning knob. Obviously, engaging the front panel lock, or setting the manual-tuning step to stop, would avoid this.

On the positive side of the trade-off is smooth tuning while clarifying SSB signals. In addition, without those detents, you can easily turn the tuning knob using the tip of your finger.

❖ Anti-Muting

The tuning knob detents weren't the only things to go in the S909. The muting function that takes place when changing frequency has been disabled. Now, when you turn the tuning knob, not only does it feel smooth, but also sounds smooth; no more "chuffing."

On the negative side of the trade-off, you may hear a very short burst of noise in the speaker when jumping from one frequency to another using the keypad.

❖ Sensitivity

Sensitivity is another area in which the S909 is claimed to show improvement. Unfortunately, as seen in Table 2, the sensitivity measurements of the A909 and S909 that I tested were virtually equal. A cursory check of AM sensitivity yielded different measurement numbers, but, again, they were comparatively similar.

Perhaps I received a hotter than normal A909. Although the sensitivity is very similar, it should be noted that it is very respectable for a portable receiver.

Table 2: 10dB S+N/N Measurements, USB mode

Frequency MHz	ATS-909	Super-909
0.425	3.50 uV	3.80 uV
1.000	1.41 uV	1.55 uV
1.700	0.65 uV	0.67 uV
2.500	0.30 uV	0.32 uV
4.500	0.18 uV	0.19 uV
6.500	0.16 uV	0.18 uV
10.500	0.16 uV	0.17 uV
14.500	0.19 uV	0.18 uV
20.500	0.15 uV	0.17 uV
29.500	0.16 uV	0.18 uV

❖ Selectivity

Finding a portable in this price range with ideal selectivity can be problematic at best. The buyer is typically stuck with the compromises the manufacturer has built into the radio, with the exception of, in some cases, replacement filters offered by a third party. For example, Kiwa offers optional filters for the Sony 2010, available in a do-it-yourself install kit, or as a mail-in upgrade package.

For the purpose of this review, I did a rather crude "overall receiver selectivity" check. That means my measurements not only yield response characteristics of the IF filters, but are also influenced by the traits of all other RF and AF signal path circuits from the antenna to the line-out jack. I decided to measure the 6 dB bandwidths in SSB and AM, including the wide and narrow widths – in AM only – with the results shown in Table 3.

Table 3. Bandwith Measurements

Radio	Mode	Filter	6dB Width (kHz)
S909	AM	Wide	7.5
A909	AM	Wide	5.1
S909	AM	Narrow	6.2
A909	AM	Narrow	3.7
S909	USB	NA	2.3
A909	USB	NA	2.5

The measurements support one of the things I liked most about the S909: both wide and narrow bandwidths yield usable and useful audio. I don't know how manufacturers – for this type of receiver – decide what bandwidths to provide, but it usually seems like the narrow setting is too narrow. The very thing that you are depending on to eliminate adjacent-channel interference ends up ruining the audio of the desired signal. In the S909, the wide bandwidth really is wide, providing increased fidelity when listening to AM signals that have little or no interference. The narrow is just a little wider than the standard A909's wide bandwidth.

The only negative that I observed here was that, even in the narrow position, the S909 didn't eliminate adjacent channel heterodynes to the same degree that the A909 wide filter did. Although heterodynes were occasionally heard, their levels were completely within tolerable levels, and were offset by the quality of the received audio.

❖ Audio

That brings us to the speaker, and, I must say, this modification really jumps out at you when you tune into an FM broadcast of classical music. The crispness and fullness of the S909 audio is, well, super. And, yes, the difference is also noticeable when listening to shortwave broadcasts. I own one of the early YB400 (Yachtboy 400) receivers, but I experience audio fatigue after such a short time that I can't bear to listen for extended periods, let alone gain any pleasure from just tuning around. The sound of the S909 is as much of an improvement over the A909 as the A909 is over my YB400.

It's not my intent to portray the A909 as having poor audio, because it doesn't – it's just that the S909 sounds so much better.

❖ What comes with it?

The S909 ships with the same complement of accessories as the A909. A 120 Vac to 6 Vdc wall adapter, a nice carrying case, stereo earpieces, and owner's information packet round out the contents of the box.

❖ Bottom line

I must say that I am as curious as I am disappointed with the sensitivity measurements of the S909. It doesn't lack sensitivity; I guess I just expected at least a little difference between the two 909s. Perhaps, at one time, the S909 did have better sensitivity than the typical A909, but since then Sangean has apparently made a circuit change to improve it.

Despite that surprise, I found the S909 package as a whole to be worth the money. RadioLabs takes a very respectable portable radio and "kicks it up a notch" to stand head and shoulders above its A909 siblings. Now if I could just find the cash lying around, I'd go ahead and buy one.

❖ How to get one

RadioLabs sells the S909 direct for $329.95. If you already own an A909, you can ship your radio to them, and, for $109.95 plus two weeks of time, they will transform it into an S909. After any A909 is converted, it goes through a 24-hour operational burn-in period, to ensure quality, before shipment.

❖ Other cool stuff

RadioLabs also sell some nifty portable solar power packs. One package includes a 10.4 Watt folding solar panel, an 8 AH battery with charging circuitry, a 12 Vdc input to 3-12 Vdc 1 A output converter, plug and play cables, and an S909. To see more, visit their web site at **http://www.radiolabs.com** or write for a catalog at RadioLabs, 1136 Main Street, Fortuna, CA 95540; call toll-free (877)575-3700.

These types of power packages seem to be popping up more and more lately. Let us know if you'd like to see a comparative review

John Catalano, PhD
johncatalano@monitoringtimes.com

Protect Your Computer With a Radio and Listen to Your Table

When I built a new home and moved into my rural town a decade or so ago I was surprised but pleased to see so many vertical antennas adorning the roofs. I knew that I had picked a location to live that was heavily wooded, sparely populated, beautifully nestled between two mountain ranges and on the shore of a huge clean lake. But having all these radio enthusiasts as my town folk, well that was an unexpected bonus.

I did find a few facts strange. All of the antennas were verticals. No dipoles, beams or ground planes. They all seemed to be installed in a similar manner, on chimneys. And finally, I noticed they were cut to roughly the same VHF frequency. It appeared that they didn't allow SWLers, HF Hams or CBers in this part of New England.

A few weeks later the mystery was solved. While looking through the newspaper I noticed that many of the houses for sale in my town listed "wireless security" as a included feature. That's when I remembered reading about the Repeater Ring Security method, which utilized the newly FCC-auctioned VHF/UHF frequencies around 300 MHz.

This frequency auction occurred on the heels of the 800/900 MHz cellular frequency auctions that made instant multimillionaires of the successful bidders. Thinking that history would repeat itself, there was a feeding frenzy when the 300 MHz frequencies were auctioned; resulting in outrageous over-inflated bids and therefore buy prices.

Once the winners realized that the spectrum they now owned did not behave as "nice" as the higher frequencies for cellphone applications, they were stuck. They had paid an exorbitant price for useless radio spectrum. I know many technical consultants who were contracted by the auction "winners" to find a use for their spectrum. The Repeater Ring was one of the few concepts that was commercialized in an attempt to use this spectrum. The Repeater Ring was targeted at rural towns with miles separating each of the member houses.

A number of different radio schemes were implemented. But essentially the main monitoring security station "listened" for each member house to transmit a signal in a given period.

If, however, a break-in occurred, the signal would stop. This lack of signal at the appointed period indicated a security breach and the main monitoring security station then notified the police. As of the late 1990s when I was last involved with "spectrum investors," this use had not proven to be a business success.

Interestingly, the Wireless PC Lock product uses a very similar method to provide personalized access to any computer.

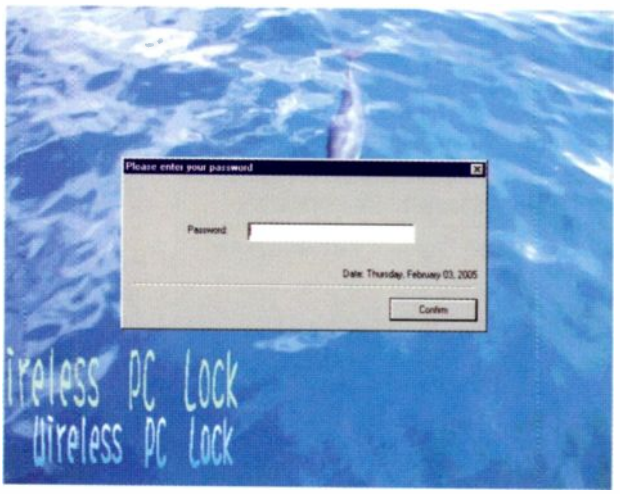


Figure 2 - You've traveled too far from your computer. The Lock-Out screen.

Figure 1 – Wireless PC Lock's silver dollar sized pocket transmitter and USB receiver.

Old Concept - New Use

The PC Wireless Lock is actually two units, Figure 1. The authorized PC user carries a small silver dollar sized battery-operated 315 MHz transmitter. A companion receiver is connected to, and powered by, the computer's USB port.

Once installed, five seconds after the receiver loses the transmitter's signal, the PC goes into lock-down, rendering the keyboard and mouse useless. Loss of signal can be due to physical separation of over 7 feet between the transmitter and PC, or as a result of the user switching off the transmitter.

The PC can be brought back to life by either bringing the transmitter back in range or by entering a password.

Will It Work On My PC?

This product will work on just about any PC with a USB port, CD Drive using Windows 98SE/ME/2000/XP. PC Wireless Lock comes with a 3-inch CD ROM disk. Installation instructions appear when the disk is inserted. The product comes with a Lithium battery that has to be installed in the transmitter. A penny is the only tool required.

During installation you will be prompted to enter a password that will be used if the user needs to bypass the transmitter security. A small icon of an open or closed symbol appears in the lower right tray to indicate the program is loaded and its state of operation.

Arming

Pushing the clear center of the transmitter turns it on and an LED begins to blink. If the transmitter is in range of the USB receiver, an LED on the receiver flashes to indicate signal acquisition. In this case, the PC operates normally, transparent to the PC Wireless Lock.

You CAN Take It With You

If you shut off the transmitter or go farther than about seven feet from the PC, Figure 2 appears. This screen stops normal PC opera-

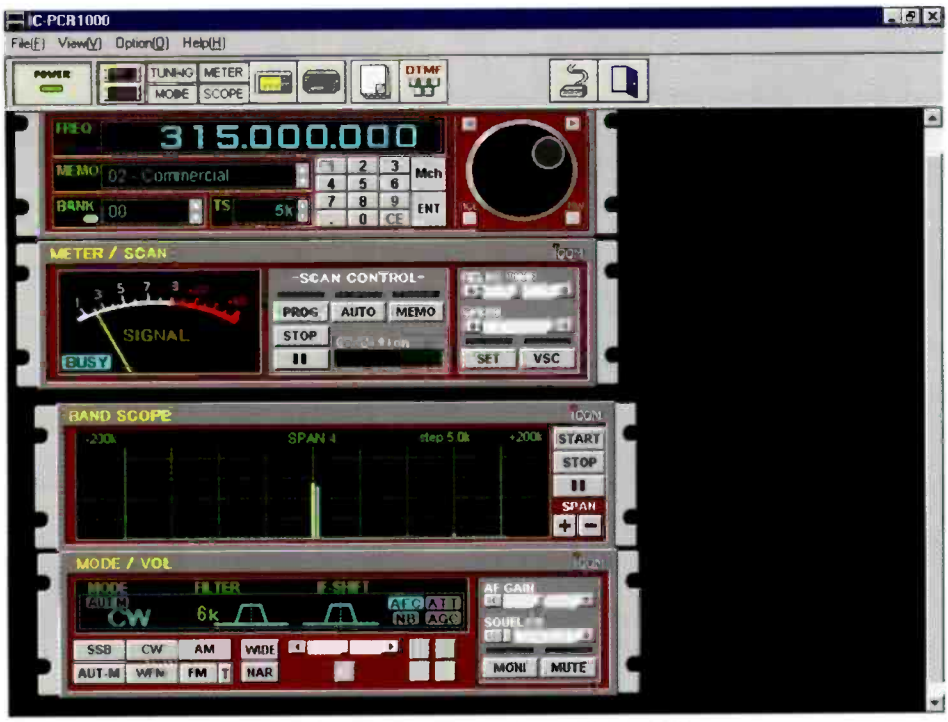


Figure 3 – Looking at the Wireless PC Lock's signal on a PCR-1000.

tion. The keyboard and mouse don't appear to respond.

Well, almost. In the tests, I found that if a screen capture program such as Paint Shop Pro was previously loaded and ready for screen capture prior to lock-up, it would still operate. For example, the screen capture shown in Figure 2 was obtained by pressing the mouse's right button WHILE in lock-out!

Resetting

You can regain full control of the PC by typing your password into the screen shown in Figure 2 or by simply bringing the operating transmitter back into range. Then the Lock Out screen disappears and your PC returns to where you left it.

DXing the Wireless Lock

I could not resist the opportunity to listen to the transmitter using a computer-controlled radio. Figure 3 displays the transmitter's pulse when received by an ICOM PCR-1000 using the basic ICOM software. The Wireless PC Lock transmits a fast pulse centered at 315 MHz.

Although the transmitter was located within feet of the PCR-1000 antenna, notice that the signal strength is still quite low. It's no wonder that the lock-out range is only seven feet, especially considering the relatively simple companion receiver.

A $19.95 Transmitter & Receiver

That's all the Wireless PC Lock costs. It is available from Cyberguys.com for $19.95 plus shipping. If you need to keep busy fingers out of your computer when you are not around, this may be just what you need.

Figure 4 – The strange looking, but great sounding Soundbug.

Now Hear This!

Another unique product that I happened upon, can be used with most laptops AND portable scanners. How many times have you wanted to listen to digital or analog audio playing on your laptop, but those little tinny speakers in your laptop's plastic case just don't cut it?!

Similarly, listening to your scanner in the high ambient noise of a car can really destroy the joy of monitoring.

The Soundbug Model SB002-US, Figure 4, turns any flat surface into a speaker. It attaches to the surface, such as a window or tabletop, via a suction cup type attachment. It's pretty small, measuring only 3.8 x 2.1 x 1.5 inches.

With its small size and operation using only three AAA batteries, the Soundbug is truly portable. However, since we are mechanically moving a large mass of air, at high volume battery life may be an issue. Although not mentioned in the very skimpy instructions, it appears that a jack on the side of the unit is for an external power supply.

Using the Bug

Installing the three included AAA batteries is the biggest issue. The cover does not open easily. When you finally do get the batteries in, then remove the protective cover and attach the suction cup to a flat surface. Finally, connect the 3.5mm stereo plug into the speaker jack of a laptop, scanner, CD/MP3 player, or just about any electronic device with a 3.5mm speaker jack output. The connecting cable is a convenient six feet long. The unit is turned on via the three-position switch, Off-Low Volume-High Volume.

BIG Sound

The info with the Soundbug says that it can "generates sound levels of up to 75 dBm peak." That's a lot of sound ... and it IS! It takes a bit of adjusting of the laptop/scanner volume to prevent overload. But once a setting is found, the Soundbug really fills a room or moving car with high levels of audio.

It Really Works

I was skeptical about the operation of the Soundbug, but after using it for a few hours it made a believer of me. Reflecting on past technology, I fondly remembered buying PolyPlanar speakers in the early 1970s. These speakers were made of flat, expanded foam panels. No speaker cones here.

I'll bet you that if today I had one of these PolyPlanar speakers its driver would look like the Soundbug. But what makes the Soundbug work is 21st century high magnetic field materials such as its FeONIC.

I had a hard time finding the product on the website of manufacturer Olympia. The web address given on the packaging **http://www.soundbug-us.com** leads nowhere. But Google brings up a number of sites. Try **http://www.feonic.com** for technical details. Soundbug by Olympia is available from many outlets, such as **http://www.ThinkGeek.com** for around $25 plus shipping.

Who Would Have Guessed?!

Let's see, if I attach my laptop to a computer-controlled receiver, a GPS receiver, a Wireless PC Lock and a Soundbug, my laptop can do some amazing things. Who would have imagined a laptop computer with all this technology when I was listening to the Beatles on Polyplanar speakers in 1970? No one I know.

What's NEW

Tell them you saw it in Monitoring Times

Antenna Season!

Springtime for DXers often means erecting new antennas, checking the old ones to see how they fared over the winter, and preparing for the storm season to come.

DX Engineering

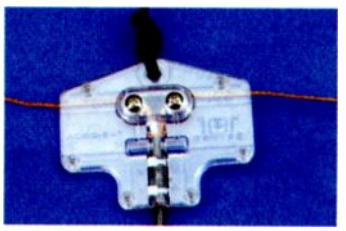
One website we came across recently belongs to DX Engineering – home to a variety of antenna accessories and solutions. We were intrigued by their RBS-1 – a two-direction, reversible Beverage array designed and used by W8JI. The unit can switch directions of reception by having a 10-18 Vdc voltage applied through the coaxial feed. The antenna between the two units is standard 450 Ohm ladder line (not included). Operating range is a broad 0.2-30 MHz ($129).

Also of interest to protect your radio during spring storm season is their new flange mount, dc-block, lightning protector (PPC-IS-B50HU-C0). Intended for any single transmitter/receiver application using 50 ohm transmission line, it handles 2 kW of power at HF frequencies and will survive multiple lightning strikes ($56.95).

For more information on these and other products, visit **http://www.dxengineering.com** or write or call DX Engineering at P.O. Box 1491 Akron, Ohio 44309; (800)-777-0703.

Ten-Tec Acro-Bat

For easy construction of your own wire or ladder-line antenna, check out Ten-Tec's new model 3003 Acro-Bat antenna hanger. The Acro-Bat is constructed of UV resistant, high-stability, virtually unbreakable Trirex polycarbonate plastic.



Acro-Bat can be used to suspend either a ladder line-fed or small gauge RG-58 or RG8X coax-fed wire antenna. It will also accommodate ladder line used as antenna wire if desired. Internal screw connections allow solid clamping with no soldering required, unless ladder line is used for both feed and antenna. Ten-Tec (1185 Dolly Parton Hwy, Sevierville, TN 37862; sales@tentec.com; 865-453-7172).

Listen to Your Luggage

Audio solutions are of interest to any radio buff, but here's one I'll bet you never thought of – a speaker system which makes use of your luggage! Frequent business travelers in particular will find the Boom Bag™ to be useful both for personal listening enjoyment and for business presentations.

Connect any audio source to the 10 Watt amplifier using a stereo mini-plug connection and listen to your radio, laptop, MP3 player, CD player, etc, through two 3-inch speakers and a 4-inch subwoofer with 8-watt amplifier. Or, the Boom Bag can provide quality audio amplification for a multimedia presentation, while allowing live narration using the built-in microphone input with separate volume control.

Boom Bags are available in two models. The Boom Bag Rolling Office is a ballistic nylon business case with a removable laptop shoulder bag. The Boom Bag Rolling Suiter is a clothing-oriented, 22-inch carry-on sized bag with a removable hanging garment sleeve.

The Boom Bags are priced around $330 and can be ordered from the website at **http://www.boombags.com** or call 800-927-1767 or fax 925-439-9155.

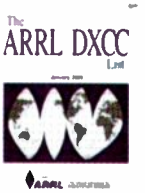
New ARRL Publications

By Larry Van Horn, N5FPW

The ARRL DXCC List

Being an avid DXer in the ham bands, I use a lot of aids to keep track of my current DXCC (DX Century Club) stats. One of my favorite publications in this regard is the *ARRL DXCC List*.

The *ARRL DXCC List* is the official League source of DXCC information, organized so that you can maintain a record of the DXCC entities you've worked and QSLed within its pages. This new January 2005 edition includes a complete listing of DX Century Club rules, including the latest changes and clarifications. It contains information about each entity on the DXCC list, deleted entities, and the latest entity updates for the 335 current countries on the list. The booklet also includes a call sign prefix cross-reference, a list of international call sign assignments, and much more.



Descriptions of all awards available under the DXCC banner are covered, and information about how to get DXCC logo material, such as pins and plaques you have qualified for is also included. This is a "must have" for the active amateur radio DXer.

ARRL DXCC List – January 2005 edition (ISBN: 0-87259-935-3) #9353 is $5.00 plus shipping and handling (see below for contact information).

ARRL Periodicals on CD-ROM

The American Radio Relay League has released their 2004 anthology of their popular journals on a compact, fully searchable CD-ROM. Every word and photo published throughout the year is included for three publications: *QST* – the official membership journal of the ARRL; *NCJ – National Contest Journal*; and *QEX Forum for Communications Experimenters*.

Using the Adobe Acrobat engine you can search the full text of every article by entering titles, call signs, names – almost any word. You can see every word, photo (including color images), drawing and table in technical and general interest features, columns and product reviews, plus all advertisements. And you can even print what you see, or copy it to other applications. Web links appearing in the article can be used to launch your Web browser to view additional information.

In addition to the features above, this CD-ROM includes source code for software projects and PC board etching patterns. And the 2004 version also includes Section News and ARRL Contest Results –with individual scores and Contest Soapbox.

Minimum System Requirements (Windows):
Intel Pentium processor or higher.
Microsoft Windows 98SE, Windows ME, Windows NT 4.0 with service pack 6, Windows 2000 with service pack 2, or Windows XP.
64 MB of RAM
60 MB of available hard-disk space.

Minimum System Requirements (Macintosh):
PowerPC processor
MAC OS software versions 8.6, 9.0.4, 9.1 or OS X.
64 MB of RAM
24 MB of available hard-disk space.

The *ARRL Periodicals on CD-ROM* is published by The American Radio Relay League, Inc. (ISBN: 0-87259-939-6) #9396 and cost $19.95 plus shipping and handling. It is available from ham radio dealers everywhere and on the ARRL website (**http://www.arrl.org**). You can also order this and other League publications on their toll-free telephone line 1-888-277-5289 (Outside the US +1-860-594-0355), or via snail mail to ARRL Publication Sales Department, 225 Main Street, Newington, CT 06111-1494 USA.

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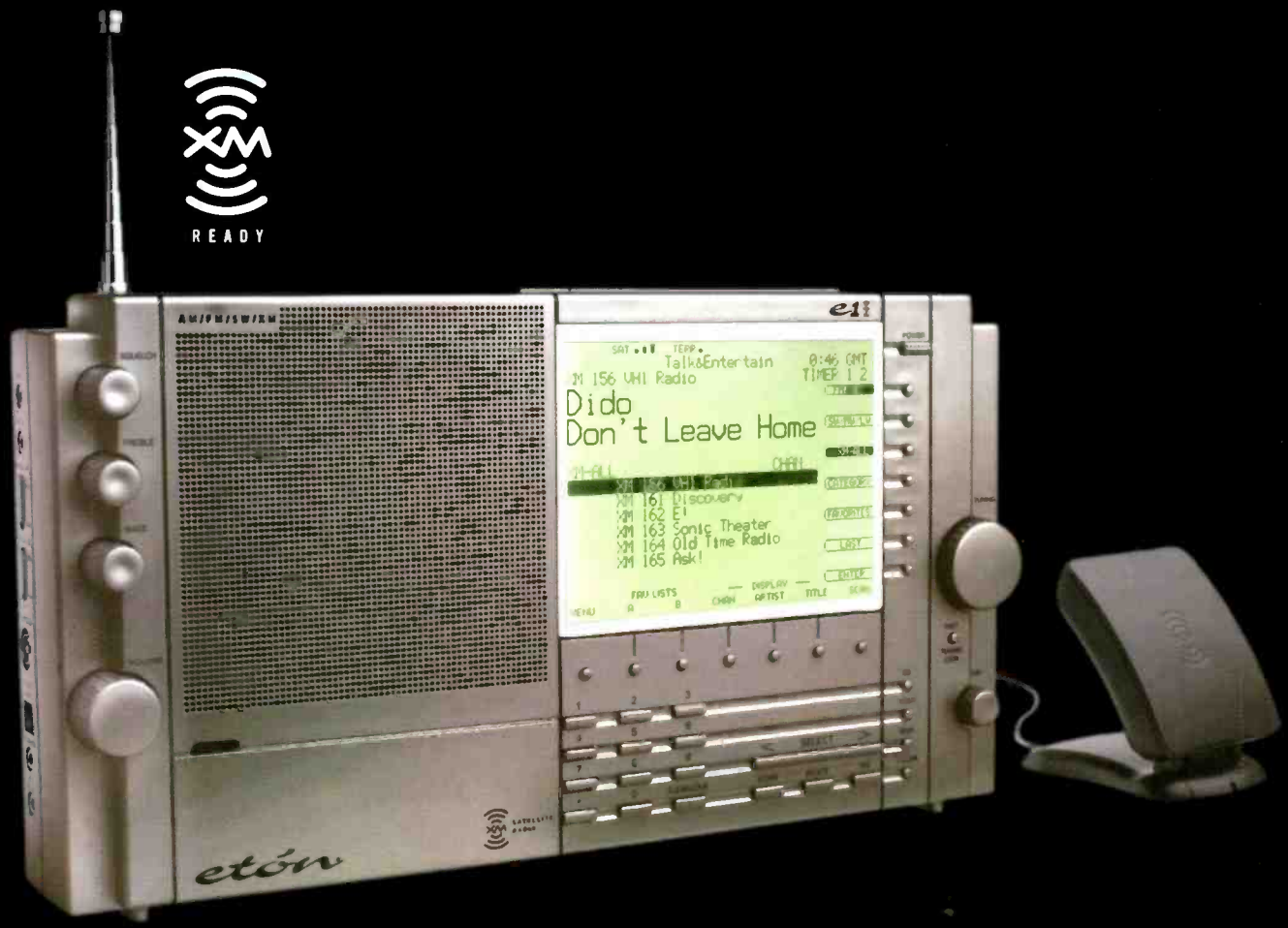

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