Scanning -- Shortwave -- Satellites
Ham Radio -- Computers

Monitoring Times

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January 2005

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Shortwave Listening Beginners' Guide

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- New Federal and Military Systems
- Cutting Edge Radio Reviews
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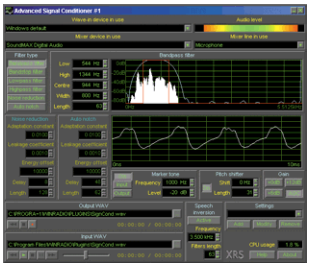

Antennas

Amongst our many antennas and accessories, also check out our long wire antenna kit (AX-05E), and an extremely efficient long wire adapter (LWA-0130). Unlike most conventional antenna 'baluns', the WiNRADiO Long Wire Antenna Adapter employs a dual broadband transformer technique which offers an improved performance over single-transformer devices. Add this low cost device to your existing long wire and hear the difference!

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Monitoring Times

Vol. 24, No. 1 January 2005

Cover Story

Beginner's Guide to Shortwave Listening

By Ken Reitz KS4ZR

In this day of gee-whiz wireless communications devices that can even whistle ***Dixie***, much of the world still relies on the workhorse of shortwave broadcasting to disseminate news, information, and culture. If you're new to this field, how do you get started? What kind of radio do you need and where can you get one? What kind of antenna? Where do you find broadcasters? What can you expect to hear? All your questions are answered in this beginner's guide to shortwave listening. Story starts on page 8.

C O N T E N T S

Reviews:

Software radio seems to be an idea whose time has come. **RFSpace** radio has joined the newcomers and John Catalano compares it to **FlexRadio** and the older **Icom R1000**, putting all three through their paces during an HF blackout (see page 69).

We also try the **DeLorme Earthmate GPS**, coupled to Street Atlas USA 2005 and Topo USA Version 5.0. " Very impressive and very, very miniature," says our reviewer (page 72).

Clocks are always of interest to radio hobbyists. In ***On the Bench*** you can check out a variety of clock kits to build your own atomic clock with your personal touch (page 66).

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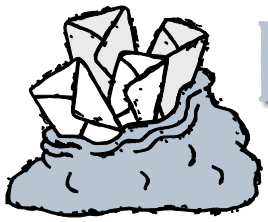

LETTERS TO THE EDITOR

Change and Growth

"I'm a loyal and continuous subscriber since the old 'Shortwave Guide' back in the fall of 1984. It's amazing how much the magazine has grown since the old days when I was a disc jockey on WRNO Worldwide... and how much change technology has brought to shortwave listening and ham radio."

– Phillip Colwart, AA5FJ

The *International Listeners Guide* was Larry Miller's publication which merged with *Monitoring Times* in 1988. The hobby has indeed changed since then and *Monitoring Times* has helped you follow the changes in easy to understand language.

In 1988, the internet wasn't a factor in the hobby. Now, most of our readers are comfortable with the internet, but many of us haven't moved beyond e-mail and visiting our favorite sites. This month, Tom Sundstrom will introduce us to some internet tools that can help in modernizing our online radio-related communications. If you have questions you'd like him to answer in future articles, write him at *tomsundstrom@monitoringtimes.com.*

Radio Stuff Online

"I'm enjoying reading *MT* ... I have a PCR-1000 radio that I make available on line through a service known as Shortwavelog. You can access their site at **http://www.shortwavelog.com** and for a list of receivers the URL is **http://www.shortwavelog.com/ActiveRadios/**

"Listeners can tune a few active radio receivers including mine there. My web access URL is **http://shortwaveradio.dyndns.org/RCSweb/**

"Please keep in mind not all radios are on 24/7. My radio is usually on weekday and weekend evenings Eastern time. I also have another radio hobby of collecting vintage music radio shows.

"The website is located at **http://www.davesairchecks.com** There you can listen to samples of how AM-FM radio sounded back in the 1960s through the 1980s."

– Dave Freeman

Jacques d'Avignon sent us a link to the report on the annual DXpedition to Miscou, New Brunswick. Check out the pictures, loggings, and the challenges that seem to crop up on any DXpedition, even in the boonies: **http://www.dxing.info/dxpeditions/miscou2004.dx**

Takes a Lickin' and Keeps On...

Remember the impressive antennas and shack photos of Al Stern's shack in Satellite Beach, Florida, which appeared in the November issue of *MT*? Well, Al has an interesting follow-up story!

"The hurricanes shredded the few antennas that I did not take down from my towers/poles. I have a Pro-2035 hooked up to the shredded Grove Scantenna on the left of this picture. All that is left of the Scantenna is one piece of metal about 20" long. . . a single piece of tubing sticking up from the boom. I have been getting comms from all over the place in the 225-400 range, as far away as the other side of the state, Tampa Approach.

"I'm in the process of resurrecting my two dozen antennas, but I plan on leaving the shredded Scantenna as is; why fix something that is broken but works so well?"

– Al Stern

Scanning Laws

"I must admit that I haven't read nearly all the State Laws concerning scanners in vehicles. I am a volunteer firefighter in Mississippi, I have two way radios as well as scanners in both of my vehicles. I travel to CT, NY, NJ, DC, MA, RI; all along I-81 to I-66 up I-95. What are the basic laws since I am a volunteer FF and do have radios and scanners in my cars?"

– Jimmy Taylor, Jackson, MS

Jimmy, check out Jorge Rodriguez's final column in the December issue of *MT*, which gave a great summary of federal and state laws as well as excellent general advice to all hobbyists. The article remains on line with the rest of his columns on "Monitoring and the Law" at **http://www.monitoringtimes.com/html/mt-laws.html**

Great reception on Amtrak

"Last fall (10/16), I was traveling home from a business conference in Glens Falls, NY, to Manhattan, on an Amtrak coach. At about 8:30 p.m. (00:30 UTC), I took out my Sony SW7600GR receiver, connected it to Sony active antenna AN-LP1, attached the antenna to the train car's window, using the integral suction cup, connected my AC adaptor and plugged into the car's AC outlet (usually used for laptop computers), and, finally, connected headphones. Then, I consulted the Shortwave Guide in *Monitoring Times*.

"I tuned to 5890 kHz and immediately attained absolutely solid reception of Radio Thailand. For more than 15 minutes I listened to their 'call in' type talk show. Finally, at a station stop, a hoard of noisy people boarded the train. I disconnected the setup. After moving to a quiet part of the car, feeling too lazy to redeploy the full equipment, I began listening to local broadcast FM – with much noisier reception than Radio Thailand!

"For me, this was an altogether unique experience, as I have never seen anyone shortwave listening on Amtrak. Also, I was not sure if the train crew would raise some objection to the antenna attached to the window – they didn't. Conductors passed me several times, without comment. Now, I have one more reason that I *love* to travel by train."

– Joe Wagner, Dover, NJ, WPXD 483 (GMRS)

Attribution

On page 17 of the October 2004 issue, we reprinted with permission an attractive chart of the Electromagnetic Spectrum from the Lawrence Berkeley National Laboratory. Readers should note this chart is courtesy of the Advanced Light Source, which produces the chart for the lab, run by the University of California for the US Department of Energy.

Happy New Year

We here at *Monitoring Times* are grateful for your support and for the great response to our reader survey. We'll report on the results as soon as they are fully analyzed. We put some reader preferences into effect immediately. For example, *The Fed Files* will be appearing bi-monthly instead of only three times per year, alternating with the *American Bandscan* mediumwave column.

Response to the online survey was so successful, we will probably run other surveys there periodically. Check out the *MT* website for new surveys and its new, easier to navigate design.

Wishing you the very best monitoring times in 2005,

Rachel Baughn, KE4OPD, Editor

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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BROADCASTING

FCC Auctions 288 radio licenses

In the first auction of FM broadcast licenses since 1999, the Federal Communications Commission made 288 licenses available for auction in November. Even more surprising than the number of offerings is the unprecedented number of bidders for the licenses – 465 applicants qualified to bid, ranging from radio conglomerates to individuals.

"I have been in this business a long time, and I was shocked at the number of applications for licenses," said George Reed, managing director of Media Services Group, a media brokerage firm in Jacksonville Beach, Florida.

The auction was initiated by the FCC in response to a demand for new radio stations by towns and small cities with no home broadcaster. Towns throughout the Midwest, West and South are getting most of the new commercial FM radio stations. There are 28 licenses available for stations in Texas, 20 in Colorado, 18 in Montana and 17 in Wyoming. The signal strength of the stations will vary from 3,000 watts to 100,000 watts.

The lively competition is expected to make the stations more costly. The 1999 auction raised $57.8 million; this year's auction had already reached $185 million in mid-November before the close of the auction.

Student Station Grab

Some networks seem to think they have discovered a way to acquire a station without going through an auction, by petitioning the FCC to impose a seldom-invoked rule which can require educational stations to share airtime unless they broadcast at least 12 hours a day.

Marty Hensley, director of Hoosier Public Radio Corp., submitted petitions to share airtime with seven noncommercial stations in Indiana and Kentucky when their licenses came up for renewal; all but one are high school or college stations. Several of them already broadcast 24 hrs per day thanks to automated programming, but the petitions were filed anyway.

A Texas company by the name of R B Schools petitioned the FCC to share the airwaves of five Michigan high school radio stations, five Illinois high school stations, and three in Ohio. The company's president, Linda de Romanett, is also head of several companies which operate religious stations. But again, the company didn't do its homework. Several of these stations also operate 24 hours per day.

ON THE TECHNICAL SIDE

Design Your Own SDR

The Mobile and Portable Radio Research Group (MPRG) at Virginia Tech has developed fundamental software for use in designing software radios and has made the tool available for free download to other wireless communications researchers throughout the world. Originally designed for a software radio research project sponsored by the Office of the Director of the Central Intelligence Agency, OSSIE (Open-Source Software Communication Architecture Implementation: Embedded) is an operating environment, or software framework, that is compatible with the Joint Tactical Radio System military hardware and is written in C++.

"Software radio technology is today where personal computer technology was in the 1970s," said Max Robert, the MPRG post-doctoral Fellow who led development of the new tool. http://www.mprg.org/research/ossie.

A Short Solar Cycle?

Even during the lowest ebb of solar activity, you can usually find one or two spots on the sun. But on Jan. 28, 2004, there were none, then again on Oct. 11th and 12th the sun was utterly blank.

"This is a sign," says Solar physicist David Hathaway Hathaway, "that the solar minimum is coming, and it's coming sooner than we expected."

Hathaway points out that solar cycles aren't not precisely 11 years long, but can vary from 9 to 14 years. What makes a cycle long or short? Researchers aren't sure. "We won't even know if the current cycle is long or short – until it's over," he says.

But Hathaway and colleague Bob Wilson, both working at NASA's Marshall Space Flight Center, believe they've found a simple way to predict the date of the next solar minimum. "We examined data from the last 8 solar cycles and discovered that Solar Min follows the first spotless day after Solar Max by 34 months," explains Hathaway.

The most recent solar maximum was in late 2000. The first spotless day after that was Jan 28, 2004. So, using Hathaway and Wilson's simple rule, solar minimum should arrive in late 2006. That's about a year earlier than previously thought.

The next solar maximum might come early, too, says Hathaway. "Solar activity intensifies rapidly after solar minimum. In recent cycles, Solar Max has followed Solar Min by just 4 years." Do the math: 2006 + 4 years = 2010.

Capricious TV

Last month we reported the story in which the television of Corvallis, Oregon, resident Chris van Rossman apparently began to malfunction, emitting a signal that was picked up by the Search and Rescue Satellites and relayed to Langley Air Force Base in Virginia, who sent a team of local sheriff's deputies and Civil Air Patrol volunteers to the door of his apartment.

The Toshiba television in question has now been tested by the company's tech wizards and by the Federal Communications Commission. Toshiba spokeswoman Maria Repole said the FCC lab results were inconclusive, showing that any 121.5 MHz emissions the TV was putting off were within FCC limits for home electronics. But those who visited van Rossmann's apartment the day the TV freaked out, have no doubt about what they heard.

Malfunctioning appliances (even the scoreboard at the Razorback Stadium in Fayetteville, Arkansas) cause false reports often enough that the international search-and-rescue community is planning to move away from the 121.5 frequency. Officials say that by 2009, when search-and-rescue agencies plan to stop monitoring the old frequency, the aim is to have all emergency beacons emit a digital signal on a new frequency of 406 megahertz.

TV-B-Gone

A new key chain gadget that lets people turn off most TVs – anywhere from airports to restaurants – is selling faster than Mitch Altman can make them. Hundreds of orders for Altman's $14.99 TV-B-Gone gadget poured in after the tiny remote control was announced in *Wired* magazine and other online media outlets. The key chain fob works like a universal remote control that only turns TVs on or off.

"I didn't know there were so many people who were into turning TV off," said the inventor, who hasn't owned a television in 24 years.

FCC

The Wireless Highway

The US Federal Communications Commission (FCC) has opened up the 5.9 GHz frequency band allocated for Dedicated Short Range Communications (DSRC) systems along US roads and highways to the private sector.

According to ABI Research, any organization can now buy a non-exclusive license to erect towers in a defined geographical area. The transmitter towers must be registered with the FCC, and in cases of interference, law enforcement and public safety will receive priority. But within these constraints, businesses can make use of the frequency for their own purposes.

Prior to this FCC action, it was assumed that most of the infrastructure for any future DSRC networks would be constructed under the US federal Department of Transportation. Now, however, it appears that private industry will be able to build its own.

New wireless network applications could include real-time traffic updates beamed into vehicle navigation systems, universal automatic toll collection, streaming entertainment, intelligent safety systems, and even interactive commerce.

ABI Research analyst Dan Benjamin said, "Right now there are no vehicles that can actually use the 5.9 GHz signals. Transmitters will, however, be added to vehicles later this decade, and companies should start planning their infrastructure deployment strategy soon."

Move over, here comes AWS

In order to make room for advanced wireless services (AWS), including so-called "third-generation" (3G) wireless systems, the FCC is shifting several federal users, such as aeronautical test telemetry into the 2360 to 2395 MHz band. In so do-

ing, they will make amateur radio co-primary on the first five 5 megahertz of the 2390-2417 MHz Amateur Radio Service primary allocation.

The ARRL told the FCC it could support Amateur Radio sharing of 2390 to 2395 MHz on a co-primary basis with flight test telemetry operations. But it has insisted that 2395 to 2400 MHz remain an exclusive amateur primary allocation.

Nextel and Verizon Call a Truce

Nextel Communications Inc. and Verizon Wireless are settling all legal disputes between them, removing the primary challenge to the FCC decision to clear up interference between cell phones and emergency response radios in the 800 MHz band by moving Nextel to 1.9 GHz.

In the surprise settlement, Verizon will drop its opposition to the swap and Nextel will drop its claim of trademark and ownership rights for the phrase "Push To Talk" and other uses of the word "push" to describe the popular walkie-talkie service which Verizon and other rivals now offer.

HOBBY NEWS

WUN Celebrates Ten Years

"It's hard to believe ten years have gone by since WUN was formed," says president Ary Boender. "Back in the '80s and early '90s utility station monitoring was mostly a solitary hobby. However, in the mid '90s, several radio hobby clubs, such as the old Speedx Club, the Benelux DX-Club and others worldwide, began to have regular utility related columns."

With access to the internet growing, and the continued loss of clubs such as Speedx, the idea was hatched that a "paperless" internet club dedicated to HF utility stations in all modes would promote the rapid exchange of information. The Worldwide UTE News Club "WUN" was born in January 1995 and issued its first newsletter in February 1995. Originally WUN also produced a paper edition newsletter.

WUN was the world's first in many cases. WUN was the first "electronic" club. It was also the first club devoted to utility monitoring. It was also the first to set up a list server where members could post logs and questions.

Today, with over 1300 members in 35+ countries and well over 3000 people who are reading the newsletter each month, WUN is very much alive and kicking. Congratulations, WUN!

To join WUN, fill in the form at: **http://mailman.qth.net/mailman/listinfo/wun**

AWR Wavescan Shifts

Adventist World Radio's English language service will be converted from a centralized global service to a local regionalized service beginning January 2005.

Wavescan, the English program produced for shortwave radio hobbyists, will be shifted to a studio location in the Asia/Pacific region, where the largest DX communities are found. The international DX program will continue with the participation of AWR's DX editor, Dr. Adrian Peterson.

The final edition of *Wavescan* produced in England will be aired at all usual times and frequencies on Sunday, December 26, 2004. The first program produced in Asia will be broadcast on Sunday, January 2, 2005, from AWR's station KSDA on the island of Guam.

Wavescan recently broadcast two very interesting programs: one featured a 60 year old broadcast from an American Forces Radio Station in New Zealand, and the other featured what is believed to be the world's first off-air recording. The 90-year-old Morse Code broadcast from July 4, 1910, was recorded by station TG in San Francisco on a cylinder covered with tin foil!

"Communications" is compiled by editor Rachel Baughn KE4OPD from newsclippings submitted by our readers. Thanks to this month's fine reporters: Anonymous, John Hackett, Alan Henney, Norman Hill, Sterling Marcher, Jerry None, Ira Paul, Ken Reitz, Clive Ridpath, Doug Robertson, Brian Rogers, Matthew Stanley, Robert Thomas, Gayle Van Horn, Larry Van Horn, Ed Yeary.

Beginner's Guide to Shortwave Listening

By Ken Reitz KS4ZR

Today, when on-line broadcasting and satellite radio are getting all the buzz, shortwave (SW) broadcasting is still delivering news and information every day to regions of the world where households may not have access to the Internet or the money for satellite radio.

What makes this broadcast mode popular world wide even today is simple: Small, low cost, battery powered receivers can bring news and entertainment to countries whose media might be entirely government controlled. Even those of us with a plethora of media options turn to the shortwave bands for details of world situations direct from the source, since shortwave radio voice is still a viable broadcast medium across the globe.

Listening to shortwave broadcasts can be a rewarding experience, but if you're new to this part of the radio listening hobby it can be frustrating as well. If you're used to America's crowded AM and FM bands, you'll be surprised to find what seems like wide expanses between SW broadcasters. How can you know what stations to look for and where? And, compared to today's FM sound, shortwave broadcasts lack the full audio range you're used to hearing. Add to that the occasional characteristic signal fading and general atmospheric noise encountered on the bands, and newcomers can be quickly turned off.

Here's how you can find your way around the shortwave bands using the right receiver and the right antenna, and how to really enjoy this old and venerable monitoring hobby.

So, What's On?

From Albania to the United Kingdom, Australia to Vietnam, there are dozens of countries which operate a full schedule of programs on their shortwave frequencies. Many transmissions are for domestic use within the country, while others are intended for natives living abroad so that they can keep up with current events back home in their own language. Other transmissions are intended for a world audience as an effort to explain foreign policy or to help foreigners understand their culture. Such transmissions are also used to attract tourists to the country. Programming can range from explanations of cultural values, latest hits in their own musical style, and editorials examining key issues of the moment.

But, to get the most out of your shortwave radio you'll need a guide. *Monitoring Times* publishes a complete guide of English language shortwave broadcasts each month in the center of the magazine which lists the name of each country transmitting, type of service, the times and frequencies. A complete explanation of how to use the guide is found on page 37. This takes some of the guess work out of tuning in and lets you really enjoy the shortwave listening hobby.

Once you become familiar with the various international broadcasters you may want to check out their web sites for more details about their broadcasts. Some broadcasters also have archives of recent programs.

Here's an important thing to know about shortwave broadcasts: All times quoted on-air are in *Coordinated Universal Time* which is abbreviated as (UTC). It's a 24 hour clock which starts its day at the Prime Meridian in Greenwich, England. This way everyone's on the same time and it doesn't matter which time zone you're in.

Choosing a Receiver

Shortwave radios come in a dizzying array from the absurdly cheap discount store $30 specials to the sophisticated Ten-Tec RX-340 which comes to you at a price tag just shy of $4,000. Many find that the cheapest radios with their small telescoping antennas give them all they want – the ability to listen to the big international broadcasters whose powerful broadcasts are easily tuned in. Tuning in the smaller voices of the world takes a better receiver and a better antenna.

Before making a purchase, check out some reviews on the receivers in which you're interested. *MT* has published reviews on all manner of receivers, some of which may be found on the *MT* web site: **http://www.monitoringtimes.com**. An index of the last ten years of reviews is online. Copies of most out-of-print reviews are available for $3: for help email *order@grove-ent.com* or call 1-800-438-8155.

Another source of useful comments on shortwave receivers is found on the

The venerable Drake R8B all-band, all-mode, high-end shortwave receiver (Courtesy: R. L. Drake Co.)

TenTec RX-340 HF DSP Receiver is the top of the line for SWLers with unlimited budgets. Here's a surprise, it's made in the U.S.A.! (Courtesy: Ten-Tec)

web site e-ham.net. Specific reviews from individuals are found at **http://www.eham.net/reviews/products/8**. Keep in mind that these are personal opinions from individuals which may not represent general opinion. Still, they may be worth reading.

One thing you'll notice is that the cheapest radios have old-fashioned analog tuning. This keeps down production costs but gives these radios a number of drawbacks. It's hard to tell exactly where you are on the bands with this type tuner, the numbers are often hard to read without a magnifying glass, and there's no way to have pre-set memory banks for instant access tuning. The price of a SW radio goes up as options are added. Here are some "must haves" that you should look for in a serious shortwave radio:

- External antenna connection. Allows attachment of an external antenna or other accessory such as a pre-selector or antenna tuner.
- Digital frequency readout with keypad entry and a reasonable amount of memory pre-sets. This display should also include some type of signal strength meter.
- Sideband reception capability. Allows tuning amateur radio transmissions in upper or lower sideband as well as digital modes which also use sideband transmissions.
- Wide/Narrow switch provides better audio for international broadcasters and helps sideband transmission sound better.
- Built-in 24 hour clock. Can be set to UTC so you'll know when to tune into programs you see in the guide.
- External speaker connection allows use of an external speaker to improve audio quality or to be used with an external tape recorder.

Shopping for a Radio

Once you've narrowed the field of receivers you'd like to buy and have read the reviews, it's time to do a little shopping. Radio Shack used to be a good place to check out shortwave radios. They carried a wide range of models and had stores in nearly every town. Now, they are reduced to offering only three shortwave products, all made by Grundig and ranging from the M100 for $30 to the Digital Compact for $80. That leaves the mail order houses as your best bet for price comparisons. Here's a round-up of these vendors, the brands they carry and other shortwave accessories of note. They are arranged in alphabetical order:

Amateur Electronic Supply: 800-558-0411 **http://www.aesham.com** offers AOR, Drake, Sangean, Sony, & Yaesu brands. Has accessories and cable.

C. Crane Co.: 800-522-8863 **http://www.ccrane.com** Offers CCRadio Plus, Icom and Sangean brands. Has portable antenna & longplay recorders.

Grove Enterprises: 800-438-8155 **http://grove-ent.com** Offers AOR, Drake, Grundig, Icom, JRC (Japan Radio Corp.), Sangean, Yaesu and WiNRADiO. Sells outdoor and indoor antennas, cables and preselectors, books, and *Monitoring Times* subscriptions.

Universal Radio 800-431-3939 **http://www.universal-radio.com** Offers Drake, Grundig, Icom, JRC, Sangean, and Ten-Tec brands. Also sells many SWL accessories including antennas, preselectors and books.

The Computer-hosted Receiver

There's another type of SW receiver on the market, a "virtual" receiver which uses your computer to display a radio control panel that you would tune as any other receiver. The audio comes through your computer as well. The receiver is a box or a circuit board which interfaces between your antenna and your computer. Advantages of this type of receiver is that it has the features of radios many times the price. The disadvantage, of course, is that it depends on your computer for its existence. If your computer goes down, your radio goes with it. One such computer-based receiver is the Ten-Tec RX-320D which is widely available and sells for $328.95.

Another such receiver is the WinRADiO 1500 series, available through the Grove catalog, which offers a wide tuning range (150 kHz to 1.5 GHz with cell phone frequencies blocked) and also features performance and extras you'd expect from a more expensive "real" radio. Or, the new

Table 1: Shortwave Broadcast Bands

Courtesy Monitoring Times

Freq kHz	*Meter Band*
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

MFJ'S 784B Programmable Digital Signal Processor can take out just about any interference. Helps dig out the weakest signals and improves SWL enjoyment. (Courtesy: MFJ Enterprises)

WR G303 PC-based radio is a sophisticated shortwave-only radio at the same price. Both models are available as an internal card or an external box and are priced around $500. It's a way for SWLers to get a lot more receiver for their money. Of course, your computer has to be up to supporting this computer-controlled radio.

Extended Range of Your Receiver

While the shortwave bands start at 1.8 MHz and end at 30 MHz, many receivers are capable of tuning in frequencies below or even above those frequencies. Most portable shortwave radios include the AM and FM broadcast bands and many include the longwave (LW) frequencies (50 to 540 kHz) as well. Many desk top (*i.e.,* expensive) shortwave receivers tune from as low as 30 kHz to 30 MHz with some tuning as high as 60 MHz. Most desktop receivers do not include the FM broadcast band.

If your radio is capable of tuning LW, don't be surprised if you don't hear anything. These frequencies are home to low power beacon transmitters which send only two or three letters in Morse code (CW) as identifiers as well as powerful stations for international broadcasters from Europe and Africa which, because of the distances and extremely low frequencies, take extraordinarily long antennas to pick up. Even then, they are mostly heard only at night and during the depths of winter.

If your radio is capable of tuning above 30 MHz, it gets into the low end of the VHF band (home to some local public service agencies such as police and fire departments), and will work best with a ground plane antenna similar to a CB antenna. Since most agencies have long since moved to higher VHF and UHF frequencies, there may be little active radio traffic in your area on these frequencies.

There is one amateur radio band, the six meter band from 50 to 54 MHz, over which you may hear transmissions in CW, as well as single sideband (SSB) AM, and some digital modes. For best reception of this band, you will need a multi-element beam antenna with the elements horizontally polarized. This band is active year 'round with long distance (DX) openings occurring during the summer months along with TV and FM band DX.

A little help for your receiver. MFJ's 956 LW/MW/SW Preselector/Tuner matches your receiver to the antenna to improve reception and minimize intermodulation. (Courtesy: MFJ Enterprises)

Shortwave Listening Antennas

Unlike portable SW radios, most desk top receivers have no built-in antenna. It's assumed that you will be using an outside antenna. So, what type of antenna is best for shortwave reception? Can you make your own antenna? What can you do if you can't have an outdoor antenna?

Almost any short length of wire will work as a shortwave antenna. That's because you don't need much of an antenna to pick up the powerful international broadcasters. That's why those little whip antennas on the portable radio seem to work so well. They fall short on delivery when you're trying to tune in something more esoteric with a lot less power. However, simply adding a long antenna wire to a poor SW receiver may end up creating more problems, like swamping the receiver with the big broadcasters or introducing spurious signals from nearby out of band transmitters.

For serious shortwave listening you need a serious antenna. There are several on the market including the Grove Skywire, a 66-foot antenna. Another ready-made antenna is the PAR End FedZ, which is a 45-ft long antenna that also comes ready to install (see review in *MT* 9-03, pages 82-83). All you'll need to supply is enough coax to go from your receiver to the antenna. (Grove's coax comes with "F" connectors, so you'll need a PL-259 adaptor for the antenna and possibly one for your receiver.) The advantages of the PAR antenna is that it brings very little extra noise to the receiver, making it even easier to tune in the weak ones.

MFJ Enterprises' 54" active Outdoor Antenna brings you big signals in tight spaces. (Courtesy: MFJ Enterprises)

You can make your own antennas. In fact, Radio Shack has an SWL antenna kit which contains 70-ft of antenna wire, 50-ft of lead-in wire, and insulators for $10.49. It's at your local RS store as catalog #278-758. There are many other good antenna designs which are not hard to make and can be found in many antenna books. The American Radio Relay League (ARRL) sells several books on the subject in their free publications catalog (call 888-277-5289). You can also check out the SW antenna primer on the Grove web site at **http://www.monitoringtimes.com/html/mtantennaprimer1.html.**

But, what if you live in an area where outside antennas aren't allowed or there's simply no space? That's where an active indoor antenna might save the day. MFJ Enterprises offers several active tuned indoor antennas: the MFJ-1020C covers .3 to 40 MHz and may be used as an antenna preselector when an external antenna is attached. The MFJ-1024 is a vertically mounted 54-inch active outdoor antenna which could be used on a balcony and tuned from indoors.

DIYer's Special: Radio Shack's external antenna kit has all you need for an external antenna for just $10.49. (Courtesy Radio Shack)

Secrets of Better Shortwave Listening

Almost any shortwave receiver will benefit from several available accessories designed to improve reception and audio quality. A *preselector* or *tuner* is intended to boost signals by tuning the antenna to match the receiver. Most tuners are *passive* which means not powered.

There are also powered antennas which use active broadband amplifiers to help increase signals while tuning the antenna to match the receiver. Active antennas work best in places where it's impossible to have an outdoor antenna, but shouldn't be thought of as equal to an external long wire.

Noise filters have long been used to aid in shortwave listening regardless of the type or size of antenna. Many high-end receivers have noise filters built-in, and manipulating them can reduce adjacent channel interference or other noises which make listening less enjoyable. If your receiver doesn't have such a filter, you can add an out-board filter which will be very effective.

ICOM SP-23 Noise Reducing Speaker. Passive external speaker allows you to customize the audio from your shortwave receiver. (Courtesy: Icom)

The best filters use *digital signal processing* (DSP) and are very effective at removing interference and making otherwise unreadable signals listenable. They are particularly good at removing static, ignition, pulse and power line noise. DSP filters are powered and are more expensive

Dawn of the shortwave digital age. This AOR 7030 SW radio has been retrofitted with the necessary hardware to allow it to receive DRM broadcasts. (Courtesy: BBC R&D)

than passive noise filters and preselectors.

There are other products which may also improve audio on your shortwave radio. Most shortwave radios have 2- or 3-inch speakers often aimed away from the listener and producing a restricted range of audio. You can add external speakers to your receiver to customize the audio range of your receiver.

A Digital Future for Shortwave

Digital Radio Mondiale (DRM), French for Digital Radio World Wide, is the name of an international non-profit consortium designing an open platform MPEG4 based digital broadcast mode being heralded by some as the future of SW broadcasting.

If you didn't understand a word in that last sentence, don't worry, you're not alone. DRM is simply a way to turn analog SW transmissions into digital data streams, which can be transmitted on the HF bands, "read" by a receiver at your home, and turned back into the same audio you're used to hearing. The advantages are that it allows greater audio fidelity, is easily adapted to contemporary transmitters, and radios in use today may be able to receive the signals with certain modifications. It may some day replace analog broadcasting on the HF bands.

However, it's early days in this process and, as with the experiments happening across America with digital AM and FM broadcasts, there is no final decision. We find ourselves in a time of transition from the age-old analog broadcasts to the new all-digital broadcast future. Because the process has to be fully developed and tested and submitted for lengthy trial and acceptance by the international radio community, that transition could last many years despite the optimism of the public relations companies charged with promoting the venture.

There is no need to fear that any radio you purchase today won't be working for the foreseeable future. There is every indication that, when a digital system is finally in place, there will be a retrofit for current SW receivers. For more information on modifications to contemporary receivers for DRM reception see this web site: **http://www.drmrx.org/receiver_mods.html**

Buying Used Shortwave Radios

Hobbyists are always upgrading their listening posts, and that means there is a large supply of good, used shortwave receivers on the market. Everyone loves a bargain, but to save big bucks you have to know where to look and what to look for. You might find what you're looking for at an on-line auction site, a local junk shop, or at any number of tag sales and swap meets. Remember, anytime you buy from a private seller it's *caveat emptor* (buyer beware). You may not have any recourse if the product is misrepresented or fails to perform as you might have hoped.

Buying used equipment from commercial vendors is a less risky proposition. These vendors value their reputation and are likely to have more liberal returns policies, offer a trial period or limited warranty. They thrive on positive word of mouth from satisfied customers. Below is a list of companies which deal in new shortwave receivers but have a limited, and constantly changing supply of used receivers. Lists of available gear changes almost daily so check these sources often. Keep in mind that companies may have different policies regarding these products. Ask about a trial period, guarantee, shipping, returns, etc. Find out if the product you are buying has been tested by their technicians to be performing up to specs published for that particular product.

Finally, there's the market for antique shortwave radios. These can be anywhere from 30 to 70 years old and lovingly restored by professionals or hobbyists to near their original condition. These tube fired relics still work and many do an outstanding job of reception. Expect to pay a premium for the best of these radios, but for many, owning a working piece of radio history is well worth the price.

Scanning the First State

By John Mayson

In the early years of the seventeenth century, Sir Thomas West, Lord de la Warr, led a contingent of 150 men who landed in Jamestown, Virginia. Twenty-one years later, Europeans settled in a Dutch trading post farther north on the North American coast called Zwaanendael. Peter Minuit, a Swede, started a colony in this area and called it "New Sweden." Eventually, the land was granted to William Penn and became the Pennsylvania counties of New Castle, Kent, and Sussex.

Over 100 years after Lord de la Warr first landed in Virginia, the lower three counties of Pennsylvania formed their own colony and named it after Sir Thomas West by calling it "Delaware." In 1792, Delaware was the first state to adopt the newly written United States Constitution.

Two-hundred and one years after becoming the first state in the union, Delaware purchased a statewide, APCO-25 compliant, Motorola trunked radio system. The system was designed to provide complete, statewide coverage for all state and local agencies.

So, in this first month of a new year, we're going to explore the statewide APCO system of our nation's first state. Northerners heading for sunny Florida cut through part of the state on Route 95. Delaware is a short hop across the Chesapeake from Washington D.C. which is hosting the presidential inauguration this month.

You have no plans to visit Delaware? Believe it or not, you can listen to state police communications online via the State Police website. Point your browser to: **http://www.state.de.us/dsp/** and click on the scanner to activate.

About the System

Delaware's state system is divided into three parts that correspond to Delaware's three counties. Each county has its own dispatch center and the counties are linked via 6 and 10 GHz microwave transmitters. The state has a total of 32 sites.

The system provides very reliable communications anywhere in the state for both state and local users.

Since the system is digital, an appropriate scanner is required. The system uses a 3600 baud control channel, meaning any digital trunk tracking scanner on the market will work.

Frequencies

Each county has its own set of frequencies. In addition to these, there are Intellipeater (IR) sites that provide additional coverage. An asterisk (*) denotes a control channel frequency. Some scanner listeners may wish to enter only the control channels and operate their scanner in control channel only mode. Uniden scanners must be set to "Plan 2" when using this feature.

New Castle County
866.2375
866.4875
866.5625
866.7250
867.0375
867.2375
867.4875
867.7125
867.7375
868.2125*
868.3875
868.7125
868.9375*
868.9625*

Kent County
866.0750
866.1625
866.6500
866.6750
866.7625
867.1250
867.6500
867.6750
867.9500
867.9750
868.6125
868.6500*
868.7500*
868.8625
868.9000*

Sussex County
866.1000
866.3625
867.0875
867.3500
867.6000
867.8375
868.0875
868.1125
868.3500
868.5875*

Hartly IR
866.1625*
866.7625
867.9750
868.6125
868.8625

Winterhur IR
866.3000
866.6500
866.8250
867.1250
867.3000
867.6625
868.3250
868.5000*

Hockenssin IR
866.5375
866.7875
867.2625
867.4250
867.7750
868.0875
868.5750*

Agencies

All state agencies and many local ones use the statewide system. Having everyone on a single system makes mutual aid and interoperability much easier. We'll start with the Delaware State Police.

Delaware State Police

As is the case with many states, the Delaware State Police (DSP) had humble beginnings back in the 1920s. The automobile was becoming an increasingly popular mode

of transportation and the state embarked on building new roads. Roving bands of trouble makers speeding at 35 miles per hour were terrorizing the good people of Delaware, so in 1923 the state's General Assembly created the Delaware State Police whose job was to patrol the state's highways.

World War Two caused a shortage of men, and the State Police saw its first women employees. In 1943 seven women began clerical duties. In the same year the agency began using a high-frequency (HF) radio system for two-way communications.

The Delaware State Police has a history of being on the cutting edge of technology. They were amongst the first law enforcement agencies to use a breathalyzer, a polygraph, statewide teletype, radar for speed detection, and a scuba team.

Today the State Police is divided into eight troops.

Troop 1 is headquartered on Philadelphia Pike in Wilmington and is responsible for the area north of Wilmington.

Troop 2 is headquartered in Newark and is the consolidated criminal investigation facility for New Castle County.

Troop 3 is headquartered in the state capital of Dover and is the only troop in Kent County.

Troop 4 is headquartered in Georgetown and patrols central and south Sussex County. This part of the state is mainly rural and the DSP provides first responder law enforcement to the many communities in this part of the county.

Troop 5 is headquartered in Bridgeville and protects drivers during the summer months of seasonal resort travel.

Troop 6 is the largest troop in the state. It's headquartered in Wilmington.

Troop 7 is headquartered in the resort town of Lewes, which is home to the largest outlet mall on the east coast. The mall traffic keeps the DSP busy. Delaware does not have a sales tax, which brings bargain hunters from around the region.

Troop 9 is headquartered in Odessa. The chemical industry is very important to Delaware's economy, and a large number of chemical plants are located in troop 9's patrol area. Troop 9 is also prepared to respond to emergencies at the largest prison in the state, a major US highway, three bridges, and at the nuclear reactor in nearby Salem, New Jersey.

DSP New Castle County Talkgroups

New Castle County is the northernmost county in Delaware and the most populous. It is home to the cities of Wilmington and Newark, two of the state's largest population centers. Troops 1, 2, 6, and 9 are all based in New Castle County.

Talkgroup	*Description*
1840	Executive Security
2032	Special Operations Response Team 1
3056	Special Operations Response Team 2
2128	Command
2160	Tactical 1
2192	Tactical 2
2224	Tactical 3
2256	Tactical 4
2288	Data
2640	Secure
2672	Troop 1
2704	Troop 2
2832	Troop 6
2896	Troop 9
2928	Supervisor
13904	Detectives
14000	Intelligence
14032	Special Investigation Unit
14416	Homicide
14512	Casinos/Gambling
14608	Intelligence
15952	Command Center
16048	Special Investigative Unit Investigation
16240	Aviation
14512	Casinos/Gambling

DSP Kent County Talkgroups

Kent County is the middle county in Delaware and home to the state capital of Dover. Troop 3 is wholly responsible for this county.

Talkgroup	*Description*
1872	Executive Security
2064	Special Operations Response Team 1
3088	Special Operations Response Team 2
2320	Command
2352	Tactical 1
2384	Tactical 2
2416	Data
2736	Troop 3
2960	Supervisor
13936	Detectives
14064	Special Investigation Unit
14128	Intelligence
14448	Homicide
14640	Intelligence
15984	Command Center
16080	Special Investigative Unit Investigation
16176	Secure
16272	Aviation
17776	Kent TCU
17840	Kent/Sussex TCU
14544	Casinos / Gambling

DSP Sussex County Talkgroups

Sussex County is the southernmost county in Delaware and home to the state's beaches and resorts.

Talkgroup	*Description*
1904	Executive Security
2096	Special Operation Response Team-1
3120	Special Operation Response Team-2
2448	Dispatch
2480	Tactical-1
2512	Tactical-2
14864	Tactical-3
14896	Tactical-4
2544	Data
2768	Troop 4 Georgetown
2800	Troop 5 Bridgeville
2864	Troop 7 Lewes
2992	Supervisor
13968	Detectives
14096	Special Investigation Unit
14288	Intelligence
14480	Homicide
14672	Intelligence
16016	Command Center
16112	Intelligence Unit
16208	Secure
16304	Aviation
17808	Sussex TCU
17936	Office of Narcotics & Dangerous Drugs

DSP Statewide Talkgroups

Talkgroup	*Description*
1616	Emergency Net
1648	Detective Net
1680	Conflict Management Team
1712	Aviation Net
1776	Executive Command
1808	Executive Security
1936	National Law Enforcement Emergency Net
1968	Information Support Services
2000	Special Operations Response Team
2576	Headquarters
2608	Bomb Squad
3024	Police Administration
14704	Internal Affairs
14800	Intelligence
14832	Intelligence
16144	Special Investigative Unit Investigation
16336	Aviation Administration

New Castle County talkgroups

The city of Wilmington operates its own

Motorola Type I trunked radio system. The county and most communities within the county operate on the state system.

County talkgroups

Talkgroup	*Description*
6480	New Castle County Criminal Investigation Unit A
6512	New Castle County Criminal Investigation Unit B
6544	New Castle County Criminal Investigation Unit C
6800	New Castle County Emergency Preparedness
3856	New Castle County EMS Dispatch
4144	New Castle County EMS Ops 2
4368	New Castle County EMS Ops 3
3184	New Castle County Fire Dispatch
10576	New Castle County Fire Police
3216	New Castle County Fire TAC 3
3248	New Castle County Fire TAC 4
3280	New Castle County Fire TAC 5
3312	New Castle County Fire TAC 6
3888	New Castle County Fire TAC 7
3920	New Castle County Fire TAC 8
21232	New Castle County Justice of the Peace
6992	New Castle County Mounted Patrol
9328	New Castle County Mutual Aid 1
9360	New Castle County Mutual Aid 2
6448	New Castle County PD Administration
6416	New Castle County PD Data
6224	New Castle County PD Dispatch 1
6256	New Castle County PD Dispatch 2
9520	New Castle County PD Mutual Aid
6608	New Castle County PD Special Operations 1
6640	New Castle County PD Special Operations 2
6704	New Castle County PD Special Wepaons and Tactics
6288	New Castle County PD Tactical 1
6320	New Castle County PD Tactical 2
6352	New Castle County PD Tactical 3
6384	New Castle County PD Tactical 4
8656	New Castle County Sheriff
7056	New Castle County Sheriff
13008	New Castle County PD
17872	Office of Narcotics & Dangerous Drugs

City talkgroups

Talkgroup	*Description*
9808	Aetna FD
9840	Belvedere FD
9872	Brandywine Hundred FD
9904	Christiana FD
9936	Claymont FD
9968	Cranston Heights FD
10000	Delaware City FD
10032	Elsmere FD
12912	Elsmere PD
10064	Five Points FD
10096	Goodwill FD
10128	Hockessen FD
10160	Holloway Terrace FD
10192	Middletown FD
10224	Mill Creek FD
10256	Minquadale FD
10288	Minquas FD
10448	New Castle County Airport FD
19216	Newark PD Dispatch
19248	Newark PD Ops
19280	Newark PD TAC
13136	Newport PD
10320	Odessa FD
10384	Talleyville FD
10416	Townsend FD
19312	University of Delaware PD 1
19344	University of Delaware PD 2
19376	University of Delaware PD 3
3696	Wilmington FD
10640	Wilmington Fire Mutual Aid
10480	Wilmington Manor FD
12944	Wilmington PD
10672	Wilmington PD Mutual Aid

Other talkgroups

Talkgroup	*Description*
4080	A. I. DuPont Hospital Emergency Room
10608	Christiana Care Health System Fire Protection
3952	Christiana Hospital Emergency Room 1
3984	Christiana Hospital Emergency Room 2
4016	Christiana Hospital Emergency Room 3
10352	Port Penn FD
4048	Saint Francis Emergency Room
13808	State Fire Marshal
14192	State Fire Marshal
4112	Wilmington Hospital Emergency Room 1
4656	Wilmington Hospital Emergency Room 2

Kent County Talkgroups

Kent County is home to Delaware's capital and also Dover Air Force Base (DAFB). The base is home to the 436th Airlift Wing. The wing has over 4,000 active-duty and civilian employees. DAFB has the somber distinction of receiving the remains of service personnel killed overseas.

County talkgroups

Talkgroup	*Description*
3344	Kent County Fire Dispatch
3376	Kent County Fire 1
3408	Kent County Fire TAC 4
3440	Kent County Fire TAC 5
3472	Kent County Fire TAC 6
4208	Kent County Fire TAC 7
3920	Kent County Fire TAC 8
4176	Kent County EMS Ops 1
11440	Kent County Fire police
11536	Kent County EMS Dispatch
11568	Kent County EMS Ops 2
11600	Kent County EMS Talk Channel 2
11696	Kent County Paramedics
7408	Kent County Emergency Preparedness
8688	Kent County Sheriff
9392	Kent County Mutual Aid 1
9424	Kent County Mutual Aid 2
9552	Kent County Police Mutual Aid
21264	Kent County Justice of the Peace

City talkgroups

Talkgroup	*Description*
10832	Bowers FD
10864	Camden & Wyoming FD
19760	Camden PD
10896	Cheswold FD
10928	Clayton FD
19600	Clayton PD
10960	Dover FD
4240	Dover FD
11760	Dover FD Dispatch
11408	Dover Fire Marshal
19984	Dover PD Criminal Investigation
19888	Dover PD Data
12880	Dover PD Dispatch 1
19856	Dover PD Dispatch 2
20144	Dover PD Exec Command
20016	Dover PD Hostage Negotiation Team
20112	Dover PD Sort Command
20048	Dover PD Sort-1
20080	Dover PD Sort-2
19920	Dover PD TAC-1
19952	Dover PD TAC-2
10992	Farmington FD
11024	Felton FD
19824	Felton PD
11056	Frederica FD
19792	Frederica PD
11088	Harrington FD
19632	Harrington PD Command
19664	Harrington PD Data
19696	Harrington PD Special Operations
11120	Hartly FD
11152	Houston FD
11184	Leipsic FD
11216	Little Creek FD
11248	Magnolia FD
11280	Marydel FD
11312	Milford FD
20240	Milford PD Admin
19728	Milford PD Dispatch
20176	Milford PD Operations 1
20208	Milford PD Operations 2
11344	Smyrna FD

19408	Smyrna PD #1
19440	Smyrna PD #2
19568	Smyrna PD Admin
19504	Smyrna PD Ops
19536	Smyrna PD SIU
19472	Smyrna PD Tac 1
11376	South Bowers FD
20592	Wyoming PD

DAFB talkgroups

Talkgroup	*Description*
4272	DAFB Hospital
11792	DAFB Clinic
11824	DAFB Fire Department
11632	DAFB EMS
11472	DAFB Security Police

Other talkgroups

Talkgroup	*Description*
4304	Kent General Hospital ER 1
4336	Kent General Hospital ER 2
11504	American Legion Ambulance
13840	State Fire Marshal
14224	State Fire Marshal
22704	Dover Fire Marshal
13296	Capitol Police

Sussex County talkgroups

Virtually all agencies in Sussex County have abandoned their VHF frequencies for the state's TRS.

Police talkgroups

Talkgroup	*Description*
13456	Bethany Beach PD
13776	Bridgeville PD
13520	Dagsboro PD
13584	Dewey Beach PD
20624	Ellendale PD
13424	Fenwick Island PD
12592	Sussex County Fire Police-1
21072	Sussex County Fire Police-2
21104	Sussex County Fire Police-3
21136	Sussex County Fire Police-4
21168	Sussex County Fire Police-5
13360	Georgetown PD
20272	Greenwood PD
13616	Laurel PD
13712	Millsboro PD
13392	Lewes PD
13744	Milton PD
13168	Ocean View PD
13648	Rehoboth Beach PD
20656	Rehoboth Beach PD-1
20688	Rehoboth Beach PD-2
13552	Seaford PD
20336	Seaford PD
20368	Seaford PD Detectives
20400	Seaford PD Special Ops team
9584	Sussex County Police Mutual Aid
8720	Sussex County Sheriff
20304	Selbyville PD
13680	South Bethany Beach PD

Fire/EMS talkgroups

Talkgroup	*Description*
11856	Bethany Beach FD TAC
11888	Blades FD TAC
11920	Bridgeville FD TAC
11952	Dagsboro FD TAC
11984	Delmar FD TAC
12016	Ellendale FD TAC
12048	Franford FD TAC
12080	Georgetown FD TAC
12112	Greenwood FD TAC
12144	Gumboro FD TAC
12176	Indian River FD TAC
12208	Laurel FD TAC
12240	Lewes FD TAC
12304	Millsboro FD TAC
12336	Millville FD TAC
12368	Milton FD TAC
12560	Ocean City MD Fire Patch
3728	Rehoboth Beach FD/EMS Dispatch
12400	Rehoboth Beach FD TAC
12432	Roxana FD TAC
3760	Seaford FD/EMS Dispatch
12464	Seaford FD TAC
12496	Selbyville FD TAC
12272	Slaughter Beach FD TAC
4432	Sussex County FD/EMS Dispatch
4464	Sussex County EMS-1 Ops
4496	Sussex County EMS-2 Ops
12656	Sussex County EMS-3 Ops
13872	Sussex County Fire Marshal
14256	Sussex County Fire Marshal
3536	Sussex County Fire-1 Ops
3568	Sussex County Fire-2 Ops
3600	Sussex County Fire-3 Ops
3632	Sussex County Fire-4 Ops
3504	Sussex County Fire-5 Ops

Other talkgroups

Talkgroup	*Description*
12688	Atlantic General Hospital MD
4528	Beebe Medical Center Lewes ER
4560	Beebe Medical Center Millville ER
7440	Emergency Medical Preparedness
12752	Emergency Operation Center
12784	Georgetown American Legion Ambulance
12624	Mid-Sussex Rescue Squad TAC
4592	Milford Hospital Emergency Room
4624	Nanticoke Memorial Hospital ER
12816	Paramedics Ops-1
12848	Paramedics Ops-2
12720	Suscom Support Personnel
21296	Sussex County Justice of the Peace
9456	Sussex County Mutual Aid-1
9488	Sussex County Mutual Aid-2

Delaware is a beautiful location for a summertime getaway, and even wintertime has its own rugged beauty. Its mid-Atlantic location places it within a day's drive from much of the eastern seaboard. Pack lots of sunscreen and remember that digital scanner.

Baudwalking
New Modes of Communication

By Tom Sundstrom, W2XQ

Happy New Year and belated Seasons Greetings to the *Monitoring Times* family of readers, subscribers, advertisers and gang behind the desks in North Carolina. *Baudwalking* is a new occasional column that takes a wide look at what's new on the Internet as it pertains to radio, media and communications.

The listening and amateur radio hobbies radically changed beginning with the 1980-era telephone BBS systems and the Internet's growth starting in 1994 or so.[1] But this isn't a history lesson. There are several sources for looking at the past.[2] Let's get going and communicate.

Electronic mail is probably the largest application of types of services available through the Internet. It is a blessing and it is a curse. Although e-mail is delivered quickly, unwanted, annoying and rude "spam" e-mail clutters the inbox and is an expensive time-waster. What can we do?

Working around E-mail Junk

Alternative communication methodologies include instant messenger (IM) programs, blogs, Internet relay chat (IRC) "channels" or "rooms," and headline news servers. Mention IM, and some persons say "I would rather not be interrupted all the time." The interruptions can be totally controlled. The IRC network of servers around the world enable the creation of public or private chat rooms, and there are software controls to fine tune each room's characteristics. Blogs – writers' web pages of comments on the social or political scene, or on just about anything timely – and newsletters using special Web page coding are relatively new, but have already become mainstream; "bloggers" (people who write the blogs) were even invited to the USA 2004 national political conventions.

This month let us look at the two-way communications: instant messaging and Internet relay chat. The common characteristic: immediate communications, no delay, and no spam. The significant difference: IM is one-on-one, whereas IRC is a multi-user chat room.

How does all of this tie into the subjects that interest *Monitoring Times* readers? Whereas the printed word in *MT* provides the depth and background to current events, such as features on monitoring in the Middle East, the World Wide Web cannot easily provide the details, depth and analysis found in the *MT* articles. Rather, the 'net is superb when it comes to breaking news.

One example. As this column's deadline was looming, a window into the IRC chat channel #swl came to life. It was late at night, and listeners in Baltimore, New Hampshire, and Ohio typed "the MW band is open... hearing trans-Atlantic signals." I turned on the radio and listened to a very good signal from Croatia on 1134 kHz, peaking at 30 db/s9. It was the best of the signals noted on 1062, 1215 and 1314 in the southern New Jersey area, and I listened for a while continuing to work.

What's the point? Had I depended upon e-mail, I would have only found out about the Europeans the next day when picking e-mail from the server and only if someone thought to write me. Weekly e-mail newsletters would be slower yet.

A second example. Are you a radio amateur but not a contester? You could tune into a server posting callouts of foreign stations in the CQ WorldWide Contest. Data is instant, and includes the exact frequency and time. If you had the right transceiver and software, the data could even tune the transmitter.

A third example. The South Jersey Radio Association – **http://sjra.net** – have a swap net on K2AA-145.29 MHz at 8 p.m. Sunday nights. The net control of the session opens an IM program and other club members participating on the net help with missed calls or questions on equipment. It makes for a more efficient net, and there is less on-air confusion.

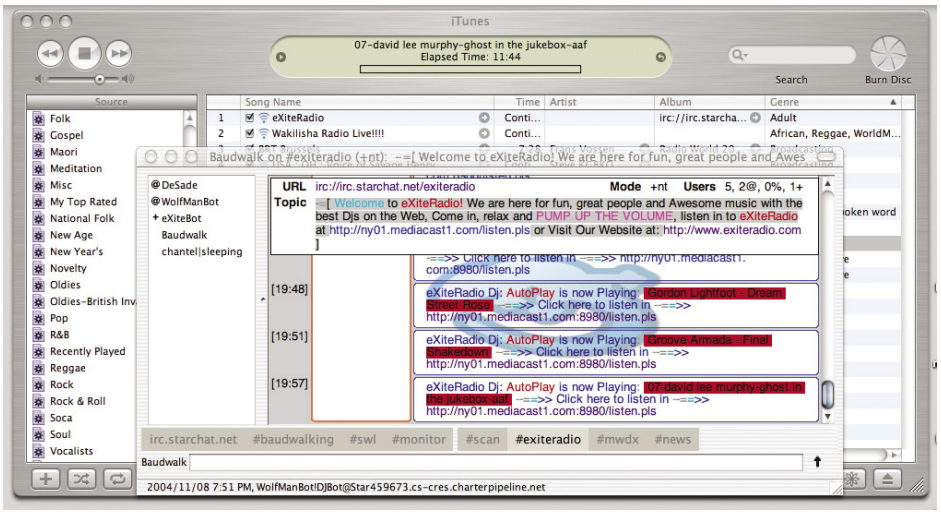
In the business of communicating, these technologies are for more than just business and personal use. It can be very useful in the pursuit of your radio "career." But how, you ask?

Instant Messaging

These snappy little software programs were originally designed to do just one thing. You could tell when another person signed onto the Internet and could engage in a keyboard "chat" with that person. Feedback is immediate and positive, without the delays of e-mail and frustration of not knowing if the mail recipient had read the latest message sent.

Marketing pressures and software designers have added everything but the kitchen sink to

Trillian, for Windows, offers a Basic and Pro version of their software that connects to multiple instant messaging services in one application. Mac users have a similar product, Fire, available to users of OS X 10.2 or higher. See the text for more details.



A variant on two-way messaging in IRC is to use an automated program such as done here by #exciteradio. Their Starchat chat room, shown in Chatzilla, shows the song being played by Apple's iTunes at the stated time. The Firefox browser, the plugin Chatzilla and iTunes are available for the Windows platform as well.

the current generation IM programs. News and sports headlines, weather, stock quotes, audio and video messaging, conference or chat rooms, links to e-mail applications, advertisements... the features are endless.

IM programs typically do one-on-one short messaging. Are you and a friend elsewhere doing some listening while sharing notes of what's heard on a frequency? Did the six-meter band open with Sporadic-E to a place far away? Is your friend busy working on the computer in another software program and you want to attract his or her attention amongst the pile of windows on their screen? Perhaps you are in the same community, and the scanner has come alive due to some activity? What's the phone number? Are you free for lunch?

Virtually all IM programs can be set to beep, squeak, honk, or play the national anthem (not really, I made up that last option...) when a message arrives on station. For someone who cannot pay close attention to the IM window for the occasional words of wisdom, the user-selected noisemaker can be helpful to turn attention to the computer screen.

The most popular of the IM programs are AOL's AIM and ICQ, Yahoo! Messenger, and Microsoft's Messenger. But there are other IM programs out there that are not so well known, and some of these may be a better choice once you look at your needs. Perhaps there are only a few officials with ham licenses involved in managing a county's Amateur Radio Emergency Services (ARES). For security purposes, perhaps a group may select an IM program that has no file transfer capabilities within it or they may step up to an industrial strength IM program like Bantu.

Look at these alternative software applications:

Bantu (Win) - http://corp.bantu.com/ (corporate product)
Excite's Private Messenger - http://www1.excite.com/home/messenger/messenger_overview/
Jabber (Win) - http://www.jabber.com/
Odigo (Win) - http://www.odigo.org/
PeopleLink - http://www.peoplelink.com/ - corporate product, for behind firewall.

What do you do when you have friends on different IM networks? The solution is an IM aggregator. Rather than launch up to four or five different programs, taking up display screen real estate and memory resources, a single application "talks" to several networks. Generally, these types of programs do messaging only.

Fire (Mac) - http://epicware.com/ - AOL, ICQ, MSN, Yahoo! and Jabber
Gaim (Win, Mac, Linux, BSD) - http://gaim.sourceforge.net/ - AIM, ICQ, MSN, Yahoo!, IRC, Jabber, Gadu-Gadu, and Zephyr
Kopete (Linux) - http://kopete.kde.org/ - supports AIM, ICQ, MSN, Yahoo, Jabber, IRC, Novell GroupWise Messenger, Lotus SameTime, and more
PalTalk (Win) - http://www.paltalk.com/ - AOL, Yahoo and MSN
Pexit (Win, Mac, Linux and Unix) - http://www.pexit.com/ - "all the popular networks"
Trillian (Win) - http://www.trillian.cc/ - AIM, ICQ, MSN, Yahoo! and IRC

The programs identified as operating on the Mac do so on OS X 10.2 and higher.

In all probability, in a hobby environment you have friends and acquaintances on most of the popular consumer-oriented IM programs. If one were to ask, I would probably suggest looking at Trillian (Win) and Fire (Mac) as starting points. An aggregate program focuses on messaging and the extra features that bloat some of the individual programs disappear from view.

A Matter of Control

Some persons you ask to join you on an IM program will decline. Reasons offered include citing a nuisance value, opening the computer to virus attacks, and unwanted "visits" from persons unknown seeking to open a conversation that may quickly dissolve into something tasteless.

I contend that if a computer user perceives a need or want to communicate directly and quickly with a few friends, such as illustrated earlier, there is little or no reason to avoid using the "proper" IM application.

Consider these ideas to eliminate nuisances. Sign up for a Web mail-based e-mail account that can serve as a throwaway address. Use this throwaway address when signing up for an IM account, and keep your home or personal e-mail address close to the vest (family et al).

Internet Relay Chat

IRC stands for Internet Relay Chat. IRC is a multi-user, multichannel chat system that is run on a network of computers that may well be scattered all over the world. People can type messages to each other in real time. Each user has a nickname (nick) and converses with other users in either public channels (chat rooms) or in private message areas.

There are a number of different networks, but the radio-related chat rooms – the focus of this column – seem to settle on less than a handful of providers.

The well-known radio-related chat rooms operate with a minimal set of rules established by the chat room organizers who keep order. Common sense and courtesy are the keys to the chat rooms. You will not find the chaos and mayhem that characterizes the chat areas on the large Internet access providers (e.g., AOL, MSN and others).

IRC Software

Software solutions for IRC are relatively easy to use for Windows and Mac users, and are either low-cost, shareware or free. Mozilla and

Firefox browser users have an extension plug-in option, Chatzilla, that works quite well, in my opinion. The Windows platform is dominated by a UK program, mIRC, and Pirch is a second; for Mac, Ircle is often-mentioned, but I prefer AkwaIRC. Look at these and select the one you like:

AkwaIRC (Mac) - http://akwairc.online.fr/
Chatzilla (browser plug-in) - http://www.mozilla.org/projects/rt-messaging/chatzilla/
HydraIRC (Win) - http://www.hydrairc.com/
Ircle (Mac) - http://www.ircle.com/
mIRC (Win) - http://www.mirc.co.uk/
Pirch (Win) - http://www.pirchat.com/
Snak (Mac) - http://www.snak.com/
Visual IRC (Win) - http://www.visualirc.net/
Xchat (Unix) - http://xchat.org/

If you are using a third-party computer when traveling, in a library, or on rental, most of the IRC networks also offer a Java-based user interface accessible through the installed browser. The access is immediate and no software installation is required, but system response may be a bit slower and all IRC features may not be available. Nevertheless, you can get to many chat rooms with just a Web browser.

IRC Networks

In the past few years I have found radio- and communication-related chat rooms on five networks. Clearly, there are more networks, and a search in the search engine of your choice will find more networks. As a starting point, you may like to browse these networks and look through the available chat rooms:

Chatnet - http://www.chatnet.org/
EFnet - http://www.efnet.net/
Slashnet - http://www.slashnet.org/
Starchat - http://www.starchat.net/
ZiRC - http://www.zirc.org/

IRC Chat Rooms

What chat rooms are available? There are quite a few to start with. I may show up in #swl – note the leading pound sign – almost any time outside normal work hours and put in an appearance in #cybershortwave during the live shows of Big Steve Cole (http://www.dkosmedia.com) and Dave Kirby, N1DK (http://www.n1dk.com/) that air on Live 365 (http://www.live365.com/), and usually monitor our own chat room #Baudwalking. If you see Baudwalk in the list of chat room attendees, that's us. Say hello!

Try these chat rooms. If you know of other chat rooms that fall into our circle of interest, please do tell us. Here is a starting grid:

#swl - irc.starchat.net/#swl - One of the oldest chat rooms that I know of, this one dates back to the ANARC SWL Net days of the late 1990s. See N1DK's history on the shortwave listener's net. This room is alive 24/7 although activity and response time slows during the working hours, mostly east coast North America. See a specific help page at http://trsc.com/irc_swl.html for supplemental directions that should make software installation and configuration easy to understand.

#cybershortwave - irc.startchat.net/#cybershortwave - Originally supporting the ANARC SWL Net, it now comes alive every two weeks when N1DK does a live show on Sunday mornings with a combination of music, radio, and fun. All are welcome. The chat sessions during Big Steve Cole's weekly Saturday night "Different Kind of Oldies" show also takes up occupancy here; if you like Doo Wop and music of the '40s, '50s and '60s, you can't do better than tune to this show. Cole airs repeats of the show during the week, but without the live interaction in the chat room.

#monitor - irc.zirc.org/#monitor - This chat room changed networks in the summer of 2004 due to some technical difficulties, and now has found a home on ZiRC. Whereas #swl tends towards more broadcast listening, it appears to me that #monitor has an active group of utility monitors. I see discussions on military and coded transmissions. The chat room organizers have accompanying chat rooms of #airband, #milcomm and #satcomm, but when I have visited I have not seen any traffic. There is a nice touch here: the #monitor room is also repeated on Starchat (irc.starchat.net/#monitor), which makes it easier for users with IRC software that logs onto only one network at a time.

#cqdx - irc.radiochat.org - As a radio amateur active on the HF bands chasing DX, undoubtedly you have heard of the term "DX cluster." It is an over-the-air packet radio network system that displays "callouts" of stations worked and heard. The "spotting" of the frequency, mode, date and time gives instant information to other hams on the packet radio network. This #cqdx chat room is an Internet reflection of what is seen at a packet terminal. Frankly, it was rather fascinating to watch during the two CQ World-Wide Contests in late fall. Data just flew by the window at a high rate of speed.

In addition to the instant feedback and alerting to special events as described earlier, the roundtable nature of the chat rooms is useful in day to day monitoring. A number of years ago, ye scribe heard a bandsweeping noise in 60 m. It was destroying the otherwise normally very good daily reception of Ghana on 4915 kHz. Asking others in the #swl chat room to listen, within an hour we all knew that the pulsing noise was heard in Brazil, the Netherlands, South Africa, Norway, Canada and around the eastern half of the USA. Internet research showed that the interference was low-powered vertical polarized signals from New Jersey-based transmitters, measuring ocean wave heights at short distances out to sea. (Publicity soon forced some reengineering and reduction in bandwidth of these signals.)

What's the point here? The rapid gathering of data and sharing of notes among all listeners would have just about been impossible by any other means. After circulating the information by other delivery mechanisms, several persons wrote and said (in so many words) "I heard that noise but I didn't know where to find more information." If those listeners had kept an eye on the #swl chat room... You get the picture. Undoubtedly similar stories can be told by users in other chat rooms.

Getting More Help

Does IRC still look like it is too confusing? There are a few Web sites for users just starting out in IRC. Look at these pages for assistance:

#Beginner - http://www.ircbeginner.com/
Chatting on the Net - http://www.newircusers.com/
IRC Beginner - http://www.beginner.proroom.com/
IRC Help - http://www.irchelp.org/

Quickies

Grab your calendar and a red pen. Circle the dates of March 11 and 12, 2005, and make plans to attend the 18th edition of the USA-based Winter SWL Festival. The gathering of the clan is perhaps the largest convention gathering of long-, medium- and shortwave listeners and scanner enthusiasts in the world. It is not too early to plan ahead, and watch for the 2005 registration form to be posted on **http://swlfest.com/** in December or so. You can sign up for a news feed alert as well.

In Closing

The purpose of this edition of *Baudwalking* was to review a few easy-to-use alternative means of communications on the Internet other than e-mail. E-mail continues to be plagued by spurious spam messages from persons and companies clogging bandwidth and wasting our time. Sometimes there may be a better way to communicate.

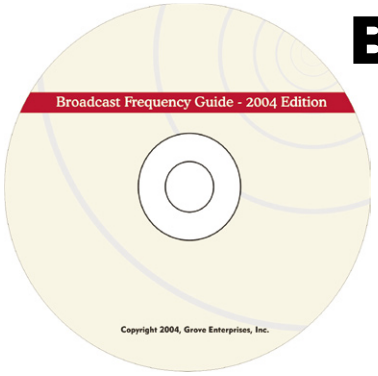
By controlling access to yourself, instant messaging can be a useful tool for the occasional short message to and from a friend. If your contacts use a variety of IM programs, there are all-in-one solutions to communicate with different IM sources at once.

Whereas IM programs are designed for one-on-one messaging, somewhat akin to a radio amateur net, a controlled Internet Relay Chat channel is fun or useful for ongoing conversations 24/7 among a group of like-minded persons. In the IRC program setup, mark yourself "invisible" and the stray broadcast messages from unwanted intruders will not show up on your screen. Set the "logging" on to see what happens when you are away from the computer. There may be a listening tip or something interesting found on the 'net, that scrolled off the screen in your absence.

See you next time. Topics will include blogs and XML/RSS news feeds. These are useful tools for current information. Comments or questions? Is there a topic you would like us to address? Please e-mail tomsundstrom@monitoringitmes.com.

1 My first computer, a 48k Apple II with 3 drives, an optional 16k memory card and CP/M card, an Epson MX-80 printer, green screen monitor and Hayes 300 bps modem was a powerful beast indeed. Times have changed. A Palm T3 PDA gets a daily workout.

2 One source of history is Wikipedia, a multilanguage free-content encyclopedia, at http://en.wikipedia.org/, with more than 382,000 pages on the server.



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Whether you are just starting to explore the broadcast frequency spectrum or you are a seasoned veteran, the Grove Radio/Television Broadcast Directory should be a part of your radio library.

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How to Beat the Sunspot Cycle Blues

Several hundred years ago astronomers discovered that activity on the surface of the sun, which they could see as sun spots, was cyclical in nature. It shouldn't have been much of a surprise since everything else associated with living in this solar system is cyclical. That cycle lasts roughly 11 years.

The reason this is of interest to radio hobbyists is that the sun spot cycle directly effects how good (or bad) HF band conditions are. It's not really a simple sine wave pattern, because there are highs and lows within the overall 11 year cycle. These smaller ups and downs can last a few days or just a few minutes and are also related to seasonal propagation effects.

It's generally considered that we are at or near the bottom of the current cycle which is known as Cycle 23. It can be a frustrating time to be in the radio hobby unless you have some alternatives. Here are a few for beginners to consider.

1) Move to Another Band

While the low solar cycle is not supporting the HF bands, it leaves the VHF and UHF bands available for exploration. The 2 meter band (144-148 MHz) is known to most as an FM band. It's the realm of repeaters for Handi-Talkies and mobile operation. But, it's also a DX band. With an all-mode transceiver you'll hear operations in single-sideband (SSB), CW (Morse Code) and digital modes. You can monitor Earth-Moon-Earth (EME) contacts (now *that's* DX!), International Space Station contacts, amateur radio satellites and more.

Another less explored band is 6 meters. From 50-54 MHz this band allows CW, SSB, AM, FM and digital modes. There are also repeaters operating on this band. Openings on 6 meters allow substantially longer range coverage and happen at the same time as TV and FM radio DX, because the 6 meter band is very close to the FM band (88-108 MHz) which is between channels 6 and 7 on the VHF-TV band.

MHz Networks downlink facilities in northern Virginia. This is what you need when programming mostly international fare for a DTV station. (Courtesy Normal Hill)

Better than a Bose. This Cambridge SoundWorks Radio 88CD gives you outstanding audio and decent FM reception. Hey, you get the CD player too! (Courtesy: JR.com)

Most scanners don't tune these bands in SSB; among the full coverage receivers capable of tuning in these bands are the AOR-8200 MK III-B, the Icom R-8500-02, and the Drake R-8B. If you're a ham, check out the new rigs such as the Icom IC-706 MK II-G, Kenwood TS-2000, and the Yaesu FT897D, which cover these frequencies in all modes and also offer cross-band (transmit on one band and receive on another) operation. Of these, the Icom-706 MKII-G is the least expensive at just under $800.

2) Get Serious About Those Antenna Projects

Don't wait until conditions improve to start thinking about putting up new antennas. Now's the time to do a little research on the kind of antenna or antennas you need to round out your listening post, order the materials, and put it together.

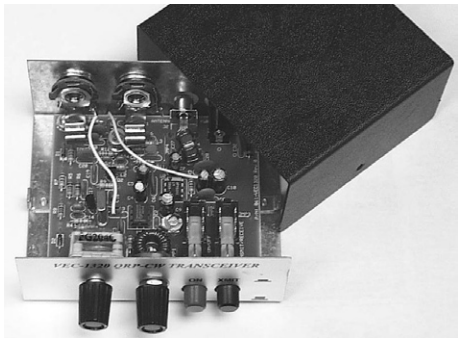
How about a great all-band antenna for HF? Check out the plans for the antenna in the October 2000 *Getting Started* column in *MT*. This antenna is easy to build, very inexpensive, gives outstanding reception on all HF bands, decent reception on AM and is a great transmitting antenna in the event you decide to get your license.

Need to improve reception on your scanner? How about an attic mounted omni-directional antenna? (Courtesy Grove Enterprises)

How about a great VHF/UHF omni-directional, multi-band antenna you can put in your attic? Or how about a VHF/UHF beam antenna on a rotator to explore the farthest reaches of your area? Check out the ones offered in the Grove catalog or at your local Radio Shack.

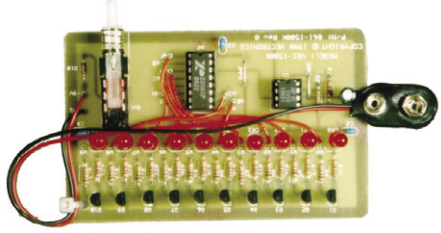
3) Build Something

Part of the fun of the radio hobby is learning new things and becoming familiar with the building blocks of electronics. One way to do that is with any one of the low priced kits available from Vectronics at **http://www.vectronics.com**. They offer a wide array of kits ranging from the Counter Surveillance Monitor Kit for $19.95 to an FM stereo transmitter kit for $34.95.



Build this low power (QRP) transceiver and work the world on 20 meters for $29.95. (Courtesy: Vectronics)

For the real beginner there's a comprehensive soldering course designed to teach the very basics of soldering. The kit sells for $29.95 and includes instruction on theory as well as a PC



Want to learn the basics of soldering and electronics? Try this soldering course kit for $29.95. (Courtesy: Vectronics)

board and components for practice.

If you're more experienced you might enjoy building their QRP (low power) transceiver kit for 80, 40, 30 or 20 meters. This one watt rig includes an operating crystal for the band of your choice. They're $59.95 each.

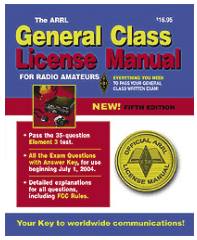
4) Discover Something Out-of-this-World

Satellites aren't bothered by the solar cycle. Operating in the VHF and UHF bands, they're strictly dependent on line-of-sight. Equipment to actually work another station through the satellites is fairly complicated, but there's no trick to simply monitoring them. All you need is a radio which can tune the VHF and UHF bands (see above) and a modest receiving antenna.

Details are found at **http://www.amsat.org**. Once there, click on the button about getting started in satellites. There are a number of well written articles for the AMSAT beginner here. Print them out for future reading. For a list of all satellites, operational or not, go to **http://www.amsat.org/amsat-new/satellites/status.php**. One of the fun things to do is monitor the International Space Station (ISS). A list of ISS frequencies is found at the end of this column.

Information on these satellites changes all the time, so having the most current information is crucial. You can subscribe to a number of AMSAT e-mail newsletters which deliver this information to you each week for free. The latest updates on operational satellites and their frequencies are found here. To sign up, go to this web site:
http://www.amsat.org/amsat-new/tools/maillist/maillist.php#lists

5) Take the License Challenge



Take advantage of the bad band conditions: get your amateur radio license and be ready for the good times ahead! Choose the entry level no-code Technician license or get it all with the General Class license and code study. (Courtesy ARRL)

It's easier than ever to get on the air and operate your own amateur radio station. With inexpensive, used transceivers on the market and the slower speed Morse code requirement, there's no reason you shouldn't try for your ham license. The American Radio Relay League (ARRL) has everything you need: license study manuals, Morse code study cassettes and CDs. The manuals are under $20 and the code study course is just $14.95. Call them at 800-277-5289 or order on-line at **http://www.arrl.org/catalog/lm/**. Exams are given year round in every area of the country on a regular basis. If you've been around the radio hobby any length of time, you might actually already know enough to pass the entry level exam for the Technician class license. To check your own "radio IQ" go to **http://www.qrz.com/testing.html**.

❖ MT Readers Write

A number of readers have written me regarding other articles I have written for *MT*. Since they are of interest to all, I'll answer them here.

Looking for Zenith

Steve Flynn read a review I did in the March '99 *MT* comparing the Zenith Z213 table radio with the Bose Wave radio. He asks, "Do you know if the Zenith radio is still being produced and which major electronics outlet may sell them?"

Steve, that model was replaced by the Zenith Z2000 which included a built-in CD player and has itself since been discontinued. I have not seen it available anywhere for several years. However, for the same price as the Z2000, you can get a Cambridge SoundWorks Model 88CD (see photo). It's similar to the Kloss Model 88 which I reviewed in the July '99 *MT* though this model has a CD player built-in. It's a superior radio, totally equal to the Bose Wave (I actually like it better!). You can check it out at **http://www.jr.com** in the category of "Cambridge Clock Radios."

Cambridge SoundWorks sells their Model 730 on their web site **http://www.hifi.com** or call them at 800-367-4434. Check out the specials and the returns departments where these radios are sometimes deeply discounted. I've seen the Model 88CD reduced to $180 and the 730 (no CD player) for as little at $150. Both are terrific bargains compared to the Bose Wave radio. If you're "just looking," call and ask for a free catalog.

MHz Networks Independent TV

Norm Hill from Arlington, VA, read the piece I did on digital TV last year in *MT*. I had mentioned MHz Networks which is based in the Washington, D.C. area and is an independent public TV station. He was one of the original founders of the channel and is now retired. He notes that the channel began in 1972 as an educational channel and went through a number of changes before settling on its current international programming format. News broadcasts from England, France, and Germany are broadcast everyday in English and native languages. It operates a second DTV channel which retransmits Russian TV programming most of the day. Two other DTV channels remain on the air with only the MHz ID card and may be used for future niche international programming. Norm sent along the photo of the MHz Network's dish farm at their studios.

Sloppy Engineering

Doug Griffiths, N2POW, from Schenectady, NY, adds his comments on the CCRadio Plus. He complains that when a long wire antenna is hooked up to the radio it picks up Radio Japan on the AM band. He also believes that one of the problems on the AM band today is that station engineers aren't properly observing their license requirements such as reducing power at night or signing off at all, having the FCC approved antenna pattern and other poor operating procedures such as over driving the audio.

And, finally, a correction. In the October issue I inadvertently garbled Paul Marcum's call sign. It's AC4ZQ. Sorry, Paul!

Monitor the International Space Station (ISS)

Voice and Packet Downlink: 145.80 (Worldwide)
Voice Uplink: 144.49 for Regions 2 and 3 (The Americas, and the Pacific)
Voice Uplink: 145.20 for Region 1 (Europe, Central Asia and Africa)
Packet Uplink: 145.99 (Worldwide)
Crossband FM repeater downlink: 145.80 MHz (Worldwide)
Crossband FM repeater uplink: 437.80 MHz (Worldwide)
(Courtesy: AMSAT)

Ask Bob

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *Without my having to drag an expensive ohmmeter up on the roof, what is another simple instrument I can use to check the continuity of the coax for opens and shorts? (Michael Herman, NY, NY)*

A. Sometimes the easiest answer is the most elusive. Remember, you either want the line to have infinite (or extremely high) resistance between the center conductor and the shield, or full continuity (short circuit) from end to end of the center conductor and the shield to indicate that they are not broken between the two ends of the line.

You could simply attach a buzzer in series with a battery; when the circuit is closed by a short, it will sound, and when it's an open, it won't! You can also do this with a series of two AA cells, a 470 ohm resistor and an LED for visual indication.

There are also inexpensive ICs available from Radio Shack that will give an audible tone when connected to a speaker or earphone. Again, you would simply make sure the circuit is oscillating, then substitute the two probe leads for the switch.

Q. *A major ham radio manufacturer is about to come out with an HF rig which has an output of 400 watts – four times as powerful as most standard ham transmitters. Will there be much practical advantage to the additional 300 watts? On the receiving end, how much real difference is there between 100 watts, 400 watts and 1000 watts? Is it worth shelling out an extra kilobuck or two for this rig or an linear amplifier? (Ken Cohen, NI3F, Bethesda, MD)*

A. These are excellent questions. The fact of the matter is that when you quadruple your power, the receiving station will see his S-meter rise one S unit (6 dB). Going from 100 watts to 1000 watts would make a 10 dB improvement (about 1-1/2 S units). If your signal is right on the threshold of reception, it will make a noticeable difference. If the signal is already in the clear, it will make no difference whatsoever because your receiver will simply automatically reduce its sensitivity to accommodate the increased strength (automatic gain control – AGC).

As a practical matter, once you have 100 watts or so, concentrate on antenna gain, not increasing power. That's why there are so many 100-watt rigs!

Q. *I am experiencing "RF in the shack" with my HF transceiver. My earth ground is about 15 feet away. A friend suggested using an "artificial ground"; what is this? (Brent Davenport, N7NBC)*

A. Nice call, Brent; I hope you don't work for CBS!

An artificial ground is nothing more than a resonant length of wire attached to the chassis of your transceiver; it acts like a counterpoise element to avoid SWR-related RF in the shack. You would need roughly 1/4 wavelength of insulated wire for each band you operate, and it can be either run in a random fashion around the room, or even coiled loosely.

An artificial antenna shouldn't really be necessary if you have a resonant antenna system, or any antenna system with a properly-adjusted transmatch (tuner).

Another possibility is to run a cable to a good, moist, earth ground. A heavy-gauge wire, or the braid of a length of coax should work fine. A good ground consists of at least one, and preferably two 8-ft. rods separated by about 10 feet, driven into moist earth.

Yet a third possibility, one which I've never tried, is to connect only the center conductor of the grounding coax between the ground rod and the rig grounding terminal, but solder a 0.01 microfarad, 600 volt capacitor between the shield and center conductor at the top, and another at the bottom. I'd be interested in hearing from readers who have tried this.

And finally, at least one manufacturer, MFJ Enterprises, makes a tuner for an artificial ground, allowing a random wire to be resonated on different bands.

But if you are using a properly-tuned transmatch (antenna tuner), such gimmicks shouldn't be necessary.

Q. *What do the terms "digital," "WFM" and "NFM" mean in scanners? (Robert Wilkinson, Continental, OH)*

A. In normal scanner parlance, *digital* refers both to computer control of the frequencies (trunking) for spectrum economy, and scrambling speech for security. While it is unlawful in the U.S. to listen to, or even possess a scanner that will decode encrypted communications, there is one exception: the new APCO Project 25 (P-25) system.

A growing number of civilian and federal agencies are now using P-25, and although they can select an encryption level that no outsider can decode, most of them choose the lowest level of digitization which can be received by the new scanners that have P-25 decode capabilities.

At VHF and UHF, there are two dominant types of modulation (putting sound or data on a signal): frequency modulation (FM) and amplitude modulation (AM). Aircraft communications use AM; terrestrial services use FM (some hams use other modes).

Because music is sonically so complex, its signal takes up a wider chunk of spectrum, typically 150-200 kHz, and so is called *WFM*. Voice comms are much simpler, with less frequency range, and can be narrowed down for spectrum efficiency (*NFM*).

If you try to listen to a narrow FM signal on a WFM receiver (FM broadcasting receiver), the recovered audio will be very weak, and if several adjacent-channel signals come on simultaneously, you would hear them all at once, because the receiver's selectivity is very broad so it can process the wider music bandwidths.

On the other hand, if you try to listen to WFM music or speech on an NFM scanner, it will be distorted, or you may hear nothing at all because the modulation occupies a wider amount of spectrum than the narrow scanner filters can process.

Q. *Is it permissible to listen to an AM/FM/shortwave portable radio in a commercial aircraft? And if not, why not? (Zach Braddock, email)*

A. It is against Federal Aviation Administration (FAA) Rules and Regulations, but not because of signal reception. It's because radiation from the oscillator in your radio may interfere with the aircraft's crucial radionavigation system.

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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1 I know that my readers faithfully read this column first, so here is an idea for December 31st. If you don't go out for New Year's Eve, it is a great night for listening to the scanner. The closer to midnight, the better the action. I just mute the TV program and listen to a pair of scanners on the fire and police bands. Think of the money you save by staying home! Can you say "new radio"?

2 The recent poll of *MT* readers made a clear statement. The readers want more frequencies! Are you reading every page in every issue? Because *MT* does publish literally hundreds, make that thousands of frequencies. When you discover some that interest you, make a photocopy of that page, or transfer the information to your computer database of frequencies. The HF frequencies are more universal, and I would hope that SWLers use the center section of the *Shortwave Guide* to their full advantage.

If you subscribe to *MT*, you should also get the digital, online, downloadable edition of *MT Express* for only an additional $11.95 ($19.95 to non-subscribers). This electronic format has several advantages. It arrives early, you get the benefits of active web links, and it is in full color! It is very slick! Go to **http://www.grove-ent.com** or call 1-800-438-8155 for details

3 The long anticipated deadline of narrowband technology re-farming has arrived. Government VHF users must be in compliance by January 1, 2005. This means two things. First, there are hundreds of new 7.5 kHz splinter frequencies now in use. The old, full 15 kHz spacing now exists with a new channel between each of the old allocations.

For example, fire allocations that looked like this: 154.160, 154.175, 154.190, 154.205, etc. will now look like this: 154.1600, 154.1675, 154.1750, 154.1825, 154.1900, 154.1975, 154.2050, etc. Your old radio probably does not have these 7.5 kHz steps. You can program something close and hear the signals, but it may sound unnatural because your radio was not designed for this new narrowband spacing. I have been disappointed listening to the new narrow spectrum using my old scanners. ATTENTION, Uniden, and Radio Shack (GRE): get with the new channel spacing!

So what are the new channel assignments in your area? Read on.

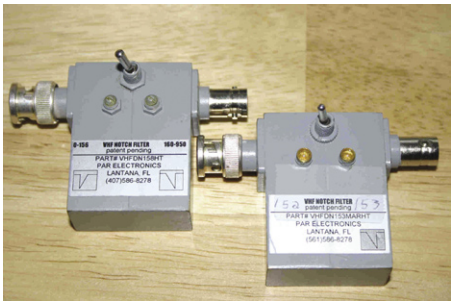
4 OK, so you did not get a new Scout™ Frequency Finder for Christmas. Well, let's start 2005 out right, and make a new sweep of the local bands you wish to monitor. The *Bright Ideas* column does not post lists of towns and frequencies. Rather, I intend to make it easier for you to find you own local frequencies. That is the fun part of the hobby!

Keep in mind there are frequencies in use that have never been published anywhere. They may not even be legally authorized by the FCC. (Remember the mess in Nevada?) SWAT frequencies are rarely published for obvious reasons.

To begin a new search, you can do as I have and create a template in your word processor. Start with a new document, and hit the enter key a couple of times. Now go to the Tables feature, and select Insert (or create.) Start with six columns and 25 rows. Columns can be labeled: Receive (RX), PL tone (CTCSS), Transmit (TX), PL tone, and the Agency Name, or use. The sixth column can be left blank for your imagination to fill in later. Using your mouse, you can adjust the width of the columns. The first four can be fairly narrow, just wide enough for the eight spaces of a frequency. The Agency column needs to be much wider. For the first frequency, you can start with the first VHF Low, VHF High, UHF, 700-900 public safety frequency allocation. Figure 1 is a sample of my VHF high table.

Don't forget about the new VHF 7.5 kHz narrowband allocations. For UHF it is 6.25 kHz.

You can go back to the top of the page and give it a title like "Public Safety Frequencies in use in Spokane, Washington."



OK, you spent an hour at the computer, and listed all the possible VHF High frequencies in the RX column up through, say, 162.000 MHz. Anything above this is probably, but not always, a US Government agency assignment. Now set your scanner or fancy receiver to scan or search in that band by sections, such as 150.700 to 155.995. Later you can search 156.000 through 162.000. Be patient. You need to sit on this search for several days at varying times. The best time to catch some activity are usually in the early morning, when people, and vehicles, go into service; again at their lunch hour, "I'll meet you at the steak house"; and 4-7pm when units go off duty or dispatchers make pager tests or announcements. This is particularly true of rural volunteer fire departments.

5 For me, half the fun of the monitoring hobby is finding these new, sometimes undocumented frequencies. Sometimes I find a new signal from a distant county or city because a new, powerful repeater or tower location has made the signals stronger enough for you to monitor them.

The best scanner for this type of search is the Pro 92 or the Pro 2067. In fact, most of the newer scanners will decode the PL tone or DCS. As you find or confirm the frequencies in use in your area, just begin filling in your database table.

Now that you have a new, accurate list of frequencies, why not send them to the appropriate *MT* column writer, such as *Scanning Report, Fed Files, MilCom*, or *Boats, Planes and Trains*?

As you search through the bands, you might find birdies which you can lock out. However, there may be some major interference which you need block out entirely. I find these howling intermods a real annoyance. I use PAR 152 and PAR 158 MHz notch filters. These use in line BNC couplings, and are easily installed (or removed) between your radio and your antenna. If your trouble emanates from the 162 MHz NOAA stations, PAR has a filter for that, too. Available at Grove Enterprises 1-800-438-8155.

My annual statement:

Except for Grove Enterprises, I have no business association with any vendor, nor stock in any company. If I discuss, or promote a product, I usually have a photo to verify that I bought one and use it. If it is a turkey, well, I just wasted my dollars, and hopefully saved you from wasting yours.

I work hard to ferret out new websites about radios or related topics. I write the column several weeks in advance before it hits your mailbox. Sometimes the URLs change or even disappear. Use several search engines for complete coverage of topics you are researching. Happy New Year!

Public Safety Frequencies for your town, your state

RX	PL Tone	TX	PL Tone	Agency or use	Comments
150.995	107.2	153.770	unknown	Lincoln County Fire Dist. 2,5,7	Very busy
151.0025	123.0	154.1525	162.2	Cherry County fire main dispatch	Net at 7pm
151.010					
151.0175					

Dan Veeneman
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Scanning in 2005

As we start a new year it's worth taking some time to reflect on our hobby and consider the effect of changes that are occurring in radio monitoring. Technology, regulation and security are all having an effect on what we can hear, but as the French say, *plus ca change, plus c'est la meme chose* (the more things change the more they stay the same).

❖ A Future for Scanning?

Dan,

About two years ago, I got interested in scanning after a bit of an absence from the hobby. With shortwave radio stations disappearing at an alarming rate, I looked for another aspect of the radio hobby to entertain and inform.

Unfortunately, it now looks like scanning could become a thing of the past. With more and more law-enforcement agencies encrypting their communications, is there hope for life on the action bands? I know there is ham traffic – I got my general-class license last year – air traffic, railroads, etc., but the police bands are fascinating and draw many into this exciting hobby.

Let me know what you think. It's just sad to see so many forms of radio seemingly fading away. Thanks.

– Chris in California

Although this isn't a shortwave column, I would encourage you to take another look at shortwave listening. As with many other hobbies, digital has come to longwave reception. Digital Radio Mondiale (DRM) is a new broadcasting standard for signals below 30 MHz and holds out some hope for shortwave listening in the years to come.

Back to scanning – I don't think it will become a thing of the past. Let's take a quick look at some of the previous challenges faced by our hobby:

In the early 1980s we were afraid of being locked out as public safety agencies began to operate in the 800 MHz band. Electronic experimenters responded by designing and building *down-converters* that allowed our VHF scanners to hear 800 MHz signals. Eventually manufacturers began to market scanners capable of tuning 800 MHz directly.

In the mid 1990s we started to become concerned about this new thing called *trunking* that would make it impossible for a scanner listener to follow an entire conversation. Computer programmers responded by writing custom software that could decode trunking signals and automatically tune a receiver, allowing a listener to follow these new systems. It took a little more work and some additional equipment, but it became possible for nearly everyone to trunk track. Eventually manufacturers began to market scanners capable of automatically monitor trunked systems.

Just a few years ago there was real concern that the new APCO Project 25 digital standards would mean the end of scanning. Today we have a choice of several consumer receivers capable of decoding APCO 25 audio and tracking these fully digital systems.

In each of these cases a solution was found and the hobby continued. Now we are faced with public safety agencies moving to encryption. Because the restriction now is as much legal as technical, the hobby may have to pursue a non-technical solution. We may have to press the case in the court of public opinion that agencies should be open and accountable to their citizens, and that encryption goes against those goals.

Whichever way that effort may go, certainly most agencies will never encrypt their traffic, whether for cost or other reasons. I think there will be quite a bit to hear for quite some time to come.

❖ Bristol, Tennessee

In 2000, Sullivan County in northeastern Tennessee partnered with the cities of Bristol, Kingsport and Bluff City to install an $11 million Motorola trunk radio system across the county. The system was operated "mixed-mode" with both analog and digital voice traffic.

In November of 2004 the Bristol police department finally switched over to all-digital operation after a delay of several months. Unfortunately for scanner listeners, according to reports all of their transmissions are now encrypted. The police department had gone to the city finance board to press for additional funding for encrypted radios, citing security concerns.

The Bristol Police Department handles about 50,000 calls each year, serving a population of just over 25,000 residents. You may be familiar with the city as the home of the Bristol Motor Speedway, a busy tourist attraction hosting numerous races on their half-mile oval.

The Bristol Fire Department and Emergency Medical Services are still operating unencrypted and in analog, although they may move to digital in the future.

The county-wide system is a Motorola Type II network transmitting on the following frequencies: 855.9875, 856.2625, 856.7375, 857.2625, 857.7375, 858.2625, 858.7375, 859.2625, 859.7375, 860.2625 and 860.7375 MHz. Three repeater sites provide coverage, with one on top of Holston Mountain in Blountville, another on top of Bays Mountain in Kingsport and a third at the Sullivan Justice Center in Blountville.

Decimal	Hex	Description
16400	401	Bristol Police Dispatch
16432	403	Bristol Police Supervisors
16464	405	Bristol Police Patrol
16496	407	Bristol Police Tactical 1
16528	409	Bristol Police Tactical 2
16560	40B	Bristol Police Tactical 3
16592	40D	Bristol Police Detectives
16656	411	Bristol Animal Control
16752	417	Bristol Fire Dispatch
16784	419	Bristol Fire 2
16816	41B	Bristol Fire 3
16848	41D	Bristol Fire Mutual Aid
16880	41F	Bristol Fire Rescue
16912	421	Bristol Fire Inspectors
16944	423	Bristol Fire Training
16976	425	Bristol Fire Command
32432	7EB	Kingsport Police Patrol 1
32464	7ED	Kingsport Police Patrol 2
32496	7EF	Kingsport Police Traffic
32528	7F1	Kingsport Police Detective 1
32560	7F3	Kingsport Police Detective 2
32592	7F5	Kingsport Police Records
32624	7F7	Kingsport Police Special Operations
32784	801	Kingsport Fire East 1
32816	803	Kingsport Fire East 2
32848	805	Kingsport Fire West 1
32880	807	Kingsport Fire West 2
32912	809	Kingsport Fire Central 1
32944	80B	Kingsport Fire Central 2
32976	80D	Kingsport Fire Training
33008	80F	Kingsport Fire Hazardous Materials 1
33040	811	Kingsport Fire Hazardous Materials 2
33072	813	Kingsport Fire Special Operations
48560	BDB	County Rescue (Tactical 1)
48592	BDD	County Rescue (Tactical 2)
48624	BDF	County Rescue (Tactical 3)
48656	BE1	County Rescue Hospital 1
48688	BE3	County Rescue Hospital 2

48720	BE5	County Air Medical
48752	BE7	County Rescue Dispatch 1
48784	BE9	County Rescue Dispatch 2
48816	BEB	County Rescue Dispatch 3
49264	C07	Sheriff Dispatch
49296	C09	Sheriff (Patrol)
49328	C0B	Sheriff Court Services
49360	C0D	Sheriff Detectives
49392	C0F	County Animal Control
49424	C11	Sheriff Administration
49456	C13	Sheriff Major Incident
49520	C17	Bluff City Police 1
49552	C19	Bluff City Police 2
50704	C61	Rural Fire Dispatch (Upper End)
50736	C63	Rural Fire Dispatch (Lower End)

The city of Kingsport itself is also licensed for a five-frequency conventional system fed from a single repeater on Center Street. The frequencies are 856.4875, 857.4875, 858.4875, 859.4875 and 860.4875 MHz. It's not clear from the records whether these frequencies are used as part of the Sullivan County system or are operated separately. Can anyone local to the area verify?

❖ West Chester, Pennsylvania

Just west of Philadelphia lies Chester County and the borough of West Chester. The county shares a border with both Delaware and Maryland and is home to more than 433,000 residents.

The West Chester Police Department recently completed a $450,000 upgrade to their radio system that brought new antennas, equipment and an updated dispatch center. This update also laid the groundwork to add encryption, which is expected to be phased in over the next few years.

The system has five repeater sites, located in West Chester, East and West Bradford and Pocopson. The department receives about 20,000 calls a year.

West Chester Police have two primary frequencies in a band that may not be a common hunting ground for scanner listeners. Dispatch can be heard on 500.4125 MHz and operations are on 500.5125 MHz. These frequencies are in the normal allocation for UHF television channel 19, which is between 500 MHz and 506 MHz. Because of a shortage of public safety frequencies in the Philadelphia area, the Federal Communications Commission (FCC) approved this "non-standard" use of unused television channel 19.

West Chester Fire can be heard in low band on 45.32 MHz and 45.56 MHz. West Chester University Police are licensed for 155.865 MHz.

❖ Chester County, Pennsylvania

The Chester County Department of Emergency Services (DES) uses a number of conventional frequencies as they handle upwards of 300,000 calls each year. The information I have isn't entirely clear about exactly how things are arranged in the county. There are a number of conventional frequencies, at least one trunk system and a block of licensed frequencies that don't appear to be in use.

These are the most popular conventional frequencies below 800 MHz:

33.86	Chester County Fire (North)
33.88	Chester County Fire (East)
33.96	Chester County Fire (South)
154.740	Chester County Police (East)
154.785	Chester County Police (Central)
155.760	Chester County Police (West)
159.600	Chester County Fire (East/Central)
159.735	Chester County Fire (West)
160.185	Chester County Fire Dispatch

In addition, Chester County operates on a number of 800 MHz frequencies from more than a dozen repeater sites. The following table lists individual conventional frequencies that are assigned for a particular purpose:

856.4625 Fire 1
856.9625 Mutual Aid 1
857.4625 Mutual Aid 2
857.9625 Police 1
858.4625 Fire 2
858.9625 Police 2
859.4625 Police/Fire 1
859.9625 Police 3
860.4625 Mobile Data Terminal
860.9625 Mobile Data Terminal

The following frequencies are operated as a trunk system on an LTR (Logic Trunked Radio) Multi-Net system:

01	866.0625
02	866.2125
03	866.6125
04	866.8625
05	868.1125
06	866.7500
07	867.3250
08	868.2625
09	860.4375
10	866.1250
11	866.3875
12	856.2375
13	857.2375
14	858.2375
15	859.2375
16	860.2375

Talkgroups:

3020	DES Dispatch
3021	DES Local
3030	DES Administration
3033	DES Tactical
3035	County Sheriff Department
3050	Police Dispatch (East)
3051	Police Dispatch (Central)
3052	Police Dispatch (West)
3060	Police Group 1 (East)
3061	Police Group 2 (East)
3062	Police Group 1 (Central)
3063	Police Group 2 (Central)
3064	Police Group 3 (Central)
3065	Police Group 4 (Central)
3066	Police Group 1 (West)
3067	Police Group 2 (West)
3068	Police Group 3 (West)
3069	Police Group 4 (West)
3070	Police Tactical (East)
3071	Police Tactical (Central)
3072	Police Tactical (West)
3074	Police Group 3 (East)
3075	Police Group 4 (East)
3080	Police Tactical 1
3081	Police Tactical 2
3082	Police Tactical 3
3083	Police Tactical 4
3084	Police Tactical 5

3085	Police Tactical 6
3090	Police National (Patch)
3091	Police Information (East)
3092	Police Information (Central)
3093	Police Information (West)
3150	Ambulance to Chester County Hospital
3151	Ambulance to Paoli Memorial Hospital
3152	Ambulance to Brandywine Hospital
3153	Ambulance to Southern Chester County Medical Center
3154	Ambulance to Phoenixville Hospital
3155	Ambulance to Bryn Mawr Hospital
3031	Hazardous Materials
3032	Fire Marshal
3100	Dispatch (East District)
3101	Dispatch (Central District)
3102	Dispatch (West District)
3120	Fireground 1 (East)
3121	Fireground 2 (East)
3122	Fireground 1 (Central)
3123	Fireground 2 (Central)
3124	Fireground 1 (West)
3125	Fireground 2 (West)
3130	Fire Tactical (East)
3131	Fire Tactical (Central)
3132	Fire Tactical (West)
3140	Mutual Aid (All)
3141	Mutual Aid (East)
3142	Mutual Aid (East)
3143	Mutual Aid (Central)
3144	Mutual Aid (Central)
3145	Mutual Aid (West)
3146	Mutual Aid (West)
3222	System Mutual Aid

The FCC has also licensed the following frequencies on repeater sites in Coventryville, Oxford, Parkesburg, West Grove, Willistown and Valley Forge: 855.7375, 855.9875, 856.2375, 859.2625, 860.2625, 860.4375 and 860.4875 MHz. I don't have any talkgroup assignments to go along with these assignments, so perhaps a southeastern Pennsylvania scanner listener could send in their logs!

❖ Cumberland County, Pennsylvania

One hundred miles to the west of Chester County lies another 800 MHz system in Cumberland County. More than four years ago the county began the process of installing equipment to join the statewide *OpenSky* network and recently completed installation of the last of thirteen repeater sites.

At present only Camp Hill and Middlesex Township are on the new network – the remainder of the county continues to use their old conventional radios. Testing has been underway for quite a while, but problems continue to surface. The most recent episode took place in November when a Middlesex Township officer needed immediate assistance but was unable to get a call through on his new OpenSky radio. The dispatch center called it a "glitch" but was unable to explain exactly what caused the problem or how it might be prevented in the future. Until the problem can be positively identified and corrected, the new system will remain shut down.

❖ Macomb County, Michigan

The Macomb County Office of Emergency Management, based in Mount Clemens, is working to upgrade their radio system and eventually join the Michigan Public Safety Communications System (MPSCS) as a fully digital APCO Project 25 network.

Macomb County covers Detroit's northeastern suburbs and has more than 800,000 residents. The Office of Emergency Management is currently in the process of identifying nine sites for the construction of 180-foot repeater towers to provide coverage for the entire county. Once those are in place, radio equipment will be installed and linked to a central dispatch center.

The County Sheriff currently dispatches on 460.400 MHz and uses 460.150, 460.250 and 460.875 MHz. Most county fire departments use 154.130 MHz, but you should also check 154.070 and 154.355 MHz.

The city of Warren, located in the southern part of Macomb County, already operates a Motorola Type II SmartNet from two repeater sites, one at 29900 Civic Center Boulevard and the other at 11899 Twelve Mile Road. Warren was recently awarded a $5.8 million grant that will be used to join the county radio network. The frequencies on Warren's system are 851.4875, 852.4875, 853.4875, 854.4875, 855.4875, 856.0375 and 856.0875 MHz.

Decimal	HEX	Description
16	001	Warren Police (North Dispatch)
48	003	Warren Police (Primary Dispatch)
80	005	Centerline Police (Dispatch)
112	007	Warren Police (Detectives)
144	009	Warren Police (Traffic)
272	011	Warren Police (Special Events, simulcast on 460.150 MHz)
368	017	Warren Police (Special Ops)
432	01B	Warren Police (Surveillance 1)
464	01D	Warren Police (Surveillance 2)
496	01F	Warren Police (Surveillance 3)
528	021	Warren Police (Surveillance 4)
560	023	Warren Police (Animal Control)
592	025	Centerline Police
624	027	Centerline Police (Tactical)
688	02B	Warren Fire (Dispatch)
720	02D	Warren Fire (Fireground 1)
752	02F	Warren Fire (Fireground 2)
784	031	Warren Fire (Fireground 3
816	033	Warren Fire (Fireground 4
880	037	Warren Fire (Fireground 5)
976	03D	Warren Fire (Training)
1136	047	Warren Department of Public Works
1168	049	Warren Department of Public Works
1328	053	Warren Health Department
1680	069	Warren Parks and Recreation
1744	06D	Centerline Fire
1776	06F	Centerline Police (SWAT)
11440	2CB	Macomb County Sheriff's Department (Tactical)

❖ Shirley, Massachusetts

Even as counties and large cities install new radio systems, smaller towns are also working to improve their own services. Sometimes relatively small changes can make a big difference. For instance, the Police Department in Shirley, Massachusetts, is installing new repeater equipment that will help complete coverage for this town of 6,000 people.

The new repeater is set to go on the top of a telephone pole at the end of Garrison Road where it turns from pavement into gravel. This is apparently the highest point in Shirley and will allow handheld radios to get coverage even when they're in low-lying valley areas. The new equipment, supplied by Motorola, will cost about $30,000.

Existing repeaters providing coverage for the town are installed at the Fire Station on Leominster Road, the Highway Garage on Clark Road, at the Water Department facilities on Patterson Road and Old Ayer Road, and at 158 Great Road.

Some local frequencies:

Police	46.54, 155.535
Fire	33.700, 46.140, 155.475
Mutual Aid	33.600

❖ Scanner Holders

It's not always easy to find a good place to put your handheld scanner. On my desk, certainly, it's often difficult to find a clear place to put it where I can reach it easily yet be sure it's not in the way of work. It's also a challenge to keep it from falling over if you just want to adjust the volume or squelch. One relatively inexpensive way to solve these problems is to use a "brochure holder" from an office supply store. These plastic frames are strong enough to support even the heaviest scanner and usually have a wide support base and a simple mounting

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10 Priority Channels • Programmed Service Search
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Frequency Coverage:
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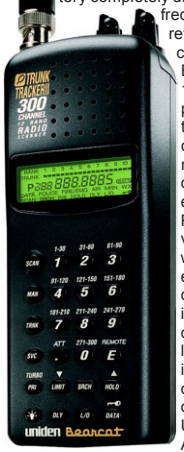

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New York VOLMET Returns to Air

The automated aviation weather broadcasts from WSY70, New York Radio, suddenly resumed around October 6, 2004. There was no formal announcement or explanation given, just like when the station vanished a year or so before. Services, schedules and frequencies are unchanged, as if nothing had happened.

Presumably, whatever budget issues had put the broadcast on hold have been resolved. The station sounds great. It's being heard worldwide on its traditional frequencies of 3485 (local night), 6604, 10051, and 13270 (local day). These are in kilohertz (kHz), and all upper sideband (USB). Duration is 20 minutes, starting on the hour and half hour, with Gander Radio, Newfoundland, Canada, filling the other ten.

Content is also unchanged. It is the North Atlantic VOLMET ("flying weather," loosely from French). It's intended for pilots on oceanic air routes. This consists of three parts. First is airport weather observations in a slightly modified METAR (Routine Aviation Meteorological) format. Second is Terminal Aerodrome Forecasts (TAF), and the third is Atlantic and Caribbean SIGMETs (SIGnificant METeorological reports).

The lower frequency uses a doublet antenna, and the others use a rhombic, 3000 watts each. Their location is near Barnegat, New Jersey, as fed from the Federal Aviation Administration on Long Island.

It sounds as if the same well-trained announcer is always on-mike, but it's really an unusually natural-sounding "Voice Concatenation System" called StarCaster. Unlike the Coast Guard's "Perfect Paul" and other voice synthesizers, it turns text files into a convincing stream of digitized human speech, from a database of words with various intonations.

Nice to have this great old station back on the air.

❖ Bern Radio Joins Kiel Mail

Last month, we erroneously reported that Bern Radio in Switzerland was owned by Globe Wireless. It is not! Since January 1, 2004, it's been managed by RUAG Aerospace, a Swiss corporation better known for aircraft subassemblies and military drones.

What is true is that all voice and teleprinting services closed on September 27, 2004. The station is being modernized and refitted for digital maritime e-mail and network services using PACTOR-III (Packet Teleprinting Over Radio, version III).

Bern will be networked with Kiel Radio, a German station that has been offering a turnkey mail system for some time. Like a lot of these, it uses a PACTOR modem with proprietary firmware. This is connected to any approved upper-sideband (USB) maritime radio with an antenna tuner, and to a standard Windows computer. Along with an Internet-like e-mail system, it offers a weather server, GPS position reporting, and access to MarineNet in Florida via WKS, Jupiter Radio.

As of early November 2004, active MarineNet WKS channels were 5258.5 and 9158.5 kilohertz (kHz), USB simplex. Kiel Radio, DAO, Germany, is using the ship/shore duplex pairs of 2628.5/2550.0, 4242.5/4164.5, 6434.0/6257.5, 6434.0/6257.5, 8510.4/8328.5, 8637.0/8336.5, 12762.0/12412.5, and 17046.5/16609.5 kHz USB, again all dial/window. All shore transmitters are 150 watts.

A complete list of frequencies used and planned by Kiel Mail is at their web site, **http://www.kielradio.de/**.

❖ Canadian Sub Fire

In October 2004, the recently purchased Canadian submarine *Chicoutimi* left the United Kingdom on its maiden voyage to its new home. Soon afterward, a serious electrical fire left the boat dead in the water 100 miles off Scotland. All circuits were dead, many were damaged, and there was no power. At least nine in the crew of 57 were injured, three seriously.

For the next two days, much of the rescue drama was on shortwave radio. 5680 kHz USB, an international aircraft safety frequency, was primary for Kinloss Rescue, in Scotland, working a number of Royal Navy and Royal Air Force assets enroute to the drifting sub. Secondary was 3023 kHz USB, another safety-of-flight channel.

When a "numbers" station started up on 5680, the net moved to 5699, then to 3945, before finally going back to 5680. At one point, someone said on-air that the "numbers" would be over in five minutes. Did they know something, or was that just the station's normal schedule? Either way, it's extremely interesting.

Meanwhile, 3023's less busy operation moved temporarily to 3939 when a military digital station interfered. While 3945 and 3939 kHz are in the 75-meter amateur band, non-amateur utilities are legal in the Eastern Hemisphere. 6697 kHz USB was also used.

A detailed log of both days, as kept by "a short-wave radio operator," was posted to the web site of the Canadian Broadcasting Corporation. While I never recommend that anyone in our hobby run to the media without first understanding the laws in their country regarding secrecy of communications, this log is out there, and it's amazing reading, if a bit scary. A text version has been posted to this column's web site.

❖ US Coast Guard ALE

Most US Coast Guard aircraft, and especially helicopters on patrols or anti-smuggling missions, are now using the Automatic Link Establishment network. Some ALE callups lead to clear and secure voice contacts on the same frequencies.

The older safety-of-flight net that we've all come to know and love on 5696, 8983, and 11202 kHz USB, survives for search-and-rescue and certain fixed-wing operations with CAMSLANT Chesapeake and CAMSPAC Point Reyes. These stand for Communication Area Master Station, Atlantic and Pacific respectively. They're on ALE, too, as LNT and PAC.

The ALE net uses an upgrade of the older US Customs Service COTHEN (Customs Over-The-Horizon Enforcement Network). Other known players include joint drug task forces, and ICE (Immigration and Customs Enforcement, under the Department of Homeland Security).

ALE frequencies for COTHEN, or "Scan" as some Coast Guard operators call it, are 5732, 7527, 8912, 10242, 11494, 13907, 15867, 18594, 20890, 23214, and 25350.0 kHz, all USB. Others may exist.

The old US Coast Guard GANTSEC (Greater Antilles Section) has been merged into a new Sector San Juan, out of Puerto Rico. Similarly, Group Key West is now part of Sector Key West. More such changes are inevitable.

May a good new year be inevitable for you, and enjoy the winter skip.

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 Modulation
ARINC	Aeronautical Radio, Inc.
ARQ	Automatic Repeat Request teleprinting system
ARQ-E3	French ARQ teleprinting system
AWACS	Airborne Warning And Control System
CAMSLANT	Communication Area Master Station, Atlantic
CW	Morse code telegraphy ("Continuous Wave")
DEA	US Drug Enforcement Administration
DSC	Digital Selective Calling
EAM	Emergency Action Message
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
ICE	US Immigration and Customs Enforcement
LDOC	Long-Distance Operational Control
M22	Israeli Navy; CW traffic, weather, and "numbers"
MARS	Military Affiliate Radio System
Meteo	Meteorological
MFA	Ministry of Foreign Affairs
MFSK16	16-tone Frequency-Shift-Keying teleprinting
MMSI	Maritime Mobile Service Identity
MXI	Russian cluster beacon, probably navigation
MXP	Special Russian "P" marker
MWARA	Major World Air Route Area
NORAD	North American Aerospace Defense Command
PACTOR	Packet Teleprinting Over Radio
RCC	Rescue Coordination Center
RSA	Republic of South Africa
RTTY	Radio Teletype
SHARES	SHAred RESources, US Federal net
SITOR-A	Simplex Teleprinting Over Radio, ARQ mode
SITOR-B	Simplex Teleprinting Over Radio, FEC mode
UK	United Kingdom
Unid	Unidentified
US	United States
VOLMET	Flight Weather (loosely from French)

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

2187.5 304010747-Unlisted MMSI of unknown ship, DSC distress call at 0127. (Day Watson-UK)

3476.0 Gander-North Atlantic MWARA, working Northwest 54 at 0214. (Allan Stern-FL)

3485.0 New York-New York VOLMET aviation weather, back on the air, simulcasting on 6604, 10051, and 13270, at 1511. (Ken Maltz-NY)

3590.0 INV-Unknown Italian military station, RTTY marker for the "Destined Glory 2004" exercise, at 2245. (Watson-UK)

4137.0 JPQ-Lithuanian Navy vessel *Klaipeda*, calling FRA in ALE, at 0356. (Watson-UK)

4149.0 WPE-Tugboat net control, Jacksonville, FL, working seagoing tug *Pioneer* (WBN 5040), at 0511. WPE, working tug *Sentry* (WBN 3013), at 2015. WPN, working tug *Defender*, (WBN 3016), at 2332. (Stern-FL)

4207.5 Unid-Vessel with partially corrupt DSC distress call, abandoning ship at 0357. (Watson-UK)

4500.0 AFA2GM-US Air Force MARS, FL, net at 0014. (Mark Cleary-SC)

4739.0 Fighting Tiger 20-US Navy P-3C, working Goldenhawk, Brunswick, ME, at 0151. (Cleary-SC)

4770.0 TN1-Lithuanian Military, working MT1 in ALE, at 0604. (Watson-UK)

4795.0 F236AA-US Army Regional Medical Center, Landstuhl, Germany, ALE sound at 0333. (Watson-UK)

4800.0 68-Danish Army, calling DK11 in ALE, at 0555. (Watson-UK)

4828.0 "P"-Russian Navy CW single-letter channel marker (MXP), Kaliningrad, at 0715. (Watson-UK)

4841.0 OWI-Danish Air Force, Aalborg, calling OWD, ALE at 0500. (Watson-UK)

4924.5 PMTRACS-US National Guard Program Manager for Tactical Radio Communications Systems, calling O050HN (Ohio NG), ALE at 1322. (Ron Perron-MD)

5042.0 FDG-French Air Force, Bordeaux, CW marker at 1825. (Watson-UK)

5159.0 4XZ-Israeli Navy, Haifa, CW marker (M22), at 1838. (Watson-UK)

5211.0 WGY912-FEMA Special Facility, Mount Weather, VA, working NMN, US Coast Guard CAMSLANT, VA, at 2152. (Cleary-SC)

5320.0 CAMSLANT-US Coast Guard, VA, calling Cutter *Decisive* at 2035. (Cleary-SC)

5616.0 Gander-North Atlantic MWARA, working US Air Force Reach 977, at 0612 (Stern-FL)

5649.0 Gander-North Atlantic MWARA, working KLM 754, came from 8846, at 2310. (Stern-FL)

5690.0 Coast Guard 1706-US Coast Guard, patch via CAMSLANT to Clearwater Air, at 2027. (Cleary-SC)

5696.0 CAMSLANT, working Falcon Jet Coast Guard 2117, at 2356. (Stern-FL)

5708.0 Darkstar Quebec-US Air Force AWACS, ALE-initiated patch to Okie Sam, (NORAD, FL), at 2355. (Cleary-SC)

5711.0 King 16-US Air Force rescue HC-130, working King 22, clear and secure at 0120. (Cleary-SC)

5717.0 Rescue 311-Canadian Forces, relay to RCC via Halifax Military, at 0101. (Cleary-SC)

5732.0 Panther-DEA, Bahamas, working search aircraft 18C, at 0141. (Cleary-SC)

6218.0 JPQ-Lithuanian Navy, *Klaipeda*, calling M1K at 0413, then working FRA, in ALE at 0515. (Watson-UK)

6529.0 AY2763-Finnair aircraft, sending position in HFDL at 2016. (Patrice Privat-France) 17-ARINC Ground Station, Canary Islands, HFDL squitters at 2145. (Watson-UK)

6577.0 New York-Caribbean MWARA, working American 586, at 0039. (Stern-FL)

6604.0 Gander-Canadian VOLMET, flight weather for Winnipeg, Edmonton, etc., also 10051, at 0125. (Stern-FL)

6640.0 New York-ARINC LDOC, sending unknown aircraft to 3494, at 0105. (Stern-FL)

6694.0 Halifax Military-Canadian Forces, traffic from Swordfish 21, probable fisheries patrol, at 0002. (Perron-MD)

6697.0 Irishman-US military, coded broadcast of 5 groups, simulcast on 11244, at 0354. (Jeff Haverlah-TX)

6721.0 Coast Guard 1502-USCG, ALE-initiated call to Elizabeth City Air, at 2344. (Cleary-SC)

6754.0 Trenton-Canadian Forces aviation weather at 0240. (Stern-FL)

7038.7 "D"-Russian Navy CW single-letter cluster beacon (MXI), Odessa, at 2038. (Watson-UK)

7527.0 Omaha 23SK-US Customs Service, working Ping Pong at 0141. (Cleary-SC)

7600.0 CIP77-Canadian Army, ALE-initiated voice and data contact with CIP36, Halifax, NS, at 0013. (Perron-MD)

7632.0 AAR4LL-US Army MARS, in SHARES net with AAT3AM at 2356. (Cleary-SC)

7633.5 STEEL 89-US Air Force tanker, calling any MARS at 0009. (Cleary-SC)

7635.0 Headcap 45-US Civil Air Patrol, National Chaplains' Net with Hillcap 49 and Red Fox 105, IL, at 2106. (Cleary-SC)

7915.0 AFA1DA-US Air Force MARS net control, working AFA20J and AFA2QG, in MFSK16, at 2358. (Watson-UK)

8026.0 Anthology-US military, several data checks with Andrews, at 0132. (Cleary-SC)

8047.0 I050NN-IN National Guard, calling HQ703N, VA, ALE at 0534. (Perron-MD) R0316-National Guard, calling KBOING, ID National Guard, Boise, ALE at 1311. (Glenn Blum-TX)

8181.0 CORE7-Venezuelan National Guard, calling MIRA3 (Guard at Presidential Palace), ALE at 2342. (Perron-MD)

8234.0 M1K-Lithuanian Navy Vessel, working JPQ in ALE, at 1529. (Watson-UK)

8459.0 NOJ-US Coast Guard, Kodiak, AK, ice chart FAX, also 12412.5, at 2258. (Watson-UK)

8494.7 "D"-Russian Navy CW single-letter beacon (MXI), Odessa, at 2350. (Maltz-NY)

8583.3 PWZ33-Brazilian Navy, RTTY navigation warnings at 0439. (Perron-MD)

8610.0 UCE5-Arkhangelsk Radio, Russia, traffic for unknown ship in

3-shift Cyrillic RTTY, at 1450. (Watson-UK)

8759.5 Navidata-Periodic identifier in PACTOR-II markers, at 2229. (Watson-UK)

8906.0 New York-North Atlantic MWARA, working Cubana 471, at 2346. (Stern-FL)

8912.0 D14-ICE P-3A, ALE-initiated clear and secure voice with PRI (Salinas, PR), at 1238. (Perron-MD)

8912.5 Unid-Whistling, rag chewing in English and Spanish, at 1731. (Blum-TX) *[Not the most inconspicuous place… -Hugh]*

8918.0 New York-North Atlantic MWARA, working Air Europa 2937, at 0206. (Stern-FL)

8948.0 17-ARINC Ground Station, Canary Islands, working many flights in HFDL, at 1829. (Watson-UK)

8971.0 Fighting Tiger 23-US Navy P-3C, working "8-Q-T" (Goldenhawk), went to Iridium Satcom at 2210. (Cleary-SC)

8980.0 Coast Guard 1705-US Coast Guard, patch via CAMSLANT to Clearwater Air at 1957. (Cleary-SC)

8983.0 CAMSLANT-US Coast Guard, VA, working Coast Guard 2131 on a go-fast intercept at 2119. (Cleary-SC) CAMSLANT Chesapeake-US Coast Guard, VA, working Coast Guard Rescue 1706 on medical aid at 2259. (Stern-FL)

8992.0 Sled Dog-US military, patch to Tinker AFB via McClellan HF-GCS, CA, at 2359. Legality-same station, new daily callsign, went to 11175 at 0007. (Stern-FL) Victor 55-US military, calling Mainsail (any ground station this net) at 1524 and 1540. Notebook, with a 28-character EAM at 1900. Kilo 05, Patch via Offutt for weather at Kirtland AFB, at 2004. (Haverlah-TX)

9007.0 Trenton Military-Canadian Forces, NS, taking traffic from Tiger 905 for RCC, at 1940. (Perron-MD)

9023.0 Huntress-NORAD Northeast Air Defense Sector, NY, working Blue Crab (NORAD Southeast), at 2055. (Cleary-SC)

9025.0 Coast Guard 1501-US Coast Guard, ALE-initiated patch to Elizabeth City Air, at 1404. (Cleary-SC)

9031.0 Ascot 6111-UK Royal Air Force, working Architect for weather, at 1946. (Privat-France)

9060.0 CG6ZM-Mexican Army 6th Zone, calling PMZORILLO in ALE at 1157. (Perron-MD)

9121.0 M050NN calling I050NN, new National Guard frequency, at 1349. (Perron-MD)

10033.0 Miami Radio-LDOC, patching Amerijet 610 to dispatch for clearance through Cuban airspace, at 2143. (Stern-FL)

10100.8 DDK9-Hamburg Meteo, RTTY weather codes at 2033. (Watson-UK)

10135.0 JAGUAR-Mexican Army, calling LINCE (Lynx), ALE at 0109. (Perron-MD)

10780.0 Reach 132-US Air Force, working Cape Radio, FL, at 2357. (Cleary-SC)

10993.6 "F-7-V"-US Coast Guard, getting a secure frequency from Sector Key West for Cutter *Tampa*, at 2102. (Cleary-SC)

11175.0 Blue 72-US Air Force, patch via Puerto Rico HF-GCS to Bangor Control, at 0155. (Stern-FL) Teal 60-US Air Force Reserve WC-130 "Hurricane Hunter," all-OK patch via Puerto Rico to National Hurricane Center, who was worried they'd lost the aircraft, at 1116. Executive 1 Foxtrot-Flight with First Family member(s) aboard, patch via Puerto Rico to Andrews Meteo for Columbus, OH, weather, at 1914. (Cleary-SC)

11205.0 Smasher-US Joint Task Force, Key West, FL, working "Hurricane Hunter" Teal 34, at 1208. (Cleary-SC)

11217.0 Stargate-US Air Force E-8C, clear and secure with AWACS Darkstar Papa, at 1818. (Cleary-SC)

11232.0 Trenton-Canadian Forces, working Canforce 3224, went to 13257 at 1645. (Stern-FL)

11244.0 Break Ride-US military, broadcasting separate 28-character EAMs at 0226 and 0232, the latter one simulcast on 6697 and then on the HF-GCS by McClellan at 0236. Break Ride, with the hour+10/40 28-character EAM activity at 0240 and 0310. (Haverlah-TX)

11253.0 Unid-UK Royal Air Force VOLMET, continuous flight weather at 2025. (Stern-FL)

11309.0 New York-North Atlantic MWARA, working American 66 at 0220. (Stern-FL) New York, working Martinair 910 at 1947. (Privat-France)

11330.0 New York-North Atlantic MWARA, working American 2051, at 1637. (Stern-FL)

11396.0 New York-Caribbean MWARA, working Springbok 212 (South African Airways), at 1640. (Stern-FL)

11494.0 Panther-DEA, Bahamas, working an aircraft at 2018. (Perron-MD)

11507.0 BR1-Brazilian Army Headquarters, Brasilia, calling RJ1, Rio de Janeiro, also 13490 and 14582, at 0154. (Perron-MD)

12223.0 Unid-Ukrainian Military, 3-shift Cyrillic RTTY, then coded message "Kriptograma ZL1T," at 1054. (Watson-UK)

12359.0 Southbound II Marine Net-Herb Hilgenberg (VAX 498), control with check-in and weather info for many small vessels, at 2001. (Stern-FL)

12948.0 JJF-Japanese Defense Force, Tokyo, CW messages in International and Japanese Morse, at 0811. (Watson-UK)

13101.0 ERMRIO-Brazilian Navy, Rio de Janeiro, calling FDEFEN, Frigate *Defensora*, also on 14780, 19709, and 22168, ALE at 2221. (Perron-MD)

13200.0 Shado 42-US Air Force, working Croughton and then Ascension HF-GCS, message for Robins AFB, at 2056. (Cleary-SC)

13215.0 Reach 5034-US Air Force tanker, patch via Puerto Rico to Anderson AFB Meteo, at 2136. (Cleary-SC)

13303.0 ARINC Ground Station, Canary Islands, working flights in HFDL, at 1337. (Watson-UK)

13354.0 New York-North Atlantic MWARA, giving Air Europa 051 a 13306 primary and 11309 secondary, at 1731. (Stern-FL)

13510.0 CFH-Canadian Forces Meteo, Halifax, NS, RTTY weather observations at 2050. (Privat-France)

13900.0 BMF-Taipei Meteo, weather FAX of depression near Philippines, at 0930. (Watson-UK)

13920.0 VMC-Australian Bureau Of Meteorology, Charleville, weather FAX at 1604. (Watson-UK)

13927.0 AFA2HF-US Air Force MARS, patch from tanker Cacti 31 to Nellis AFB, at 1210. (Stern-FL)

13945.0 STAT5-Tunisian Military, calling STAT154, ALE at 1132. (Watson-UK)

13986.7 Unid-French Forces, Paris, ARQ-E3 testing on IGU circuit (to Cayenne), at 1645. (Watson-UK)

15016.0 Teal 53-US Air Force Reserve "Hurricane Hunter," patch via Puerto Rico HF-GCS to Keesler AFB, at 1747. (Cleary-SC)

15025.0 Shark 80-US military, patch via Skywatch, Honduras, at 0008. (Cleary-SC)

15867.0 Hammer-ICE, CA, working aircraft 76T on the border, at 2020. Service Center-US Customs Service, ALE-initiated voice with Coast Guard 1504, at 2037. (Perron-MD)

16332.3 "K"-Russian Navy CW single-letter beacon (MXI), Petropavlovsk-Kamchatskiy, at 0000. (Maltz-NY)

16829.5 UCE-Arkhangelsk Radio, SITOR-B traffic list in 3-shift Cyrillic, at 0807. (Watson-UK)

17916.0 Stockholm Radio-LDOC patching flight 9866 to meteo for Pakistan weather, at 1441. (Perron-MD)

17928.0 17-ARINC Ground Station, Canary Islands, working many flights in HFDL, at 1640. (Watson-UK)

17937.0 Flight Support-LDOC, Lima Peru, working American 924, at 1345. (Perron-MD)

18003.0 NW2-US military Nightwatch net calling NW1, the airborne command post, also on 9025, 11226, 13215, and 15043, ALE at 1954. (Perron-MD)

18012.0 Circus Vert-French Air Force, Villacoublay, working COTAM 5111, at 1340. (Perron-MD)

18183.4 ACR-Algerian Embassy, Accra, Ghana, working MFA Algiers, at 0835. (Watson-UK)

18238.0 ZSJ-South African Navy, Cape Town, weak Antarctic ice chart at 0810. (Watson-UK)

18261.0 GYA-British Royal Navy, Northwood, weak Middle East weather FAX at 0830. (Watson-UK)

18341.7 Unid-Egyptian MFA, Cairo, working KKVZ (Kampala or Madrid) in Arabic SITOR-A at 1306. (Watson-UK)

18378.7 Unid-Egyptian MFA, Cairo, working XBVK (The Hague) in Arabic SITOR-A at 0749. (Watson-UK)

19103.5 SKYWAT-US Army Skywatch, Honduras, ALE sound at 2015. (Perron-MD)

19216.7 RFLI-French Forces, Fort De France, Martinique, ARQ-E3 testing at 1330. (Watson-UK)

20036.7 Unid-Egyptian Embassy, Dakar, Senegal, brief SITOR-A Arabic chatter, then traffic, at 1019. (Watson-UK)

20890.0 Panther-DEA, Bahamas, working Coast Guard 2A at 1825. (Perron-MD)

21999.0 17-ARINC Ground Station, Canary Islands, HFDL squitters at 1736. (Watson-UK)

23214.0 D42-ICE P-3, ALE and clear voice radio checks with unidentified station at 1917. (Perron-MD)

Digital Digest

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Synopticaly Speaking

This month we focus on some of the remaining weather transmissions that are audible on the HF bands using simple RTTY equipment and answer a reader's question about software.

First, let's take in a little background concerning the coded messages that the majority of weather (WX for short) stations send.

Weather Codes

The World Meteorological Organization (see Resources) was responsible for defining the set of coded messages (the synoptic codes), used by weather observing stations throughout the world for decades to communicate their local readings. There are a large number of these standard codes, each tuned to both the kinds of observations being made and the type of observing station. The code names for the most commonly seen types of reports are as follows:

SYNOP	for reporting surface observations from fixed land stations
SHIP	for reporting surface observations from stations at sea
METAR	for reporting routine aviation weather
BUOY	for reporting observations from buoys at sea
PILOT	for reporting upper wind conditions
TAF	for reporting conditions at an airfield

Each of these codes has been developed to transmit essential weather information quickly and succinctly with a well-defined, compact message. Indeed, it's very likely that any of the weather reports you see nicely decoded into "human readable form" on weather sites like IPS Meteostar, The Weather Channel and others, were originally compiled by reporting stations in synoptic form.

Here's what an actual report looks like, in this case taken directly off-air from the German Weather Service's station DDH7:

```
zczc 70  fo
sivx48 edzw 225:00
bbxx
elzl3 22211 99293 70186 46/// /0310 10248 2018/
40175 52011
22216 0426-.
elwt7 22211 99536 70159 41/9/ /3609 10228 20156
40191
53005 7//// 22254 04253=
nnnn
```

As you can see, to the untrained eye, this is little different from the off-line encrypted messages from Havana, Moscow, and other places!

One can decode the message by hand (a very tedious job indeed) or one can engage the "synoptic decoder" function found on many digital decoder software packages. In the case of the Hoka decoders, once we have correctly determined the speed, shift and transmission system in use, and are correctly receiving the coded traffic, pressing the "W" key starts the synoptic decoder.

After receiving the correct start codes for the particular messages (AAXX for SYNOP type report or BBXX for a SHIP type report), the decoder reads the complete message, turns it into readable form and displays it on the screen. These reports can even be saved to disk automatically: just think, your very own worldwide weather receiving system!

Synop Stations

If we were writing this article a decade or two ago, a listing of active HF weather stations sending synoptic messages would probably have taken at least a page and a half of *Monitoring Times*. Sadly, as with the press stations, many WX stations have gone silent. But some live on, so here are a couple to try listening out for:

German Weather Service (DWD)

The DWD (Deutscher Wetter Dienst) station, transmitting from Pinneberg in northern Germany, is probably the most well-known of the remaining WX stations. Widely audible, Hamburg Meteo, as it is commonly (though incorrectly) known, transmits a variety of reports for shipping in the Baltic, Atlantic, Mediterranean and North Seas on a number of frequencies throughout the shortwave spectrum on a 24hr schedule (see Resources).

You can hear the station on the following frequencies. In each case, standard Baudot RTTY is used.

147.3 kHz	DDH 47	50bd/85Hz	Baudot
4583 kHz	DDK 2	50bd/450Hz	Baudot
7646 kHz	DDH 7	50bd/450Hz	Baudot
10100.3 kHz	DDK 9	50bd/450Hz	Baudot
11039 kHz	DDH 9	50bd/450Hz	Baudot
14467.3 kHz	DDH 8	50bd/450Hz	Baudot

The station has also been heard on 15988 kHz on occasions. Unlike most stations, the DWD sends a frequency list as part of its call-up, like this:

```
cq cq cq de ddh47 ddh9 ddh8
frequencies  147.3 khz  11039 khz  14467.3 khz
ryryryryryryryryryryryryryryryryryryryryryryryryr
```

and on alternate frequencies, like this:

```
cq cq cq de ddk2 ddh2 ddk9
frequencies  4583 khz  7646 khz  10102.8 khz
ryryryryryryryryryryryryryryryryryryryryryryryryr
```

Nairobi Meteo

Another easy catch with a Baudot decoder is the Kenyan Meteorological Department's weather station 5YE. Once operating on several HF frequencies, this has since been reduced to three frequencies (which, by the way, also carry facsimile weather maps at other times):

7462kHz	100bd/850Hz	Baudot
9041kHz	100bd/850Hz	Baudot
17441.6kHz	100bd/850Hz	Baudot

The call-up marker for this station looks like:

```
ryryryryryryryryryryryryryryryryryryryryryryryryr
cq cq   cq   de     5ye      5ye      5ye
ryryryryryryryryryryryryryryryryryryryryryryryryr
```

What Decoder Software?

Reader Bill B wrote in with the following question: *Hi there Mike. I hope you can help me out; I am truly interested in tuning in RTTY, FAX, NAVTEX as well as FEC and ARQ. But I have searched online to no avail trying to find software. I have MMTTY, but it's a ham radio rtty program. I hope you can point me in the right direction where I can locate software.*

Fortunately, with Mike Agner's recent updates to Utility Monitoring Central, this is an easy question to answer. Point your browser at UMC and follow the links to "Software", "Hardware" and "WWW Links" and peruse Mike's work which catalogs just about every known free, shareware and commercial hardware and software for decoding the kinds of signals that we discuss here in *Digital Digest*. Mike has thoughtfully organized the sections for the software decoders by type:

- those using some kind of interface hardware (you may need to make or buy your own)
- programs that combine decoding with a radio control function
- those that talk directly to soundcards or need some interface hardware
- and finally, programs for manipulating the audio from your radio.

Check out this very useful resource next time you have a question about which software or hardware is right for you.

Resources

German Weather Service
http://www.dwd.de
DWD HF Weather Schedule
http://www.dwd.de/de/wir/Geschaefts-felder/Seeschifffahrt/Sendeplaene/e_telex-pln.htm
World Meteorological Organization
http://www.wmo.int
Kenya Meteorological Department
http://www.meteo.go.ke
Utility Monitoring Central
http://www.chace-ortiz.org/umc

Glenn Hauser
P.O. Box 1684-MT, Enid, OK 73702
glennhauser@monitoringtimes.com
www.worldofradio.com

Israel Gone? Belgium Going

We have headlined the demise of Israel's shortwave broadcasts before, but they always got reprieves. We hope that happens again, but at press time the outlook was dismal. Doni Rosenzweig reports:

I asked around and was told that a notice was sent through Kol Israel, that Israel Radio SW is due to cease as of Dec. 31, as the homepage **http://www.israelradio.org/** says. While Israel Radio is available on the Internet, many Arab countries are blocking access to the IBA Web feeds. This time around, people were told that their program budgets would improve if SW is cut, so there is much wider support for cessation of SW this time. They are now planning to stop all SW transmissions, including Reshet Bet in Hebrew. You can fax or email Member of Knesset (MK) Ehud Olmert, the Minister of Communications. He saved foreign language Kol Israel broadcasts the last time around. MK Ehud Olmert: Fax: +972-2-666-2909 email: eolmert@moital.gov.il (See the schedule below)

R. Vlaanderen Internationaal announced they're scrapping radio services in English, French and German at the end of B04 (27 March 2005). News bulletins in these languages will be available on the Web site. There will also be a drastic reduction in the use of SW for RVi broadcasts in Dutch – most of the non-Belgian transmitter sites will be dropped, says Andy Sennitt, Radio Netherlands, in **DX Listening Digest.**

Frans Vossen of RVi explained in the swprograms group: The RVi Web site will be relaunched with a new look. The name of the station will also be changed, to VRT-Internationaal. "The old and traditional mediumwave, and especially shortwave, output will be reduced," says VRT Radio Director Frans Ieven. These are outmoded delivery methods and "there are other cheaper and more efficient means of reaching people than with gigantic shortwave transmitters." **Brussels Calling** in English, French and German are being scrapped, replaced by translations, on the Web site, of the main points from the Flemish and Belgian news stories. Only SW surviving will be 4 hours per day of programs in Dutch, most of it relays of domestic VRT stations, and only beamed to south Europe.

Kai Ludwig, DXLD, pointed out: RVi program cancellations would save almost no money. Nor does RVi have any financial trouble; this is only a strategic decision.

Comment to: Mr. Leo Cortens, Counselor and Consul, Embassy of Belgium, 3330 Garfield Street NW, Washington, DC 20008; Phone (202) 333-6900, Fax (202) 333-5457; The Belgian ambassador to the USA is Mr. Frans van Daele, phone (202) 333-6900, Fax: (202) 625-7567. E-mail: washington@diplobel.be Web: **http://www.diplobel.us/** Perhaps engaging them in dialogue will help out. Can't hurt, says Richard Cuff, swprograms.

Listeners who wish to protest can also contact the Flemish Media Minister: Mr Geert Bourgeois, Alhambra Building, Avenue Emile Jacqmain 20, 1000 Brussels, Belgium. email: kabinet.bourgeois@vlaanderen.be reports Colin Clapson, VRT, in **SCDX/MediaScan.**

Express your opinion to RVi about its forthcoming SW cutbacks: info@rvi.be or use the form provided on the web site at **http://www.rvi.be/html/rvi_web/uk/aboutrvi/contact/contact_form.html** says John Figliozzi, swprograms.

Silvain Domen, Belgium, DXLD says you can also post a message on the guestbook at RVi's website. Many well known names in there already! **http://www.rvi.be/guestbook_uk/**

On **RVi Radio World**, Frans Vossen wrapped it up: As from the end of March, the entire operation abruptly stops, from one day to the other. No more SW, MW, satellite, not even sound on the internet. Nothing, zilch, zero. Nobody will be made redundant: we will all be transferred to the VRT news via the internet service, where we will write updated news items in English, German and French for the news site, **http://vrtnieuws.net** I always thought it was our mission to inform people in foreign countries about all aspects of life in Flanders. I also thought shortwave was an efficient way of achieving this. If the politicians think otherwise, they should explain their view.

More endangered stations and services: see EGYPT, SYRIA below

EIKE BIERWIRTH'S COMPREHENSIVE B-04 SW SCHEDULES
http://www.susi-und-strolch.de/eibi/bc-b04.txt
And the complete page at: http://www.eibi.de.vu/

HFCC B04 (with a considerable fraction censored out)
http://www.hfcc.org/data/index.html
(Steve Lare, MI, DX Listening Digest)

ABKHAZIA R. Republic Abkhazia [formerly varying around 9496] now from 9489.7 to 9491.3, peaking around 1430-1515, in Russian (Wolfgang Büschel, Germany, World DX Club Contact) And also from 0514 until 0524* (Büschel, BC-DX)

AFGHANISTAN [non] Blasting in here 1400-1500 on 17720, Radio Solh (Dari for "Radio Peace"), the name in WRTH 2004 (p82) for the US psyops broadcasts aimed at Afghanistan, originally "Information Radio" (Dave Kenny, BDXC-UK) Mostly Central Asian music, info inserts, about al-Qaeda and the Taleban (Mika Mäkeläinen, Finland, dxing.info) In Pashto it would be: Sola Radyo (Bernd Trutenau, Lithuania, DX Listening Digest) All broadcasts are 500 kW at 80 degrees from Rampisham, UK, in Dari, Pashto, Urdu: 0200-0500 11810, 0700-1200 21620, 1200-1300 17710, 1300-1500 15265, 1500-1630 17710 (Observer, Bulgaria)

ALASKA KNLS was slow to post its November frequency schedule on its own website, and it turned out that FCC registrations were incorrect, too. English at 0800-0900 was actually heard by Noel Green, UK on 9615; and at 1300-1400 also on 9615, by Roger Chambers, NY. Plans were at 0800 to move to 7365 from Dec 26, and to 11765 from Jan 30 (gh)

ARMENIA V. of Armenia English B04: 1925-1945 on 4810 and 9965, now 7 days a week with the Sunday 0800-0930 broadcast on 15270 dropped; also IDs as "Public Radio of Armenia" (Dave Kenny, BDXC-UK, Wolfgang Büschel)

BANGLADESH Bangladesh Betar B-04 English: 1230-1300 S & SEAs; V. of Islam 1745-1815 Eu; 1815-1900 Eu, all on 7185, 9550 Daily (Ashik Eeqbal Tokon, Rajshahi, Bangladesh, GRDXC) Can anyone confirm 7185 and 9550 actually on the air? (gh) 9550 is not at all on the air. 7185 is still on the air but severe co-channel interference during B04 season (Swopan Chakroborty, Kolkata, India, WRTH Bangladesh editor)

BOLIVIA In late October, a station on 4917 at 0950 mentioned San Miguel, the Bolivian? (Fernando Viloria, Venezuela, DXLD) Heard around 2300 on 4917.63 with program called La Voz de mi Comunidad and clear ID for Radio San Miguel, Riberalta (Björn Malm, Quito, Ecuador) By mid-November, R. San Miguel was instead on 4902.17, at 0022-0101 with ID on the hour, good signal (Chuck Bolland, FL, DXLD) By 0141 excellent signal on 4902.30 (Gerry Bishop, FL, ibid.) A few hours later at 1000 on 4902.08, and the next day at 0927 on 4902.17, tentatives (Ron Howard, CA, ibid.)

BULGARIA R. Bulgaria, B-04 English:
0730-0800 Au 11600 13600
1230-1300 WEu 11700 15700
1830-1900 WEu 5800 7500
2200-2300 WEu 5800 7500
0000-0100 NAm 7400 9700
0300-0400 NAm 7400 9700 (Bob Thomas, CT, DXLD)

CAMEROON R. Garoua used to be on 5010 and 7240. Two years ago I visited the former transmitter which had not been touched since a transformer burned up about five years earlier. The transmitter building and antenna are still guarded, but a swarm of killer bees are breeding inside the transmitter. It was said that the President of Cameroon does not want the radio station back on the air to avoid an uprising in the region (Jens Christian Seeberg, Denmark, DSWCI DX Window)

*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; B-04=winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

CANADA Why did RCI drop its 2300 UT broadcast to the USA of The World at Six and As It Happens? Broadcasting at 1800 ET excluded a large part of the US from this coverage. After all, that was at 1500 PT, 1600 MT and 1700 CT. Rather than spend our minimal resources on an 1800 ET transmission, we decided to concentrate on a time and a coverage plan that provided a broad service to the largest area possible. During the summer, as a transition, we were broadcasting both at 1800 and 2000 ET; now at 0100-0300 UT only (Steve Lemay, RCI scheduling, via Bill Westenhaver, RCI Audience Relations, swprograms)

World at Six and the first half hour of As It Happens are available in DRM on 9800 at 2200. The RCI schedule also showed that Ukrainian, at 1630-1659 via UK on 9555 and 11935 would be cancelled as of Nov. 30 (via Alokesh Gupta, Japan Premium) Ukrainian was scheduled for cancellation last spring, but got a reprieve, only until after the Ukrainian elections in November. The Ukrainian Canadian Congress was protesting the upcoming cancellation (RCI Action Committee via Kai Ludwig)

CHINA [non] CRI added some new relay sites for B-04, with some rather strange bedfellows: Spanish at 0000-0100 on 9745 via Bonaire, according to RN's schedule (gh) CRI also notified us of some new broadcasts in Portuguese to Brazil, at 1100 on 17625 and 2100 on 11720 (Jailton C. Amaral, SRDXC, Noticias DX) Not mentioning the site, but we know it is Voz Cristiana, Chile! As in Merlin/VT schedules, with 17625 also at 1200 in Cantonese and 1300 English, monitored by Wolfgang Büschel. I was able to hear the 11720 broadcast, and Andrew Flynn of VC confirmed the deal, saying that CRI programming was innocuous and not considered contrary to VC's religious mission (gh)

B-04 Sackville, Canada relays of CRI, all 250 kW, in all languages: 1100-1200 5960, 1200-1300 9560, 1300-1400 11885, 1300-1500 15230, 1400-1600 13675, 1600-1700 17735, 2200-2300 13700, 2300-2400 11970, 2300-0100 6040, 0000-0100 9790, 0100-0200 6005, 0300-0400 7190 [sic; not really!], 0400-0600 6190 and 9560 (via Wolfgang Büschel) Observations: 11970 replaced 13680 at 2300 in English, which had been colliding with Venezuela-via-Cuba; but 15230 clashed with Cuba which has been on 15230 forever (gh) See the complete CRI B-04 schedule with sites at: **http://www2.starcat.ne.jp/~ndxc/ch/cri411.htm** (Mike Barraclough, DXLD)

COSTA RICA [non] Regarding the SW broadcast, what is in the works is a station in Illinois on the farm of an engineer friend who has donated land for use as a transmitter site. Tico Times did another story about Radio for Peace International and other groups vs. the Upaz, linking Maurice Strong to fraud, in his taking $1.6 million of Costa Rican land, selling it and pocketing the $$ (James Latham, RFPI, DXLD)

CROATIA [non] HRT broadcasts on 7285 via Germany at 2300-0600 are registered as to the East Atlantic, and Iceland (Bernd Trutenau, Lithuania, DXLD) Sure, that makes them ''legal'' but we know those transmissions are actually for continental South and North America, where there are more than a handful of Croats, than at sea and in Iceland, if any (gh) 7285 with Spanish at 2330 and 0330, English at 2300 and 0300, at least. Occasional hets from frustrated North American hams, who like to run AM around this part of the band (gh)

CUBA R. Havana heard on new out of band frequency, 13360 to Europe, ex 15120 at 2000 in Portuguese, 2030 in Arabic and 2100-2300 in Spanish for at least three days in early November (Bernie O'Shea, Ottawa, Ontario, World Of Radio) I'll bet 13360 was a mistake. RHC normally plays by the rules as far as staying inside official bands (gh) 13360 was back on the next day from 1955 to 2300 (Bernie and gh) Meanwhile I publicized this on World Of Radio (gh) You were right, they made a mistake. Heard them on the probably intended new frequency of 13660 at 2000 UT, Nov. 11. Problem solved (O'Shea, DXLD)

All the old Brown Boveri and Snieg transmitters have been replaced with six new 100 kW PSM highly energy efficient ones, and we are proceeding with the somewhat longer work of installing several new antennas. A seventh transmitter of 50 kW is now on 5025, with R. Rebelde, using a provisional high vertical incidence radiation angle antenna, until we can install the new tropical band system.

RHC is on new 6060 at 00 until 05 in Spanish, 05 to 07 in English, running new 100 kW Pulse Step Modulated transmitter to old rhombic antenna beaming 020 degrees, soon to be replaced by a beautiful high gain curtain antenna array of about 15 dB gain over a dipole! The new antenna will provide much better coverage of Eastern North America because it will have a wider beam than the present narrow beam rhombic (Your friend in Havana, Arnie Coro, CO2KK, Host of Dxers Unlimited, ODXA)

RHC 6060 booms into central NY, but also nearly kills the signal from Spain 6055, which they have used for years in winter, their only English broadcast well heard here (Roger Chambers, Utica, New York, ibid.)

Stray bubble jammers: at 2121 on 13760 marring North Korea in English; maybe intended against WHR, earlier on same, which once ran Cuban exiles on 9495; Sunday at 1630 on 11670, despite Cuba's relay of Venezuela on same: operator may have misread instructions to jam 17670 Marti! (gh)

EGYPT According to a source working in Radio Cairo, huge budget cuts starting Nov. 1 and several overseas services of radio Cairo will be closed for good – including Portuguese to Brazil and several others. English, French, Spanish will remain; I don't know about German and Russian. That means a lot of SW frequencies used to carry the Voice of Egypt will be in the clear and no more Radio Cairo in Afar, Fulani, etc. Only 11 languages will remain on, out of 40+. The decision will be effective Jan. 1, 2005. Listeners of certain sections should start e-mailing Radio Cairo. Maybe they would think twice (Tarek Zeidan, Cairo, Egypt, DXLD)

Another station has joined the 40m ham band: R. Cairo going from Spanish to English at 0200 on 7260 (Roger Chambers, NY, MVSWLC) R. Cairo English is on 7115 at 2300 (Bob Thomas, CT, DXLD) So Cairo has moved both its English to NAm services into the 40m hamband! 2300-2430 on 7115, 0200-0330 on 7260 (gh) Spanish at 0045-0200 also on 7260, 9415 (R. Cairo)

ETHIOPIA [non] R. Mustaqbal, B-04, via VT Communications, Dhabayya, UAE, 250 kW, 225 degrees to EAf in Somali on Mon/Tue/Thu: 0630-0700 15370; 1130-1200 15385. The latter replaces 1230-1300 on 15370 via Meyerton, South Africa, 250 kW, 032 degrees (Observer, Bulgaria)

FRANCE RFI B-04 in English: target areas Africa and Asia only, so everyone else must try to pick up off-beam broadcasts.

(1) = 31.10.04 to 27.02.05; (2) = 27.02.05 to 27.03.05; otherwise for the entire five months. Asc = Ascension; Ch = China; Mey = Meyerton, South Africa; Moy = Moyabi, Gabon; otherwise direct from Issoudun, France: 0400-0430 Moy 9805, 9555 (1), 11995 (2); 0500-0530 Moy 11850, 11995 (1), 15155 (2); 0600-0630 Asc 9595, 15155, 17800; 0700-0800 Moy 11700 (1), Moy 11725 (1), Moy 15605; 1200-1230 Asc 15275, 21620; 1400-1500 Ch 7180 (1), Ch 9580 (2), 17620; 1600-1700 Mey 9730, Mey 15160, 17850; 1600-1730 11615, 15605 (from a complete RFI B-04 schedule via Jean-Michel Aubier, DXLD)

21620 at 1200 has a good signal here (Joe Hanlon, NJ, ibid.)

GREECE [and non] V. of Greece was slow as usual to publish a complete B-04 schedule; relays via Delano changed to: 1200-1500 on 11750, 1600(Sat/Sun 1500)-2200 on 15485; via Greenville, still 2000-2200 on 17565 – but the weekly hour in English, Hellenes Around the World was not to be heard at 1700 UT Sat, as timeshifting would expect (gh) Heard instead during the 1500 hour on Saturday (Harold Sellers, ODXA) The musical broadcast in English, It's All Greek to Me is at 1105-1200 Sunday on 9375, 15630, 15650. Good luck if you can pick it up at that time! (John Babbis, Silver Spring, MD, DXLD)

ICELAND B04 relay schedule for RUV newscasts via leased transmitter of Iceland Telecom in Reykjavík:
To Europe (live relays):
1215-1300 13865*
1755-1825 12115*
To North America (recordings):
1410-1440 13865
1835-1905 13865
2300-2335 12115

All in Icelandic, in AM-compatible USB with reduced carrier (via Bernd Trutenau, Lithuania, DXLD)

INDIA AIR English GOS B-04:
1000-1100 Au/NZ 13710B 7510Kh 17895A
1000-1100 As 15020A 15235B 17800B
1000-1100 As 1053T 15260Ki
1330-1500 As 9690B 11620Kh 13710B
1530-1545 As 7255A 9820P 9910Kh 11740P
1745-1945 Af 11935M 15075Kh 17670Kh
1745-1945 Eu 7410Kh 9950Kh 11620A
1745-1945 Af 9445B 13605B 15155A
2045-2230 Au/NZ 9910A 11620B 11715P
2045-2230 Eu 7410Kh 9445B 9950Kh
2245-0045 As 9705P 11620Kh 13605B
2245-0045 As 9950A 11645Kh 13605B
A = Aligarh, B = Bangalore, Kh = Khampur (Delhi), Ki = Kingsway (Delhi), M = Mumbai (Bombay), P = Panaji, T = Tuticorin (Jose Jacob, dxindia, via Mike Barraclough, and Alan Roe)

INDONESIA RPDT Manggarai, 2959.95, from 1317 in mid-October, powerful signal at times, some Western music, long monologues by a man, then a woman with a very penetrating voice, with announcements, likely person to person messages, as they were repeated twice. Often at armchair level! Mentioned Makassar, Bali, Riverside, Manggarai; fade up by 1500 for Love Ambon, off by 1503 (Volodya Salmaniw, Grayland, WA, DXLD)

IRAN After continuous attempts we could succeed to reëstablish SW for your area. We would be very pleased to have your comments and reception reports. Please keep in touch with us. Best Regards, IRIB English Service. 1030-1130 15480, 15460 to India; 1530-1630 9610, 9940 to India; 1930-2030 6110, 7320 to Europe; 9855, 11695 to S&E Africa; 0130-0230 V. of Justice, 6120, 9580 to NAm (via Bruce MacGibbon, OR, DXLD) 9580 blocked by China via Cuba (MacGibbon, to IRIB) Also restored German (ADX via Kai Ludwig, DXLD) And French, Italian (Wolfgang Büschel) V. of Jusice also heard until 1329 on 15275 (Roger Chambers, NY, MVSWLC)

[non] B-04 DTK schedule shows a new broadcast on 9495, Sat 1900-1930; more R. Free Syria, as on Fri and Sun? (gh to Jeff White, RMI) This is a transmission by an Iranian women's group starting Nov. 6, WFAFI, Womens Forum Against Fundamentalism in Iran, http://www.wfafi.org (Jeff White, Radio Miami International, DXLD) Confirmed on the first date, brokered by RMI, Farsi ID and talks about Iran – all by women in the studio. E-mail: info@wfafi.org (Anker Petersen, Denmark, DXLD) I got the following message and QSL from Radio Voice of Women, **radio@wfafi.org** – Please visit the section About us and Mission Statement on our website. The goal is to facilitate the voice of Iranian women as they are the victims of Islamic Fundamentalism. Fariba, Production manager of Radio VOW (via Björn Fransson, Sweden, DXLD)

ISRAEL IBA's B-04 English schedule is effective ONLY until Dec 31, to Eu and NAm, u.o.s.:
0430-0445 7545 6280; CAm/Au 17600
1030-1045 15640 17535
1830-1845 9390 11585 11605
2000-2025 9390 6280; SAf 15615
(Moshe Oren, Bezeq) See top

A TREE GROWS IN ISRAEL --- Am very happy to announce that Dottie and I are being honored by Radio Israel. Moshe Oren telephoned me from Tel Aviv to tell me that Israel Radio is planting a tree in Israel for each of us. This came about as a result of my one thousandth weekly monitoring report to Israel Radio (George Poppin, CA, DXLD) Congrats!

KOREA NORTH V. of Korea heard on 10187 at 1745 in Spanish, 1800 into French, a spur? (K6FIB, swl@qth.net) Also heard at 2153 with martial music. I went to #monitor on zirch IRC and 10187 may not be a spur. It is well known North Korean utility frequency, mainly for diplomatic traffic on very badly keyed CW. Why broadcast on this channel is a mystery; it could be a tuning signal for bored embassy staff (Robin VK7RH Harwood, ibid.)

MALDIVE ISLANDS [non] New website to go with Minivan Radio – Minivan News, to provide Maldivians with an independent and objective source of news and analysis. It has developed from the success of Minivan Radio, broadcast to the Maldives each evening and enjoying an increasingly large audience. **http://www.minivanradio.org/** Listen to Minivan Radio **http://www.minivanradio.org/radio.php** (Friends of Maldives via David Hardingham, UK, DXLD)

MEXICO XERTA, 4810, at 0310-0515+ with continuous contemporary Christian music, lite instrumental music; IDs at 0400 & 0515. Must use ECSS-LSB to avoid noise blob on high side. Armenia sign-on at 0358 caused minor co-channel QRM

(Brian Alexander, PA, DXLD)

QSLing XERTA has never been easier. No need to send them a report. Not even to tune in to their frequency. Just go to **http://www.misionradio.com** and click on "Nosotros" where, abracadabra, you will find a QSL ready for downloading. Printing the whole thing out, you will obtain a "certificado de sintonía" with the actual date of submission at the bottom of the page (Henrik Klemetz, DXLD) Devalued veries – I have long suspected that QSLing reception reports must be a nuisance to many a station. At XERTA, they have found the ultimate QSLing system (Klemetz, hard-core-dx)

NEW ZEALAND RNZI changed 15340 to 15720 at 0400-0759 (Wolfgang Büschel, DXLD) To avoid collision with Iran (Observer, Bulgaria)

PAKISTAN PBC B-04 in English: 1600-1615 to ME on 9390*, 11570*; Af 11850, 15725. Urdu to WEu [opens and closes with a few minutes of English news], 0800-1104 on 15100*, 17835*. Assami to SE Asia [has been partly in English], 0045-0115 on 9340, 11565. All transmitters located at Rewat : *250 kW – others 100 kW (via Noel Green, DXLD)

PHILIPPINES PBS, Marulas, Valenzuela, ''Radio Ng Byan'' heard at 0150-0210, on new 9619.9, ex 9582.2. Strong QRM from 9620, so best in LSB (Roland Schulze, Philippines, DSWCI DX Window)

POLAND R. Polonia, B-04 English: 1300-1359 11850, 9525; 1800-1859 7265, 7220; **http://www.radio.com.pl/polonia** Audio: **http://www.wrn.org/ondemand** (via Jacek Szymik, Katowice, HCDX)

11850 at 1300, SINPO 21111, killed by Family Radio on 11855, about 1 word in 20 intelligible, also a rough buzzing from transmitter; a bit better later in the half hour on 9525 with 1 word in 10 understandable, SINPO 22122; consistently terrible reception, unusable most of the time (Roger Chambers, NY, MVSWLC)

ROMANIA RRI B-04 English:
0630-0700 9565 11710 WEu
1300-1400 15105 17745 WEu
1800-1900 5965 7130 WEu
2130-2200 6055 7145 WEu; 6015 9540 NAm
2300-2400 6135 7105 WEu; 6180 9610 NAm
0100-0200 6140 9690 NAm; 9510 11740 Au
0400-0500 6125 9515 NAm; 11870 15250 India
(RRI via ADDX, Andreas Volk, via Wolfgang Büschel)

SERBIA & MONTENEGRO [non] R. Yugoslavia/RSCB B-04 English, 250 kW via Bijeljina, Bosnia:
0100-0130 NAm 7115 (except Sunday)
0200-0230 NAm/WEu 7130
1330-1400 Au 11835 (exc Sat and Sun)
1930-2000 Eu 6100
2200-2230 Ei 6100
(via Rudolf Krumm, BC-DX)

SLOVAKIA R. Slovakia International in their October 17 Letterbox requested listeners to send in their phone numbers. The station will then call listeners around Christmas time to find out how they spend Christmas. This might be the last time to contact the station if they go ahead and cease SW. Radio Slovakia International, P. O. Box 55, Mytna 1, 810 05 Bratislava, Slovakia (Edwin Southwell, World DX Club Contact)

SOMALIA I am trying to get back to Africa, this time a long stay in Puntland, ex-NE Somalia. I will be staying at Radio Galkayo's complex and helping out with R. Galkayo, the Puntland hams and preparing for the February 2005 Italian ham DXpedition. I have been granted the call-sign 6O0JT, and will be operating 10-80m. Sam Voron, back in Sydney, tells me the ARRL has just given Puntland country status, so she has become big news! R. Galkayo is on the air 0200-0400 and 1000-1800 GMT on 6980. Puntland does not have mail service; reports could be sent via E Mail. See the Radio Galkayo web site: **http://www.radiogalkayo.com**

I asked Sam about other Horn of Africa SW stations: "Most others have disappeared or gone FM"; R. Galkayo remains the only SW station on the air from the former Somalia. I can make sure that all correct reception reports are QSLed. Please be patient with reports and let us know if you can hear Radio Galakyo in your area (Joe Talbot, VA6JWT, Home: Red Deer, Alberta, Canada, DXLD)

SOUTH AFRICA SENTECH B-04 including Channel Africa in English with kW:
0300-0355 7390 500 E/CAf
0300-0500 3345 100 SAf
0500-0555 11875 500 WAf
0500-0700 7240 100 SAf
0600-0655 15220 500 Far WAf
0700-0800 11825 100 SAf
1000-1200 11825 100 SAf
1400-1600 11825 100 SAf
1500-1555 17770 500 E/CAf
1700-1755 15285 500 WAf
1900-2200 3345 100 SAf
R. Sonder Grense in Afrikaans:
0500-0700 7185 100 Northern Cape
0700-1700 9650 100 Northern Cape
1700-0500 3320 100 Northern Cape
(Kathy Otto, SENTECH, via Alokesh Gupta, DXLD)

SPAIN [and non] Radio Exterior de España B-04 English:
2000-2059 M-F 9595 Af, 9680 Eu
2200-2259 Sat-Sun 9595 Af, 9680 Eu
0000-0059 6055 Am
Sephardic:
1825-1855 Mon 17770 ME
0115-0145 Tue 11795 SAm
0415-0445 Tue 9690 NAm
(REE via Daniel Sampson, Prime Time Shortwave)

REE is really downplaying their Lenguas Cooficiales. I finally found current schedule on website, for Catalan, Galician and Basque, M-F 1340-1355 to NAm on 21570, 17595, 15170, 5970; and to other areas 21610, 21540, 15585?, 11910 (gh)

SRI LANKA SLBC All Asia Service is one station with great audio. Very pleasant to listen to, 15748.0 at 0040 Early Bird Show with nice instrumental music, breaks for religion at 0100 or 0115, \\ 9770 and also announcing 6005, fades around 0130 but sometimes in for hours (Mick Delmage, Alberta, DXLD)

SUDAN [non] The Radio Nile, B-04: 0430-0500 Sat-Tue via Madagascar 325 degrees, 250 kW on 12060 and 15320, is RN's technical schedule – what had been known as Voice of Hope, including some English; about time they came up with a more distinctive name (gh) Yes, it's the same station. They had to change the name due to some dispute between different churches. Because they are still using material prepared before the name change, both the old and new names may be heard. But from 1st Jan 2005, only the new name will be used (Andy Sennitt, Holland) R. Nile better on 12060, times for English vary, talks about humanitarian issues (Brian Alexander, PA, DX Listening Digest)

SYRIA R. Damascus plans to discontinue German, at least on SW. Probably English is endangered as well. Helmut Matt of the German program was asking for listener support to Radio Damaskus, German Language Department, P. O. Box 4702, Damaskus, Syrien or mmhrez@shuf.com (via Kai Ludwig, Germany, DXLD)

THAILAND R. Thailand, B-04 English via 250 kW Udorn u.o.s.: 0000-0030 9680; 0030-0100 5890 Greenville 500 kW, 13695; 0300-0330 5890 Delano 250 kW, 15460; 0530-0600 13780; 1230-1300 9810; 1400-1430 9725; 1900-2000 9840; 2030-2045 9535 (via Wolfgang Büschel) Unclear whether 13695 and 15460 are still running, or backups (gh)

TIBET Xizang PBS, Holy Tibet, 30 minute English at 1630 heard only on 4905, 4920, 5240, 7385; not on other listed channels 6110, 6130, 6200, and 9490 (Jouko Huuskonen, Finland, DXLD)

[non] Voice of Tibet: 1215-1300 around 17525; 1432-1517 around 15690; 1532-1605 around 9395; first half hour is Tibetan language, followed by 15 min in Mandarin; via Mr. Oystein Alme, VOT director (via Eric Zhou, DXLD) Must jump around to avoid jamming; a later version: 1212-1300 17545, 1301-1348 15535, 1430-1605 7520. Chinese dragon-works jammers quickly found them within a few minutes (Victor Goonetilleke, Sri Lanka, BC-DX) seemingly via Tashkent, Uzbekistan (Wolfgang Büschel, ibid.)

TURKEY Heard VOT at 2300 on 7275, and sure enough it's proof that any station broadcasting to North America must avoid the 40-meter band – lots of ham QRM on the low side. I've suggested they move to 5960, in the clear (Joe Hanlon, NJ, DXLD) English to NAm, confirmed at 2300 on 7275; 0400 on 7240, both very good (Bob Thomas, CT, DXLD)

U K Alison Woodhams has been appointed as BBC World Service's Chief Operating Officer and Financial Director. She will be responsible for finances, property and all business development activities. She takes up her post in January 2005 (Media Network blog)

The December 2004 edition of BBC World Service's monthly 'On Air' magazine is the last. They say it is no longer cost-effective (Martin Levene, London, DXLD)

U S A B04 VOA schedule, language by language starting with English: **http://www.voanews.com/english/about/frequenciesAtoZ_e.cfm** (Dave Kenny, DXLD) At 1605-1655 M-F, when Talk to America is re-scheduled: 17895, 17715, 15255, 15240, 9855, 9760, 9685, 9645, 7125, 6160 (gh)

For at least a month, mid-Oct to mid-Nov, one WEWN transmitter was putting out multiple spurs plus and minus 8.32 kHz, interfering with numerous stations neighboring 5825, 9955, 9975, 13615, as noted by Noel Green, UK, Harold Frodge, MI, gh, and others; and Brian Alexander, PA, who counted 15 extra frequencies around 5825! When you're running 500 kW transmitters (or is it only 350) into high-gain antennas you have even greater responsibility than other stations to keep your signal clean and within legal bandwidth! (Glenn Hauser, OK, DXLD)

The FCC B-04 schedule is at **http://www.fcc.gov/ib/sand/neg/hf_web/B04FCC02.TXT** but beware of ''wooden'' listings for silent stations such as WRNO, WWBS, listings which have since changed, and those representing future plans. At least KIMF, Piñon, NM, ''the station that never was'', no longer shows on 5835 and 11885.

WRMI, Miami, is covered 24 hours for two transmitters instead of the present one: 0000-1600 6870, 1600-2400 9955; 0000-1300 9955, 1300-2400 15725. In practice the times are adjusted as needed for different clients and target areas.

WMLK, Pennsylvania, moved from 9465 to 9265, supposedly with 125 kW, at 0400-0900 and 1600-2100, but 9265 was barely modulated, likely still from the old 50 kW unit. This got WMLK out from under the super WWCR signal on 9475 – except WWCR had replaced that with 9985 (gh)

VENEZUELA [non] On Sunday Nov. 14, the Cuban relays of RNV's Aló, Presidente on 11670, 11875, 13680, 13750, 17750 contained fill programming, and finally closed down early at 1640, Pres. Chávez a no-show (gh) Chávez has suspended his radio and TV program indefinitely until further notice (AP via Hector García Bojorge, Conexión Digital)

Andrés Izarra, Minister of Information and Communication, said "We are revamping the show: the format, the presentation.'' (El Universal via Henrik Klemetz, Sweden, DXLD)

VIETNAM [and non] VOV B-04, English half-hours, S'on Tay, Vietnam site, 100 kW; except: 7285 Hanoi (Me Tri) 50 kW; 5955 Moscow 100 kW; 6175 250 kW Sackville.
1100 As 7285
1230 As 9840, 12020
1500 As 7285, 9840, 12020
1600 Eu/ME 7220, 7280, 9550, 9730
1800 Eu 5955, Eu/ME 7280, 9730
1900 Eu/ME 7280, 9730
2030 Eu/ME 7220, 7280, 9550, 9730
2330 As 9840, 12020
0100, 0230, 0330 CAm 6175
(via Sean Gilbert, WRTH via DXLD)

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

Broadcast Logs

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

0100 UTC on 4780.1
GUATEMALA: Radio Cultural. Spanish identification into "Impacto" program promo. Religious vocals to 0130, followed by *Desencadenado* program presented by the Evangelical Church. (Fernando Garcia, Baltimore, MD)

0116 UTC on 6000
CUBA: Radio Habana. National news to item on terrorists in southern Florida. Station identification amid poor audio and terrible modulation. (Scott Barbour, Intervale, NH) 0530, 11760 . (Howard Moser, Lincolnshire, IL)

0222 UTC on 5815
DENMARK: World Music Radio. English ID's to pop music format. (Sheryl Paszkiewicz, WI) Logged 2330-2345 on 5815 with US/Euro pop music format. (Duane Hadley, Bristol, TN)

0232 UTC on 9965
ARMENIA: Voice of. Sign-on with interval signal. Armenian national anthem to station identification into Spanish service to South America as "la voz de Armenia." News 0234-0242 followed by pop, choral and orchestral music to 0305 tune-out. Recheck at 0315 with either carrier off or a reduced power shift. This channel carried **Voice of Russia** Spanish service form 0205-0228. SINPO 55534 gradually fading to S3 or S2 at sign-off. (Bruce Churchill, Fallbrook, CA/Cumbre DX)

0310 UTC on 4919
ECUADOR: Radio Quito. Spanish. Program mix of commercial jingles, Quito ID and local time checks. Pop Lovely Spanish ballads. Better signal than past evenings. (Gayle Van Horn, NC)

0310 UTC on 9575
SPANISH MOROCCO: Radio Medi Un. French talk to US and Arabic pop music. (Paszkiewicz, WI)

0359 on 11530
CLANDESTINE-IRAQ: Voice of Mesopotamia. Presumed Kurdish text between choral music. Very poor copy but audible to 0415. (Brian Bagwell, St. Louis, MO) Station audible 11530 at 1407 with Turkish vocals, ID and news format. (Paszkiewicz, WI)

0900 UTC on 6035.2
COLOMBIA: La Voz del Guaviari. Station ID to noticias (news) program via RCN network, followed by corridos music. (Garcia, MD)

0906 UTC 3291
GUYANA: Voice of. English birthday wishes for several listeners. Ad for "National Hardware in downtown Georgetown" at 0915, followed by local music. Weak but clear. (Barbour, NH)

0910 UTC on 6134.9
BOLIVIA: Radio Santa Cruz. Spanish. Clear identification, found while band scanning. Fair signal quality for regional ads and jingles. (Larry Van Horn, NC) Bolivia's **Radio Pio Doce** 5952.3, 1000 with IDs and Andean music. (Paszkiewicz, WI)

1001 UTC on 3385
PAPUA NEW GUINEA: Radio East New Britain. Pidgin. Presumed network newscast on parallel 4890 (NBC) until 1010. Musical bridges with brief talks segments. Choral music at 1023 to chat until signal fade by 1030. Poor/fair signal quality. (Barbour, NH) PNG's **Catholic Radio** 4960, 1120-1300. Fair quality with music and vocals in English. (Dale M. Fisher, Euclid, OH). **NBC** 4890, 1345-1400. (Thomas M. Gibson, Spokane, WA) PNG's **Radio Sandaun** 3205, 1147; **Radio Simbu** 3355, 1150. (Jerry Lineback, KS/NASWA Flash Sheet) **Radio Manus** 3315, 1034-1047; **Radio East Sepik** 3334, 1012-1022.

1007 UTC on 12085
MONGOLIA: Voice of. Fair signal amid lengthy talks and muddled audio. ID over music at 1029 to distinct interval signal followed by ID for Mongolian service. Improved signal by 1055 recheck. (Barbour, NH)

1025 UTC on 4826.24
PERU: Radio Sisuani. Quechua. Local talks from two males to "Radio Sicuani" identification. SINPO 33433. (Arnaldo Slaen, Buenos Aires, ARG)

1038 UTC on 7320
RUSSIA: Radio Rossii. Russian continuous talk by two males. Fair and improving on // 5940 under WWCR. (Barbour, NH) **Voice of Russia** 11980 // 7310 at 2020. (Frodge, MI) Russian 9480 at 0640. (Rick Barton, Phoenix, AZ)

1045 UTC on 7210
VIETNAM: Voice of. Asian dialect presumed Vietnamese with regional music and ID. Signal fair to poor with minimal copy. (Hadley, TN)

1110 UTC on 6185
CHINA: China Huayi BC. Mandarin. Lady with talks over musical bits. Interview at 1116 to pop jingle at 1128. Booming signal! **China Radio Int'l** 7115, 2253-2302 with IDs, and CRI website. (Barbour, NH) China's **Xinjiang PBS** 7155, 1110-1125 in Chinese. (Sam Wright, Biloxi, MS) **CPBS-Shijiazhuang** 6125, 2137-2148; 2155-2205 in Mandarin. (Brbour, NH) **China Radio Int'l** 7190, 2115. (Frodge, MI)

1143 UTC on 6130
LAOS: Lao National Radio. Laotian. Continuous sub-continent ballads until seven gongs and station identification at 1200. Brief instrumental music followed by newscast. Fair signal though decreasing by tune-out. (Barbour, NH) *Nice catch, Scott - GVH*

1252 UTC on 15747
SRI LANKA: SLBC. Brief signal window with nice reception of oldies music. Station ID for "SLBC all Asian service" at 1300. Commentary to world news and religious program from the book of Revelations. **Deutsche Welle** relay 9505, 0106. (Barbour, NH)

1345 UTC on 4890
PAPUA NEW GUINEA: NBC. Good reception for time checks after a song from Daru, western province. Western 70's vintage song to local tune. Military rendition of national anthem from 1358. Carrier remained on past 1359. (Walter Salmaniw, Victoria, BC, Canada/HCDX)

1400 UTC on 17780
ITALY: RAI. Italian news report on Iraq // 21520. (Bob Fraser, Belfast, ME) Italian service 11800, 2330 with IDs. (Tom Banks, Dallas, TX)

1408 UTC on 5985.80
MYANMAR: Radio Myanmar. Good reception, best I've heard in some time. Program interspersed with brief segments by male, English commencing at 1434. Somewhat difficult to follow during piece about Dengue fever, best on LSB. (Salmaniw. CAN)

1601 UTC on 11690
JORDAN: Radio. News headlines in lyric rock music program. Closing news summary to ID and regional news check. Fair/good quality. (Rich D'Angelo, PA/NASWA) Audible 11690, 1638-1700. (Frodge, MI)

1835 UTC on 15640
ISRAEL: Kol Israel. Station IDs and world news roundup. (Frank Hillton, Charleston, SC) News on Syria 17535 // 15640 at 1910. (Fraser, ME)

2116 UTC on 17800
NIGERIA: Voice of. Lady's program, *Nigerian Popular Music* to time checks, IDs and interval signal at 2130. 7255, 2241-2300* in vernaculars from a studio audience. (Barbour, NH)

2101 UTC on 11875
CUBA: Radio Nacional de Venezuela relay. Spanish text // 6000. Caribe anuncios of lite music "esta es Venezuelano Caribe." (Frodge, MI) Logged 13680, 2300 with Spanish political commentary. (Barton, AZ)

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
johnfigliozzi@monitoringtimes.com

Here's to New Beginnings

A welcome aspect of the new year is that it offers a timely opportunity for reflection and renewal. And so it is with *MT*'s efforts to inform you about international broadcasting and the programs carried on it. You will note that we're taking a somewhat new tack beginning this month. It's an approach dictated both by experience and necessity.

The task of assembling program listings from international broadcasters has not changed all that much from what it always has been. An apt analogy would be the often frustrating effort that goes into planning a family's activities around the lives of teenagers. Like teens, most broadcasters – if they are planning ahead much at all – are not letting us in those plans in advance. Certainly, they are not doing so with magazine deadlines in mind. All too often, in the time it takes to put such listings into print, it's either become stale or has even changed completely by the time the magazine gets into your hands.

Frankly, there are better ways of delivering comprehensive program listings today and that way is the internet. With the help of the ***Association of North American Radio Clubs (ANARC)*** and ***North American Shortwave Association (NASWA)***, I maintain a web site that provides, in a convenient, interactive and more timely way, the very program listings that up to now, have been part of **MT**'s *Shortwave Guide*. Go to **http://anarc.org/naswa/swlguide** and try it out.

You see, a monthly magazine format is much more suitable for providing background and perspective on the changes that come faster and faster with each passing day. That's what we are going to be providing more of in this column, which now grows to better meet that objective. We'll also be pointing you toward many other useful sources for information that has a limited "shelf life."

We hope you like our new approach. As always, you can help by letting us know your thoughts and suggestions.

❖ With a New Year Theme

Last month, we gave you some suggestions for listening on New Year's Eve (see page 44) – namely, by using your radio to ring in the new year hour by hour around the world. But you should know that there are some New Year's Day traditions on shortwave that can be expected to continue.

For the past few years, Kim Elliott of the VOA has hosted a Talk to America phone-in fielding greetings, comments and questions from around the world. This actually airs on New Year's Eve, December 31st, after the 1600UT news until 1700, and you can try the frequencies listed in the *MT Shortwave Guide* or listen on the web from **http://voanewsnow.com**. I wonder how many of the questions will deal with the incredible, shrinking nature of the **VOA**? As they say, stay tuned.

Deutsche Welle's *German Service* traditionally offers New Year's Day concerts and musical programs in genres ranging from classical to folk and contemporary. **DW**'s *English Service* has a New Year's concert special as well. Consult ***The List*** is this month's column and the English frequency listings in the *MT Shortwave Guide* for where to tune; but if the ionosphere won't cooperate, you can always try **http://dw-world.de**.

Radio Canada International and the **CBC** suspend regular schedules to give their listeners a glimpse of how the regions of Canada and Canadians celebrate. **RCI** and **CBC North** will carry this to you on shortwave, but **http://cbc.ca** and **http://rcinet.ca** are at the ready as well.

The **BBC World Service** offers programs that give a retrospective on the past year in news, sports and the arts. Several other stations, such as **Radio Netherlands**, **Radio Japan**, **Radio Sweden**, **China Radio International** and **Radio Prague** also give the New Year a special treatment. **Radio Prague**, for example, takes a humorous approach with specially prepared skits and sometimes including a "blooper" reel.

RNZI does its holiday thing – lots of music and storytelling from its domestic counterpart, **National Radio**. And **Radio Australia**, where summer vacation and the Holiday Season combine to produce "the silly season," lots of special programming airs to replace all the offerings that go on hiatus until the end of the month.

❖ Radio Sweden Anew

Radio Sweden has always been counted among the top echelon of international broadcasters. Mindful perhaps of the fact that it is now the sole remaining international broadcaster hailing from the Nordic region, **Radio Sweden** has undergone a period of soul-searching and emerged with a refreshed line-up. The pace of the presentation has been quickened, retaining old favorites and adding new segments that explore history, geography, sci-tech, sport, personalities and the intricacies of Swedish cooking.

"The daily editions offer a smorgasbord of news and current affairs, science and technology, lifestyle, and culture. We explore, debate, analyse and give insight into the way Swedish society and its people are changing to meet today's challenges and opportunities," claims Radio Sweden's web site **http://sr.se/rs**.

Each weekday has been given a broad theme. **Monday**'s focus is "culture." The arts program *Spectrum* airs on the first and third weeks of the month. **Tuesday**'s leitmotiv is "knowledge" and that brings the environmental program *Earthscan*, the medical report *Healthscan* and the all things Swedish *S-Files* on the first, second and third weeks respectively. **Wednesday** is devoted to "real life," which means *Sportscan* the first week, *Money Matters* the second and *Nordic Lights* the third. "Lifestyles" infuse **Thursday**s with *Cooking with Judi and Juan*, a new show devoted to Swedish cuisine, airing the first week and the personality profile *Close Up* presented the second. **Friday**'s theme is "Debate." Where regular features don't air, special reports and programs will.

On the weekends, **Radio Sweden** is now part of the *Network Europe* team, whose reports will go to air every **Sunday**. **Saturday**s rotate around *SONO* (otherwise known as the youth lifestyles and music show *Sounds Nordic*, documentaries from *Studio 49*, the listener interactive *In Touch with Stockholm* and the topical magazine *Sweden Today*, week to week every month.

❖ RNMusic.NL begins Live! Online

There was a time when classical music concerts from the Amsterdam Concertgebouw were a staple of the **Radio Nederland** shortwave schedule. In what might be termed a "back to the future" move, **Radio Netherlands** has started producing a special program for the exclusively for "new media" Internet listeners that tips its hat to the broadcaster's traditional radio roots.

Each week, the RNMusic.NL web site offers a new program featuring highlights from *Live! at the Concertgebouw*, a syndicated program for partner stations produced by Radio Netherlands Music, a division of **Radio Netherlands**, and distributed in North America by WCLV/Seaway Productions. All of the fantastic music, interviews and background information that are part of the main program will be featured in *Live! Online*, but in an abbreviated format. *Live! Online* is hosted by Hans Haffmans, the program's regular presenter.

On-demand availability releases both producer and listener from the "tyranny of the scheduler" so program length has the freedom to vary from week to week depending on the musical selections. Each episode remains online for two weeks, providing both last week's program and the current week's program for listening. *Live! Online* can be heard in Real and Windows Media formats.

It's all available now at **http://www2.rnw.nl/mu/catalog/radioprograms/live_online**.

❖ Briefly...

Radio Exterior de España broadcasts exten-

sively to North America in Spanish with a generally strong, high quality signal. Each weeknight at 0105UT (Tue.-Sat.), the program *Nuestro Sello* – which translates to "Our Seal" – presents a wide range of the best music carrying the RTVE Musica recording seal, a subsidiary of the national public broadcaster. Check ***The List*** for frequencies to tune...

IRIB, **Islamic Republic of Iran Broadcasting** has introduced a service entitled the **Voice of Justice**, which offers news and commentary from an Iranian perspective – or at least that of the nation's government. It airs nightly at 0130 for an hour on 6120 and 9580 kHz. Given recent developments in that region of the world, it would appear to be a perspective worth hearing.

THE LIST

This will be a new feature for this column, providing a focused, themed posting of programs on shortwave each month. For January, we fixate on **non-English services that target North America**. With all the recent talk about the demise of shortwave, I thought it might be a good idea to get the new year off on the right foot by demonstrating how much shortwave is ***still*** utilized to communicate across borders – indeed, to North America alone! There's a good deal of radio enjoyment on offer here – exotic music for one thing, but also just the romantic rhythm of the language being spoken.

Happy 2005!

Non-English Services to N America

Albanian

0000-0130	R. Tirana	6115

Arabic

0000-0200	UAE R.*	13650, 13675
0000-0400	Egyptian R.	12050
0030-0430	R. Cairo	7115
0200-0340	UAE R.*	12005, 13650, 13675, 15395, 15400
0200-0530	R. Kuwait	11675
1200-0000	Egyptian R.	12050
1300-1605	R. Kuwait*	13620, 11990
1615-1800	R. Kuwait*	11990
1745-1815	R. Kuwait*	15505
1815-2130	R. Kuwait*	9855, 15505

(*published, but not always heard.)

Bulgarian

0100-0200	R. Bulgaria	7400, 9700

Chinese

0000-0100	China R. Int.	6040, 9790
0100-0200	CBS Taiwan	11825, 15215
0200-0300	China R. Int.	9580, 9690
0300-0400	China R. Int.	9720
0400-0500	CBS Taiwan	5950, 9680
1200-1300	China R. Int.	9570
1500-1600	China R. Int.	9560
2200-0000	CBS Taiwan	5950, 15440

Cree

1200-0600*	CBC North	9625(M-F)

(*at various times during this period)

Croatian

0000-0600	V. of Croatia	7285

Czech

0030-0100	R. Prague	5930
0230-0300	R. Prague	7345
2200-2230	R. Prague	9435

Dutch

0300-0400	R. Nederland	6165, 9590
0530-0600	RVi	9590
0600-0700	R. Nederland	6165
1200-1300	R. Nederland	9890
2230-2300	RVi	11730

Finnish

1300-1400	YLE	15400, 17840
1300-1500	YLE	17840
1600-1700	YLE	13665

French

0000-0200	CBC North	9625(M)
0115-0130	RAI	11800
0200-0300	R. Bulgaria	7400, 9700
0200-0300	CBC North	9625(Tue.-Sun.)
0200-0230	R.Slovakia Int	5930
0230-0250	Vatican R.	7305
0300-0400	RAE	11710
0445-0500	Kol Israel	6280, 7545
1100-1115	Kol Israel	15640, 17535
1100-1200	R. France Int.	15515
1100-1300	R. Canada Int	9515
1130-1200	R. France Int.	17610
1200-1210	CBC North	9625(M-F)
1300-1400	R. Canada Int.	9515(Sat./Sun.)
1400-1455	CBC North	9625(M-F)
1400-1500	V. of Korea	9335, 11710
1600-1615	CBC North	9625(Sun.)
1600-1700	R. Canada Int.	17835(M-F)
1600-1900	Africa No. 1	15475
1700-2000	R. Canada Int.	17835
1800-1845	CBC North	9625(M-A)
1800-1815	Kol Israel	9390, 11585, 11605
1845-2210	CBC North	9625(Sat.)
2000-2100	R. Taiwan Int.	15130
2030-2045	Kol Israel	7520, 9390
2030-2130	R. Havana	9550, 11760
2300-0000	R. Canada Int.	15180
2300-0000	REE, Spain	6055
2300-0000	R. Prague	5930, 7345

German

0000-0200	DW Germany	6100, 9545
0000-0005	R. Austria Int.	7325(Sun./Mon.)
0005-0015	R. Austria Int.	7325(Tue.-Sat.)
0030-0035	R. Austria Int.	7325(Sun./Mon.)
0035-0045	R. Austria Int.	7325(Tue.-Sat.)
0200-0600	DW Germany	6100, 6145, 9640
1600-1605	R. Austria Int.	13675(Sat./Sun.)
1600-1610	R. Austria Int.	13675(Mon.-Fri.)
1625-1640	R. Austria Int.	13675(Mon.-Fri.)
1630-1635	R. Austria Int.	13675(Sat./Sun.)
2200-0000	DW Germany	9780

Greek

0000-0600	V. of Greece	5865, 7475, 9420
1200-1500	V. of Greece	11750
1500-1600	V. of Greece	15485 (Sat./Sun.)
1600-2200	V. of Greece	15485

Hebrew

0000-0430	Kol Israel	7545, 9345
0430-0500	Kol Israel	9345
-0600	Kol Israel	7545, 15760
-1030	Kol Israel	15760, 17535
1030-1115	Kol Israel	15760
-1455	Kol Israel	15760, 17535
1455-1700	Kol Israel	15760
-2200	Kol Israel	9345
-0000	Kol Israel	6280, 9345

Hungarian

0100-0200	R. Budapest	9835, 9870
0230-0330	R. Budapest	9775
2200-2300	R. Budapest	9825

Inuktitut

1200-0600*	CBC North	9625(M-F)

(*at various times during this period)

Italian

0000-0055	RAI	11800
0130-0315	RAI	11800
1350-1730	RAI	21520(Sun.)
1400-1425	RAI	17780, 21520
1830-1905	RAI	11800, 15250
2240-0000	RAI	11800

Japanese

0200-0300	R. Japan	5960
0300-0500	R. Japan	5960, 17825
0800-1000	R. Japan	9540
1300-1500	R. Japan	11705
1500-1700	R. Japan	9535
2200-2300	R. Japan	17825

Korean

0100-0200	R. Korea Int.	15575
1100-1200	R. Korea Int.	9650
1700-1750	KCBS	9335, 11710

Lithuanian

0000-0030	R. Vilnius	7325
2300-2330	R. Vilnius	9875

Portuguese

0000-0200	RAE	11710
0000-0300	RDP Int.	9410, 9715 (T-A)
1300-1700	RDP Int.	15575(S/A/hol.)
1700-1900	RDP Int.	17825(S/A/hol.)
1900-0000	RDP Int.	15540(irr.)

Russian

0000-0500	Russia Int. R.	7125
0200-0300	V. of Russia	7240, 9765, 12010, 13665
0300-0400	V. of Russia	6115, 7240, 12010, 13665
2300-0000	Russia Int. R.	7125

Serbian

0030-0100	Int. R.	S/M	7115
0100-0130	Int. R.	S/M 7115(S)	
0130-0200	Int. R.	S/M	7115

Slovak

0130-0200	R. Slovakia Int.	5930

Spanish

0000-0100	HCJB	15140
0000-0100	LRA1	11710(Sun.)
0000-0100	RCI	9755, 11865
0000-0100	REE Spain	9535
0000-0100	R. Havana	5965, 6000, 6060, 9820, 11760, 11875
0000-0230	RAE	6060, 15345 (Sat./Sun.)
0045-0200	R. Cairo	11780
0100-0130	R. Canada Int.	9790
0100-0200	REE Spain	6055, 9535
0100-0500	R. Havana	5965, 6060, 11760
0200-0500	REE, Spain	6055, 9535, 11880
0230-0300	RAE	6060, 15345 (S)
0300-0330	V. of Vietnam	6175
0315-0335	RAI	11800
0400-0430	V. of Vietnam	6175
0500-0600	REE Spain	6055, 11880
0600-0700	R. Taiwan Int.	5950*
0900-1200	LRA1	6060, 15345
1000-1500	REE Spain	17595 (M-F)
1100-1200	REE Spain	15170 (M-F)
1100-1500	R. Havana	11760
1100-1130	R. Nederland	6165
1200-1400	RAE	15345(M-F)
1200-1400	REE Spain	15170(S-F)
1400-1830	R. Havana	13750(S)
1500-1600	REE Spain	17850(S)
1600-2300	REE Spain	17850(S/A)
1800-0000	LRA1	11710(S)
1800-2000	RAE	6060, 15345 (S)
1900-2300	REE Spain	9630
2000-0000	RAE	6060, 15345 (Sat./Sun.)
2000-2200	RAE	11710(Sat.)
2300-0000	HCJB	15140
2300-0000	RAE	6060, 11710, 15345 (M-F)
2300-0000	R. Havana	6000, 11875 (M-F)
2300-0000	REE Spain	9535

Swedish

0200-0230	R. Sweden	6010
0300-0330	R. Sweden	6010
1200-1210	SR, P4	15240(M-F)
1200-1230	R. Sweden	15240(Sat./Sun.)
1300-1330	R. Sweden	15240
1400-1430	R. Sweden	15240
1500-1530	R. Sweden	15240
1545-1600	SR, P1	15240

Thai

0100-0200	R. Thailand	5890
0330-0430	R. Thailand	5890

Turkish

0000-0800	V. of Turkey	7300
2200-0000	V. of Turkey	7300

Ukrainian

0000-0100	R. Ukraine Int	5910
0200-0400	R. Ukraine Int	5910

Vietnamese

0130-0230	V. of Vietnam	6175
0430-0530	V. of Vietnam	6175

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QSL Scanning 101

Because photo scanners are an extension of the computer, why should it not be an extension of one's QSL collection? If you're still debating storage in binders, cabinets or a shoe box, scanning a collection may be the extra alternative you've been looking for.

Chances are, you're like me. You have cards from stations that have left the air, which means you have vintage cards that cannot be replaced. Scanning your collection preserves it for decades, whether on your hard drive or saved on a floppy or compact disc.

Most DXers, including myself, prefer a flatbed scanner over a sheetfed scanner, because it works well with any size card or letter. Like a photo copier, the scanner's mechanism moves across the original from under the glass plate. The image is then displayed on your computer's monitor. Most flatbed scanners can handle up to an 8-1/2" x 14" page.

Scanners are very affordable and include a software package to assist you in scanning the best digital image. When scanning, your first consideration should be the resolution of the item to scan. Today's scanners have a preset default resolution setting or can be adjusted to your preference from 75 to 1,200 dpi (dots per inch). The higher the resolution, the better the scanned image, but also the larger the file size. Depending on what I'm scanning, I routinely use 300 dpi.

Most flatbed scanners have a preferred corner of the glass on which to place the card or letter. Though not required, I have found that by using this guide I get a straighter scan, which is important to get the best image. When the Preview prompt is shown on the screen, you have the chance to see if the image is straight and if the scan will be adequate. At this time, you can use a cropping tool to remove excess empty margins, smears or discolorations. The next step is to hit Scan.

Now you're on your way. Hit "Save As," saving your little jewel with the station name or country as a jpeg file. From here you can move it to a disc or retain it on your hard drive in a folder you might title "My QSLs."

You'll find flatbed scanning to be versatile and easy to use. Think beyond the QSL card or letter, and scan business cards, certificates, photos, cut-outs, stickers, postcards, souvenirs and those colorful stamped envelopes. Each can be scanned separately, or if you receive several items from one station, scan them as a one-page collage and save them as one file. If scanning as one page, you may have some empty spaces between the items. Lay a sheet of white paper over them to hold small items in place as well as making a nice white background.

The possibilities of scanning your collection are as endless as your imagination. For now, however, you're set. You can upload QSLs to a personal website, or better yet, send a copy to *QSL Report*! We love graphics. So, get scanning!

AMATEUR RADIO

Isle of Wight (IOTA EU-120) 15/20 meters SSB. Full data card from ARRL bureau. Received in 46 days. (Larry Van Horn N5FPW, NC)

ARGENTINA

RAE, 11710 kHz. Full data QSL and full page letter signed by John Anthony Middleton-Head of RAE English Team, and Marcela G.R. Campos, Director-External Service. Received in 189 days for an English report and two U.S. dollars. Station address: c/o English Service, Casilla Correos 555, Buenos Aires, Argentina. (Joe Squashic W4TT0, Wake Forest, NC)

Radio Baluarte, 6215 kHz. Full data Certificado de Sintonia certificate signed by Hugo Eidinger-Director. Prepared QSL card signed and returned with tourist brochure. Received in two months for mint stamp, one US dollar and a tourist postcard. Station address: Casilla de Correo 45, 3370 Puerto Iguazu, Provincia de Misiones, Argentina. (Frank Hillton, Charleston, SC)

AUSTRALIA

HCJB, 11750 kHz. Full data verification on station letterhead, unsigned. Received in 32 days for an English report and one IRC (required for reply). Station address: Voice of the Great Southland, GPO Box 691, Melbourne VIC 3001 Australia (or) **english@hcjb.org.au** (David Stephenson, Bangor, ME)

Radio Australia, 9580 kHz. Full data color Shepparton card signed by Nigel Holmes, plus postcards and brochures. Received in 14 days for a taped report and one US dollar. Station address: GPO Box 428G, Melbourne VIC 3001, Australia. **http://www.abc.net.au/ra/.** (Mark Redfox, Albuquerque, NM)

CANADA

NHK/Radio Japan relay 6110 kHz. Full data color neon world card signed by A. Ishino, plus newsletter, and poster. Received in 37 days for an English report and one US dollar. Station address: NHK World, Nippon Hoso Kyokai, Tokyo 150-800 Japan.(Redfox, NM)

Radio Korea International relay, 9560 kHz. Full data color *Bullet Train* card unsigned. Received in 45 days for a taped report and one US dollar. Station address: KBS, 18 Yoido-dong Youngdeungpo-Gu, Seoul, Republic of Korea. 150-790. **http://kki.kbs.co.kr.** (Redfox, NM)

CHILE

Radio Voz Cristiana. Full data logo card unsigned. Received in 61 days for an English report. Station address: Casilla 395, Talagante, Santiago, Chile. Scott Barbour, Intervale, NH)

DENMARK

World Music Radio, 5815 kHz. No data email reply. Received in ten hour and 25 minutes for report to; **http://wmr@wmr.dk**, with mention of future verification. (Harold Frodge, Midland, MI)

HONDURAS

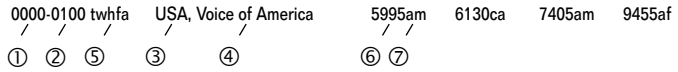
HRPC Radio Luz y Vida, 3250 kHz. Full data logo card unsigned. Received in 602 days for an English report and one US dollar. Station address: Apartado Postal 303, San Pedro Sula, Honduras. (Barbour, NH)

MEDIUM WAVE

KKAD, 1550 kHz AM. Full data card signed by Dave Bishoff-Chief Engineer. Received in 62 days for an AM report. Station address: 888 SW 5th Avenue, Suite # 790, Portland, OR 97204. Veri signer signed KPAM 860 kHz AM card in five days for same address. (Patrick Martin, Seaside, OR)

KTHH, 990 kHz AM. Friendly letter from Bill Lundon-Program Director, plus *The Truth* slogan stickers. Received in four days for an AM report. Station address: 2840 Marion Street SE, Albany, OR 97322. (Martin, OR)

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

MT Monitoring Team

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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

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

0000	0007	vl	Sierra Leone, SLBS	3316do			
0000	0015	vl	Cambodia, National Radio		11940as		
0000	0015	vl	Croatia, Croatian Radio		7285sa		
0000	0030		Egypt, Radio Cairo	11725na			
0000	0030		Japan, Radio	13650as	17810as		
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		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		6005na	6075as	
			7180as 7345eu	11770as			
0000	0100		Costa Rica, University Network		5030va	6150va	
			7375va 9725va				
0000	0100		Guyana, Voice of	3290do			
0000	0100		Japan, Radio	6145ca			
0000	0100		Malaysia, RTM	7295as			
0000	0100		Namibia, Namibian BC Corp		3270af	3290af6060af	
0000	0100		Netherlands, Radio	9845na			
0000	0100		New Zealand, Radio NZ Intl		17675pa		
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		USA, AFRTS	4319usb	5446usb	5765usb	
			6350usb	7507usb	10320usb	12133usb	
			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	11800na			

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

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		9690va	11940va	
			15430va	17760va			
0100	0157		China, China Radio Intl		6005na	6075as	
			7180as 7345eu	11770as			
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		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		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	6025va	11860as	15325as	
			17560va	17685pa	17810as	17835am	
			17845sa				
0100	0200		Malaysia, RTM	7295as			
0100	0200		Namibia, Namibian BC Corp		3270af	3290af6060af	
0100	0200		New Zealand, Radio NZ Intl		17675pa		
0100	0200		North Korea, Voice of	3560as	7140as	9345am	
			9720as 11735am	13760as	15180as		
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		7440na		
0100	0200		USA, AFRTS	4319usb	5446usb	5765usb	
			6350usb	7507usb	10320usb	12133usb	
			13362usb				
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	15415pa	17715as	17750pa	
			17795as				
0130	0200		Canada, Radio Canada Intl		6190am	9755am	
			9810am				
0130	0200		Iran, Voice of the Islamic Rep		6120am	9580am	
0130	0200		Sweden, Radio	11550va			
0130	0200	twhfa	USA, Voice of America		7405va	9775va	
			13740va				

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

0200	0227		Czech Rep, Radio 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, Radio 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 9660as 12080as 13630pa 15240pa 15415pa 15515as 17750pa 21725pa		
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	3270af	3290af6090af
0200	0300		New Zealand, Radio NZ Intl	17675pa	
0200	0300		North Korea, Voice of 4405as	11845as	15230as
0200	0300		Philippines, Radio Pilipinas 15270pa	11885as	15120as
0200	0300		Russia, Voice of 7180na 15475na 15595na	7350na	15425na 17695as
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, Radio Korea Intl 15575na	9560na	11810na
0200	0300		Sri Lanka, SLBC	6005as	11905as 15745as
0200	0300		Taiwan, Radio Taiwan Intl 11875as 15465va	5950na	9680na
0200	0300		UK, BBC World Service 9525ca 9750af 15310as	5975ca 9825ca 15360as	6195as 11955as 12095ca 17790as
0200	0300		USA, AFRTS 6350usb 13362usb	4319usb 7507usb	5446usb 10320usb 5765usb 12133usb
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 17740va	7200va	11820va
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	
0215	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
0250	0300		Zambia, Radio	4910do	

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

0300	0330		Egypt, Radio Cairo	7260na	
0300	0330		Philippines, Radio Pilipinas 15270pa	11885as	15120as
0300	0330	s	Swaziland, TWR	3200af	
0300	0330		Thailand, Radio	5890na	15460na
0300	0330	a	UK, Wales Radio Intl	9795va	
0300	0330		USA, KJES Vado NM	7555na	
0300	0330		Vatican City, Vatican Radio	7360af	
0300	0355		South Africa, Channel Africa	3345af	7390af
0300	0357		China, China Radio Intl 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 9660as 12080as 13630pa 15240pa 15415pa 15515as 17750pa 21725pa		
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	3270af	3290af6090af
0300	0400		North Korea, Voice of 3560as 9720as	7140as	9345as
0300	0400		Oman, Radio	15355as	
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 9605as 9750af 15280as 17760as	3255af 11760va 15310as 17790as	6005af7160af 11765af 12035af 15360as 15575va 21660as
0300	0400	vl/ mtwhf	UK, Sudan Radio Service	9625va	
0300	0400		USA, AFRTS 6350usb 13362usb	4319usb 7507usb	5446usb 10320usb 5765usb 12133usb
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 7340af 9885af	6035af	6080af7290af
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	4910do	
0300	0400		Zambia, Radio Christian Voice	4965af	
0300	0400	vl	Zimbabwe, ZBC Corp	5975do	
0305	0315	vl	Croatia, Croatian Radio	7285na	
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 7160af 9750af 15420af	3255af 11760af 15575af	6005af6190af 11765af 12035af

0330	0400		USA, Voice of America 9885af		6035af	6080af7290af
0345	0400		Tajikistan, Radio	7245irr		

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

0400	0427		Czech Rep, Radio Prague Intl		6200na	7345na
0400	0430		Australia, Radio 15240pa	9660as 15515pa	12080as 17750pa	13630pa 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	4960af	6080af7290af
0400	0447		China, China Radio Intl		6190na	9560na
0400	0450		Turkey, Voice of	6020va	7240me	
0400	0456		Romania, Radio Romania Intl 11870va	15250va	6125va	9515va
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		3270af	3290af6090af
0400	0500		New Zealand, Radio NZ Intl		15720pa	
0400	0500		Russia, Voice of 15425na	7150na 15595na	7180na 17695as	12010na
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 11765af	6190af 12035af	3255af 7160af 15420af	5975am 11760af 15575af
0400	0500	vl/ mtwhf	UK, Sudan Radio Service		9625va	
0400	0500		Ukraine, Radio Ukraine Intl		7440na	
0400	0500		USA, AFRTS 6350usb 13362usb	4319usb 7507usb	5446usb 10320usb	5765usb 12133usb
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, 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	9715va	6065va	6855va
0400	0500		USA, WYFR Okeechobee FL		6855va	7355va
0400	0500		Zambia, Radio	4910do		
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		Uzbekistan, Radio Tashkent 11905eu		5025eu	7185eu
0430	0457		Czech Rep, Radio Prague Intl		9865as	11600va
0430	0500		Australia, Radio 15240pa 21725pa	9660as 15415pa	12080as 15515va	13630pa 17750pa
0430	0500		Nigeria, Radio/Ibadan	6050do		
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		4960af	6080af7290af
0445	0500		Italy, RAI Intl	5965af	6000af	7230af

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

0500	0530		Australia, Radio 15160pa	9660as 15240pa	12080as 15515va	13630pa 17750pa
0500	0530		Belgium, Radio Vlaanderen Intl		9590na	
0500	0530		France, Radio France Intl		11850af	11995af
0500	0530		UK, BBC World Service 15280as 17760as	15310as 17790as	9605as 15360as 21660as	11955as 15575as
0500	0530		Vatican City, Vatican Radio 11625af		7360af	9660af
0500	0555		South Africa, Channel Africa		7240af	11875af
0500	0557		China, China Radio Intl 11770as 17540as	11880as	6190as 15350as	9560na 15465as
0500	0559		Germany, Deutsche Welle 12035af	15410af	7285af	9565af
0500	0600		Anguilla, Caribbean Beacon		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		9625do	
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 11760am	6000na	6060na	9550na
0500	0600	vl	Greece, Voice of	5865eu	7475eu	9420eu
0500	0600		Guyana, Voice of	3290do		
0500	0600		Japan, Radio 15195va	5975va 17810va	6110na 21755va	7230va
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	7255al	15120af	
0500	0600		Sierra Leone, Radio UNAMSIL		6137af	
0500	0600		Singapore, Mediacorp Radio		6150do	
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		6135ca 15565eu	6195eu
0500	0600	vl/ mtwhf	UK, Sudan Radio Service		11795va	
0500	0600		USA, AFRTS 6350usb 13362usb	4319usb 7507usb	5446usb 10320usb	5765usb 12133usb
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 13710af		6035af	6105af7295af
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	6005do		
0525	0600	vl	Ghana, Ghana BC Corp		3366do	4915do
0530	0545		UK, BBC World Service		6010eu	9815eu
0530	0600		Australia, Radio 13630pa 15515as	9660as 15160va 17750as	11750as 15240as	12080as 15415pa
0530	0600		Thailand, Radio	13780eu		
0530	0600		UAE, Emirates Radio	15435va	17830va	21700va

0530	0600	mtwhf	UK, BBC World Service	6005af	6190af7160af	
			11765af 11940af	15420af	17640af	
			17885af			
0530	0600		UK, BBC World Service	9605as	11955as	
			15310as 15360as	15575as	17760as	
			17790as 21660as			

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

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	6035af	6080af6105af	
			7295af 11835af 13710af			
0600	0630	mtwhf	USA, Voice of America	11995af		
0600	0635	mtwhf	South Africa, TWR 11640af			
0600	0657		China, China Radio Intl	6115na	11770na	
			11880na			
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 7230va	11715va	11740va	
			11690va 11760va	13630va	15195va	
			17870va 21755va			
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/Ibadan6050do			
0600	0700		Nigeria, Radio/Kaduna	4770do	6090do	
0600	0700		Nigeria, Radio/Lagos 3326do	4990do		
0600	0700		Nigeria, Voice of 7255al	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 7507usb	10320usb	12133usb	
			13362usb			
0600	0700		USA, KAIJ Dallas TX 5755na			
0600	0700		USA, KTBN Salt Lake City UT	7505na		
0600	0700		USA, KWHR Naalehu HI	9930as	11565as	
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 PA 9265eu	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 5975do			
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	
			178851af			
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 - 2AM EST / 1AM CST / 11PM PST

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	11880as	15350as	
			15465as 17540as	17490as		
0700	0800		Costa Rica, University Network	5030va	6150va	
			7375va 9725va 11870va			
0700	0800		Eqt Guinea, Radio Africa	15184af		
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 Corp	3366do	4915do	
0700	0800	vl	Greece, Voice of 9420eu	11645eu	15630eu	
0700	0800		Guyana, Voice of 3290do	5950do		
0700	0800		Liberia, ELWA 4760do			
0700	0800		Malaysia, RTM 6175as	7295as	9750as	
			15295as			
0700	0800		Myanmar, Radio 9730do			
0700	0800		Nigeria, Radio/Ibadan6050do			
0700	0800		Nigeria, Radio/Kaduna	4770do	6090do	
0700	0800		Nigeria, Radio/Lagos 3326do	4990do		
0700	0800		Nigeria, Voice of 7255al	15120af		
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	Solomon 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 7507usb	10320usb	12133usb	
			13362usb			
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	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, WMLK Bethel PA 9265eu	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 4960do			
0700	0800		Zambia, Radio Christian Voice	9865af		
0700	0800		USA, WJIE Louisville KY	13595am		
0705	0715	vl	Croatia, Croatian Radio	12105au	12110au	
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 - 3AM EST / 2AM CST / 12AM PST

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		Belgium, Radio Vlaanderen Intl		5965eu	
0800	0830		Myanmar, Radio	9730do		
0800	0857		China, China Radio Intl		11880as	15350as
			15465as	17540as	17490as	
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		15184af	
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		Nigeria, Voice of	7255al	15120af	
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
			17525pa	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		9610au	
0800	0900		UK, BBC World Service		9605as	11955as
			15310as	15360as	17760as	17790as
			21660as			
0800	0900	as	UK, BBC World Service		11760me	15575as
0800	0900		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
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	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	6855af7455af
			9985af			
0800	0900	vl	Vanuatu, Radio	4960do		
0800	0900		Zambia, Radio Christian Voice		9865af	
0805	0815	vl	Croatia, Croatian Radio		12105au	12110au
0815	0845	wf	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
			17750pa			
0830	0900		Georgia, Radio Georgia		11910eu	

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

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	17490va
			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		
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		15184af	
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	7507usb	10320usb	12133usb
			13362usb			
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, WHRA Greenbush ME		7580na	
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		3210na	5070na
			5770na 5935na			
0900	1000		USA, WYFR Okeechobee FL		5950af	6855af6890af
			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
			15240pa	15415pa		
0930	1000		Georgia, Radio Georgia		11910me	

Shortwave Guide

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

1000	1029		Czech Rep, Radio Prague Intl		21745va	
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	21660as		
1000	1057		China, China Radio Intl		15210pa	17490pa
			17690pa			
1000	1057		Netherlands, Radio	7315as	9790as	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		Australia, Voice Intl	11955as		
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		Eqt Guinea, Radio Africa		15184af	
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	6120ca	9695as	11730as
			17585eu	17720va	21755va	
1000	1100		Malaysia, RTM	7295as	15295as	
1000	1100		Nigeria, Voice of	7255al	15120af	
1000	1100		North Korea, Voice of	3560as	11710am	11735am
			13650as	15180as		
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		11940ca	15190ca
			15400af	17830af	17885af	21470af
1000	1100	s	UK, BBC World Service		15575as	
1000	1100		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
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		5935na	5070na
			5770na 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	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 - 6AM EST / 5AM CST / 3AM PST

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	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	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/as	Italy, IRRS 13840eu			
1100	1200	vl/f	Italy, IRRS 15665va			
1100	1200		Japan, Radio	6120na	9695as	11730as
			17585eu			
1100	1200		Malaysia, RTM	7295as	15295as	
1100	1200		New Zealand, Radio NZ Intl		15530pa	
1100	1200		Nigeria, Voice of	15120eu		
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	15310as	15485eu	15565eu
			17640eu	17790as		
1100	1200	mtwhf	UK, BBC World Service		17830af	
1100	1200		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
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		Belgium, Radio Vlaanderen Intl		9945va	
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		Vatican City, Vatican Radio		11625af	13765af
			15570af			
1145	1155		Rwanda, Radio	6055do		

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

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	13790eu
			17490eu			
1200	1257		Netherlands, Radio	11675na		
1200	1257	as	Netherlands, Radio	15725na		
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	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		Nigeria, Voice of	15120eu		
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
			17830af	17885af	21470af	
1200	1300	mtwhf	UK, BBC World Service		17830af	
1200	1300		Ukraine, Radio Ukraine Intl		15620eu	
1200	1300		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
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		6160va	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 15825na			
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	
1230	1245		UK, BBC World Service		17780af	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		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 - 8AM EST / 7AM CST / 5AM PST

1300	1305		Nigeria, Voice of	15120eu		
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		9570na	9795pa
			11760pa	11980as	13610eu	13790eu
			17490eu			
1300	1357	DRM	China, China Radio Intl		7250va	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	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		6110eu	13810eu
1300	1400		Malaysia, RTM	7295as		
1300	1400		New Zealand, Radio NZ Intl		9870pa	
1300	1400		North Korea, Voice of	4405eu	9335eu	11710eu
			13760eu	15245eu		
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	9700as
1300	1400		Sri Lanka, SLBC	6005as	11930as	15745as
1300	1400		UK, BBC World Service		6190af	11940af
			15420af	17830af	17885af	21470af
1300	1400	mtwhf	UK, BBC World Service		17830af	
1300	1400		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
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	15825na		
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	
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	a	UK, Wales Radio Intl	17745va		
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 - 9AM EST / 8AM CST / 6AM PST

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	DRM	Canada, Radio Canada Intl		9815eu	
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	11675eu	13675as	13685af
			17630af			
1400	1500		Anguilla, Caribbean Beacon		11775am	
1400	1500		Australia, Voice Intl	13685as		
1400	1500		Canada, CBC Northern Service		9625do	
1400	1500		Canada, CFRX Toronto ON		6070do	
1400	1500		Canada, CFVP Calgary AB		6030do	
1400	1500		Canada, CKZN St John's NF		6160do	
1400	1500		Canada, CKZU Vancouver BC		6160do	
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		6110eu	13810eu
1400	1500		India, All India Radio		9690as	11620as
1400	1500		Japan, Radio		7200as	11730as	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	15120af		
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
			17830af	21470af	21660af	
1400	1500	mtwhf	UK, BBC World Service		17830af	
1400	1500		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
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		6160va	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		7465na	9985na
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN		9320na	12170na
1400	1500		USA, WYFR Okeechobee FL		7580va	11615va
			11855va	13695va	17760va	
1400	1500		Zambia, Radio Christian Voice		9865af	
1415	1430		Nepal, Radio	3230as	5005as	6100as
			7165as			
1430	1458	mtwhf	Belgium, Radio Vlaanderen Intl		15725na	
1430	1500		Australia, HCJB	15390as		
1430	1500		Myanmar, Radio	5040do	5985do	
1430	1500		Sweden, Radio	15240eu	18960al	
1445	1500	as	Germany, Pan American BC		13820me	
1445	1500	mtwhfa	UK, BBC World Service		6140as	7205as
			15245as			

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

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	9720eu		
1500	1530		Sri Lanka, SLBC	6005as	11930as	15745as
1500	1530		UK, BBC World Service		6190af	11860af
			11940af	15400af	15420af	21470af
			21490af	21660af		
1500	1530		USA, Voice of America		6160va	9760va
			9795va 9825va	15460va		
1500	1557		Canada, Radio Canada Intl		5985as	9635as
			11730as	11975as		
1500	1557		China, China Radio Intl		7160eu	7405na
			9435eu 9525eu	9785as	13675na	13685af
			17630af			
1500	1557		China, China Radio Intl		13685af	17630af
1500	1557		Netherlands, Radio	9345as	12080as	15595as
1500	1600		Anguilla, Caribbean Beacon		11775am	
1500	1600		Australia, HCJB	15390as		
1500	1600		Australia, Radio	5995as	6080as	7240as
			9590as 11750pa			
1500	1600		Australia, Voice Intl	13685as		
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		9725va	11870va
			13750va			
1500	1600	a	Germany, Bible Voice Broadcasting		12005as	
1500	1600		Germany, Deutsche Welle		6140eu	
1500	1600		Guam, TWR/KTWR	12105as		
1500	1600		Japan, Radio	6190as	7200am	9505as
			11730va			
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	4405eu	9335eu	11710eu
			15245na			
1500	1600		Russia, FEBA	7340as		
1500	1600		Russia, Voice of	5945as	6205as	7260as
			7315as 7350as	7415as	9900as	11500as
			12025as			
1500	1600as		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		5975as	6195as
			7160as 9740as	12095eu	15190ca	15310as
			15485eu	15565eu	17790as	
1500	1600	mtwhf	UK, BBC World Service		17830af	
1500	1600	vl/ mtwhf	UK, Sudan Radio Service		15530va	
1500	1600		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
1500	1600		USA, KAIJ Dallas TX	13815na		
1500	1600		USA, KJES Vado NM	11715na		
1500	1600		USA, KTBN Salt Lake City UT		15590na	
1500	1600		USA, KWHR Naalehu HI		9930as	11565as
1500	1600		USA, Voice of America		7125va	9645va
			9685me	9855me	11780va	13735va
			13865af	15255me	17715af	17895af
1500	1600		USA, WBCQ Kennebunk ME		5105na	7415na
			9330na 17495na			
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		7465na	9985na
			13845na	15825na		
1500	1600		USA, WWRB Manchester TN		9320na	12170na
1500	1600		USA, WYFR Okeechobee FL		11615va	11855va
			15210va	17760va		
1500	1600		Zambia, Radio Christian Voice		9865af	
1530	1545		India, All India Radio	7255va	9820va	9910va
			11740va			
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		South Korea, Radio Korea Intl		9875eu	
1530	1600		UAE, AWR Africa	15225as		
1530	1600		UK, BBC World Service		6190af	11940af
			15400af	17830af	21470af	21660af
1530	1600		USA, Voice of America		6110va	9760va
			9795va 9825va	15460va		
1545	1600	t	Germany, Bible Voice Broadcasting		9460me	
1545	1600	s	Germany, Pan American BC		13820me	

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

1600	1615		Pakistan, Radio	9390va	11570va	11850va
			15725va			
1600	1627		Iran, Voice of the Islamic Rep		9610as	9940as
1600	1628	s	Hungary, Radio Budapest		6025eu	9580eu
1600	1628		Vietnam, Voice of	7220va	7280va	9550va
			11630va			
1600	1629	s	Germany, Universal Life		9495me	
1600	1630	s	Germany, Pan American BC		13820me	
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		6190af	11940af
			15400af	17830af	21470af	21660af
1600	1635		UAE, Emirates Radio	13630va	13675va	15395va
			21605va			
1600	1650		New Zealand, Radio NZ Intl		9870pa	
1600	1657		China, China Radio Intl		7255eu	9435eu
			9525af 9570af	11900af	17730na	
1600	1657		China, China Radio Intl		7255eu	9435eu
			9525eu 9570af	11900af	17730na	
1600	1659	as	Canada, Radio Canada Intl		9515am	13655am
			17820am			
1600	1659		Germany, Deutsche Welle		6170as	7225as
			11695as			
1600	1700		Anguilla, Caribbean Beacon		11775am	
1600	1700		Australia, HCJB	15390as		
1600	1700		Australia, Radio	5995as	6080as	7240as
			9475as 9710as			
1600	1700		Australia, Voice Intl	13685as		
1600	1700		Canada, CBC Northern Service		9625do	
1600	1700		Canada, CFRX Toronto ON		6070do	
1600	1700		Canada, CFVP Calgary AB		6030do	
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	7110af	7165af9560af

			9704af 11800af			
1600	1700		France, Radio France Intl		9730af	11615af
			15160af	15605af		
1600	1700	t	Germany, Bible Voice Broadcasting		9460me	
1600	1700		Jordan, Radio	11690na		
1600	1700		Malaysia, RTM	7295as		
1600	1700		North Korea, Voice of	3560me	9975af	11535af
1600	1700		Russia, Voice of	4940va	4965va	4975va
			6005me	6130eu	7260as	7290eu
			7415as 9470me			
1600	1700		South Korea, Radio Korea Intl		5975va	9870va
1600	1700		Taiwan, Radio Taiwan Intl		11550as	11815al
1600	1700		UK, BBC World Service		3915as	5975as
			6195as 7160as	9410eu	11750as	15190ca
			15310as	15485eu	15565eu	17790as
			17820eu			
1600	1700	mtwhf	UK, BBC World Service		17830af	
1600	1700	vl/ mtwhf	UK, Sudan Radio Service		15530va	
1600	1700		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
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
			9645va 9685me	9760va	9855me	13600va
			15240af	15255me	15445va	17640va
			17715af	17895af		
1600	1700		USA, WBCQ Kennebunk ME		5105na	7415na
			9330na 17495na			
1600	1700		USA, WBOH Newport NC		5920am	
1600	1700		USA, WEWN Birmingham AL		11530va	13615va
			15695va	15745va	17595va	
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 PA	9265eu		
1600	1700		USA, WRMI Miami FL	9955am	15725am	
1600	1700		USA, WTJC Newport NC		9370na	
1600	1700		USA, WWCR Nashville TN		9985na	12160na
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN		9320na	12170na
1600	1700		USA, WYFR Okeechobee FL		6085va	11830va
			13695va	17690va	18980va	21455va
1600	1700		Zambia, 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		11860af	15420af
			21490af			
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		6190af	11940af
			15400af	15420af	17830af	21470af
			21660af			
1635	1700	as	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 - 12PM EST / 11AM CST / 9AM PST

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		Azerbaijan, Voice of	6110me		
1700	1730	DRM/ a	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	11860af	15220af	15615af
			15660af			
1700	1730		UK, BBC World Service		6195eu	9410eu
			12095eu	15565eu	17820eu	
1700	1745	DRM	China, China Radio Intl		12080va	
1700	1745	h	Germany, Bible Voice Broadcasting		9460me	
1700	1745		UK, BBC World Service		3255af	6005af6190af
			9630af 15400af	15420af	17830af	21470af
1700	1750		New Zealand, Radio NZ Intl		9870pa	
1700	1755		South Africa, Channel Africa		15285af	
1700	1757		China, China Radio Intl		6100eu	7255eu
			9570af 11900af			
1700	1800		Anguilla, Caribbean Beacon		11775am	
1700	1800		Australia, HCJB	15390as		
1700	1800		Australia, Radio	5995as	6080as	7240as
			9475as 9710as	11880pa		
1700	1800		Australia, Voice Intl	13685as		
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		7189af	15184af
1700	1800	as	Germany, Bible Voice Broadcasting		9460me	
1700	1800		Germany, Overcomer Ministries		17550na	
1700	1800		Japan, Radio	9535am	11970eu	15355af
1700	1800		Malaysia, RTM	7295as		
1700	1800		Nigeria, Voice of	7255af	15120al	
1700	1800		Russia, Voice of	5910as	5945as	7415as
			9470me	9830me		
1700	1800		Swaziland, TWR	3200af		
1700	1800	mtwhf	UK, BBC World Service		17830af	
1700	1800	vl/ mtwhf	UK, Sudan Radio Service		11715va	
1700	1800		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
1700	1800		USA, KAIJ Dallas TX	13815na		
1700	1800		USA, KTBN Salt Lake City UT		15590na	
1700	1800		USA, KWHR Naalehu HI		9930as	
1700	1800		USA, Voice of America		13710af	15240af
			15455af			
1700	1800		USA, WBCQ Kennebunk ME		5105na	7415na
			9330na 17495na			
1700	1800		USA, WBOH Newport NC		5920am	
1700	1800		USA, WEWN Birmingham AL		11530va	13615va
			15695va	15745va	17595va	
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 PA	9265eu	15265eu	
1700	1800		USA, WRMI Miami FL	9955am	15725am	
1700	1800		USA, WTJC Newport NC		9370na	
1700	1800		USA, WWRB Manchester TN		9320na	12170na
1700	1800		USA, WYFR Okeechobee FL		13695va	17510va
			18980va	21455va	21680va	
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		3390af	7230af9685af
1730	1745	mtwhf	UK, United Nations Radio		7170af	9565me
			17810af			
1730	1800		Guam, AWR/KSDA	11560as		
1730	1800		Liberia, ELWA	4760do		
1730	1800		Philippines, Radio Pilipinas		11720as	15190as
			17720pa			
1730	1800		Slovakia, Slovak Radio		5915eu	6055eu
1730	1800		Swaziland, TWR	9500af		
1730	1800		UK, BBC World Service		5875eu	6015eu
			6195eu 7190eu	9410eu	12095eu	15565eu
			17820eu			
1735	1745	vl/th	Paraguay, Radio Nacional		9739sa	
1745	1800		Bangladesh, Bangla Betar		7185as	9550as
1745	1800		India, All India Radio	7410eu	9445af	9950eu
			11620eu	11935af	13605af	15075af
			15155af	17670af		
1745	1800		UK, BBC World Service		3255af	6190af
			15400af	15420af	17830af	21470af
1751	1800		New Zealand, Radio NZ Intl		11980pa	

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

1800	1810		Zanzibar, Voice of Tanzania		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	11635af	11715af
1800	1830		South Africa, AWR Africa		3215af	3345af
			11925af			
1800	1830		UK, BBC World Service		3255af	6190af
			15400af	15420af	17830af	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		5850af	7185af9770af
			11875af	15140af		
1800	1859		Poland, Radio Polonia	7265eu	7270eu	
1800	1900		Anguilla, Caribbean Beacon		11775am	
1800	1900	mtwhf	Argentina, RAE	9690eu	15345eu	
1800	1900		Australia, Radio	6080as	7240as	9475as

			9580as 9710as	11880pa		
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		7189af	15184af
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		
1800	1900		India, All India Radio 11620eu 15155af	7410eu 11935af 17670af	9445af 13605af	9950eu 15075af
1800	1900		Liberia, ELWA	4760do		
1800	1900		Malaysia, RTM	7295as		
1800	1900		Nigeria, Voice of	7255af	15120al	
1800	1900		Philippines, Radio Pilipinas 17720pa		11720as	15190as
1800	1900		Russia, Voice of 7415as 9830me	5910as 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 6350usb 13362usb	4319usb 7507usb	5446usb 10320usb	5765usb 12133usb
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 13710af		6035af 15240af	11975af 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		11530va 15745va	13615va 17595va
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, WWRB Manchester TN		9320na	12170na
1800	1900		USA, WYFR Okeechobee FL 15115eu		7240eu 17510eu	13695eu 17535eu 18980eu
1800	1900		Yemen, Rep of Yemen Radio		9780me	
1800	1900		Zambia, Radio Christian Voice		4965af	
1830	1845	mt	UK, BBC World Service 7105eu		6050eu	6130eu
1830	1900		Belgium, Radio Vlaanderen Intl		7490eu	5910eu
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 6190af 9630af 21470af	15400af	3255af 15420af	5975af6005af 17830af
1845	1900		Congo, RTV Congolaise		4765af	5985af
1851	1900		New Zealand, Radio NZ Intl		15265pa	

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

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		Philippines, Radio Pilipinas 17720pa		11720as	15190as
1900	1945	DRM	China, China Radio Intl		12080va	
1900	1945		India, All India Radio 11620eu 15155af	7410eu 11935af 17670af	9445af 13605af	9950eu 15075af
1900	1957		China, China Radio Intl 9585af		6100eu	7295af9440af
1900	1959		Germany, Deutsche Welle 13780af		6180af 17800af	11865af
1900	2000		Anguilla, Caribbean Beacon		11775am	
1900	2000		Australia, Radio	6080as	7240as	9500as
			9580as 9710as	11880pa		
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		7189af	15184af
1900	2000	as	Germany, Bible Voice Broadcasting 9470al		6015va	9460me
1900	2000	vl	Ghana, Ghana BC Corp		3366do	4915do
1900	2000	vl	Greece, Voice of	7430eu		
1900	2000		Liberia, ELWA	4760do		
1900	2000		Malaysia, RTM	7295as		
1900	2000		Namibia, Namibian BC Corp 6060af		3270af	3290af
1900	2000		Netherlands, Radio 17810af	7120af	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	7255af	15120al	
1900	2000		North Korea, Voice of	4405eu	13760eu	15245eu
1900	2000		Papua New Guinea, Catholic Radio		4960va	
1900	2000		Papua New Guinea, NBC		4890do	
1900	2000		Russia, Voice of 7335eu 7400eu	6175eu 11510af	6235eu	7290eu
1900	2000		Sierra Leone, Radio UNAMSIL		6137af	
1900	2000	vl	Sierra Leone, SLBS	3316do		
1900	2000	vl	Solomon Islands, SIBC		5020do	9545do
1900	2000		South Africa, Channel Africa		3345af	
1900	2000	m	South Africa, SW Radio League		3215af	
1900	2000		South 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 17830af	9630af	3255af 12095af	5975af 15400af
1900	2000		USA, AFRTS 6350usb 13362usb	4319usb 7507usb	5446usb 10320usb	5765usb 12133usb
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 9785va 11975af 15240af	12015va 15580af	4950af 13640va	6035af 13710af 17895af
1900	2000		USA, WBCQ Kennebunk ME 9330na 17495na		5105na	7415na
1900	2000		USA, WBOH Newport NC		5920am	
1900	2000		USA, WEWN Birmingham AL 15695va		11530va 15745va	13615va 17595va
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, WYFR Okeechobee FL 6085va 13695va		3230va 15565va	6020va 17510va 18980va
1900	2000		Zambia, Radio Christian Voice		4965af	
1900	2000	vl	Zimbabwe, ZBC Corp	5975do		
1915	1925		Rwanda, Radio	6005do		
1915	1930		UK, BBC World Service		15105af	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 - 3PM EST / 2PM CST / 12PM PST

2000	2015	fs	Germany, Bible Voice Broadcasting		7220af	9470me
2000	2020		Turkey, Voice of	6055eu		
2000	2027		Iran, Voice of the Islamic Rep 9855af 11695af		6010af	7320eu
2000	2028		Hungary, Radio Budapest		3975eu	6025eu
2000	2030	vl	Libya, Voice of Africa	11635af	11715af	

2000	2030		Mongolia, Voice of	9720eu		
2000	2030		Papua New Guinea, Catholic Radio	4960va		
2000	2030		Swaziland, TWR	3200af		
2000	2030		USA, Voice of America	4940af	6035af	
			11975af	13710af	15240af	15580af
2000	2030		Vatican City, Vatican Radio	7365af	9755af	
			11625af			
2000	2050		New Zealand, Radio NZ Intl	15265pa		
2000	2057	as	Netherlands, Radio	15315na	17725na	
2000	2059		Canada, Radio Canada Intl	5850eu	7235eu	
			9710eu 11725eu			
2000	2059		Germany, Deutsche Welle	12025af	13780af	
			15205af	15410af		
2000	2059	mtwhf	Spain, Radio Exterior Espana	9595af	9680eu	
2000	2100		Anguilla, Caribbean Beacon	11775am		
2000	2100		Australia 9500as	9580as	11650as	11880pa
			12080pa			
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	7240as	
2000	2100		Australia, Voice Intl	11685as		
2000	2100		Canada, CBC Northern Service	9625do		
2000	2100		Canada, CFRX Toronto ON	6070do		
2000	2100		Canada, CFVP Calgary AB	6030do		
2000	2100		Canada, CKZN St John's NF	6160do		
2000	2100		Canada, CKZU Vancouver BC	6160do		
2000	2100		China, China Radio Intl	6100eu	7190eu	
			7295af 9440af	9600eu	9855eu	
2000	2100	DRM	China, China Radio Intl	12080va		
2000	2100		Costa Rica, University Network	13750va		
2000	2100		Eqt Guinea, Radio Africa	7189af	15184af	
2000	2100	vl	Ghana, Ghana BC Corp	3366do	4915do	
2000	2100		Indonesia, Voice of	9525as	11785pa	15150al
2000	2100	vl	Italy, IRRS 5775eu			
2000	2100		Liberia, ELWA	4760do		
2000	2100		Malaysia, RTM	7295as		
2000	2100		Namibia, Namibian BC Corp	3270af	3290af6060af	
2000	2100		Nigeria, Radio/Ibadan	6050do		
2000	2100		Nigeria, Radio/Kaduna	4770do	6090do	
2000	2100		Nigeria, Radio/Lagos	3326do	4990do	
2000	2100		Nigeria, Voice of	7255af	15120al	
2000	2100		Papua 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, SLBS	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	7507usb	10320usb	12133usb
			13362usb			
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 Newport NC	9370na		
2000	2100		USA, WWRB Manchester TN	9320na	12170na	
2000	2100		USA, WYFR Okeechobee FL	3230va	5820va	
			6020va 7360va	7580va	15115va	15195va
			17510va	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		China, 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		Belgium, Radio Vlaanderen Intl	7490eu		
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	11715pa		
2050	2100		Vatican City, Vatican Radio	4005eu	5885eu	
			7250eu			
2051	2100		New Zealand, Radio NZ Intl	17675pa		

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

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	11760va	
2100	2130	vl	Italy, IRRS 5775eu			
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/Ibadan	6050do		
2100	2157		China, China Radio Intl	7190eu	9600eu	
			9855eu 11640af	13630af		
2100	2157		Czech Rep, Radio Prague Intl	5930va	9430va	
2100	2157	DRM	Netherlands, Radio	15150eu		
2100	2159		Canada, Radio Canada Intl	5890eu	9770eu	
2100	2159		Germany, Deutsche Welle	9615af	13780af	
			15410af			
2100	2200		Anguilla, 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		Canada, CFVP Calgary AB	6030do		
2100	2200		Canada, CKZN St John's NF	6160do		
2100	2200		Canada, CKZU Vancouver BC	6160do		
2100	2200		Costa Rica, University Network	13750va		
2100	2200		Egypt, Radio Cairo	15375af		
2100	2200		Eqt Guinea, Radio Africa	7189af	15184af	
2100	2200	vl	Ghana, Ghana BC Corp	3366do	4915do	
2100	2200		Guyana, Voice of	3290do	5950do	
2100	2200		India, All India Radio	7410eu	9445eu	9910eu
			9950eu 11620pa	11715pa		
2100	2200		Japan, Radio	6035pa	6055eu	6180eu
			11855af	17825pa	21670pa	
2100	2200		Liberia, ELWA	4760do		
2100	2200		Malaysia, RTM	7295as		
2100	2200		Namibia, Namibian BC Corp	3270af	3290af6060af	
2100	2200		New Zealand, Radio NZ Intl	17675pa		
2100	2200		Nigeria, Radio/Kaduna	4770do	6090do	
2100	2200		Nigeria, Radio/Lagos	3326do	4990do	
2100	2200		North Korea, Voice of	4405eu	13760eu	15245eu
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	6190af
			6195va 9410eu	9605af	12095ca	15400af
2100	2200		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
2100	2200		USA, KAIJ Dallas TX	13815na		
2100	2200		USA, KTBN Salt Lake City UT	15590na		
2100	2200		USA, Voice of America	6035af	11835as	
			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, WWRB Manchester TN	9320na	12170na	
2100	2200		USA, WYFR Okeechobee FL	5820va	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	9900eu		
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 Tennant Creek	4910do		
2130	2200		Australia, Radio	9660as	11650as	12080as

			13630pa	15515pa		
2130	2200		Guam, AWR/KSDA	11980as	12010as	
2130	2200	vl/f	Italy, IRRS 5775eu			
2130	2200		Turkey, Voice of	9525as		
2130	2200	f	UK, Wales Radio Intl	7150eu	7325eu	
2130	2200		Uzbekistan, Radio Tashkent		5025eu	7185eu
			11905eu			

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

2200	2205		Syria, Radio Damascus		12085eu	13610eu
2200	2220		Turkey, Voice of	9525as		
2200	2228		Hungary, Radio Budapest		6025eu	12010af
2200	2230		Belgium, Radio Vlaanderen Intl		11730na	
2200	2230		India, All India Radio	7410eu	9445eu	9910eu
			9950eu 11620pa	11715pa		
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	9900eu		
2200	2257		China, China Radio Intl		7170eu	
2200	2257	DRM	Netherlands, Radio	15525na		
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		7189af	15184af
2200	2300	vl	Ghana, Ghana BC Corp		3366do	4915do
2200	2300		Guyana, Voice of	3290do		
2200	2300		Malaysia, RTM	7295as		
2200	2300		Namibia, Namibian BC Corp		3270af	3290af6060af
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		5840eu	
2200	2300		USA, AFRTS	4319usb	5446usb	5765usb
			6350usb	7507usb	10320usb	12133usb
			13362usb			
2200	2300		USA, KAIJ Dallas TX	13815na		
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	
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		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		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 - 6PM EST / 5PM CST / 3PM PST

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	11725na		
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	3290af6060af
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, Mediacorp 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	7507usb	10320usb	12133usb
			13362usb			
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	7275va		
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		7250as	9815as
			12035as			
2305	2315	vl	Croatia, Croatian Radio		7285sa	
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	

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Denver Area Base Upgrades Radios

Land Mobile Radio communications have greatly improved at Buckley AFB in Colorado, according to an article by Scott Connolley in the U.S. Air Force *Intercom* magazine. *Intercom* is the Journal of the Air Force C4 community. During the spring and summer of 2003 the base transitioned from their old analog simplex two-way radio system to a narrowband wide-area digital trunk encrypted radio network (see Table One below).

According to the *Intercom* article, "When the base Personal Wireless Communications office stood up three years ago, the team knew the Land Mobile Radio system was in need of replacement. Half of the Security Forces' radios were broken beyond repair. Some critical users such as the base fire department and the air traffic control tower were operating with radios more than 15 years old. While waiting for replacement funding, the LMR shop managed to satisfy most requirements with radios other bases were turning in. They supplied the base with enough operational radios for emergency personnel. Additionally, antennas were relocated to improve the poor coverage.

"Since the transition, everything has changed. The new government-owned system is a Motorola Smart Zone system, which allows Buckley to control and manage its own radios using a remote terminal. It encompasses 18 repeaters geographically separated between four sites. Two additional repeaters are used for the over-the-air-rekey feature, which allows encryption keys to be updated without physically having to touch each radio. The fire department and security forces now have the capability to patch radio nets together with the local city emergency response teams. Radio users now enjoy other features such as: private call, encryption and an emergency duress alarm. Buckley has tripled the number of radio nets without tripling the amount of radio frequencies.

"This was all made possible because of the new trunk radio system, which efficiently uses a small number of frequencies to provide service to a large number of radios. The system does this through a control channel at each repeater site that acts like a traffic cop and assigns permission to talk as soon as a repeater becomes available.

"During increased demands, the users may get a busy tone, but within seconds open-air time is allocated and the radio will allow the user to make the calls.

"Currently, four federal agencies share the radio system, with the Department of Homeland Security being the primary manager. Sharing a radio system with other federal agencies is highly recommended by the National Telecommunications Administration, and in doing so saved Buckley more than US$2.3 million in equipment costs.

"Handheld radio users can communicate clearly within a 2,200 square mile radius around the Denver area. As other federal agencies attach to the system, the coverage could expand from the Wyoming border to Pueblo, about 40 miles south of Colorado Springs."

If you are in the Denver area and would like to monitor this system, Table One has the particulars we have on this system as of press time. Updates from area monitors would be appreciated.

Table One: Buckley AFB Trunk System

System: Motorola Type II Smartnet (APCO-25 Exclusive)
Motorola System ID: 8d34
Base Frequency: 406.000, Spacing: 12.5 kHz, Offset: 380
Connect Tone: 105.88 Hz
Frequencies:
Site 1 (Primary): 406.5000 406.9750 408.0750 409.4000 410.5500
Site-2: 406.7750 407.1250 407.8125 408.4250 408.7750
Site-3: 406.9875 408.2750 409.0250 409.9250 410.4250
Site-4: 407.0000 408.4500 410.6500

Talkgroups:

4400	Escorts
4416	Unknown user/Conducting Status checks
4448	Training
7584	Base Security Police
7808	Primary Fire channel
7888	Buckley Ground (148.2125)/Base Transit Line Staff
7952	Unknown user/usage
8416	140th Aircraft Maintenance
11744	Unknown user/usage
12080	Unknown user/usage
12176	Unknown user/usage

Thanks to "The Researcher" for passing along the background information on the Buckley trunk system.

❖ Robins AFB TRS has new frequencies

Regular *Milcom* reporter Mac McCormick down Savannah, Georgia, way traveled over to Robins AFB and discovered that the old frequencies for the base trunk system have changed. It would appear, based on Mac's report, that the base has moved to a newer narrowband trunk radio system. Here are the specifics that Mac found during his brief visit to the base:

System: Motorola Type II Smartnet Analog
Motorola System ID: 542e
Base Frequency: 406.000 MHz, Spacing: 25-kHz, Offset: 380
Control Tone: 90-Hz
Frequencies: 406.7625 407.1625 407.3625 407.9625 409.1625 409.5625

Talkgroups

2544	Unknown user/usage
3248	Unknown user/usage
3280	Unknown user/usage
3376	Unknown user/usage
3600	Unknown user/usage
3696	Unknown user/usage
3728	Unknown user/usage
3760	Unknown user/usage
3856	Unknown user/usage
4880	Unknown user/usage
4944	Unknown user/usage
6448	Security Control
6480	Unknown user/usage
8016	116 ACW
8080	116 ACW
8208	116 ACW
8368	116 ACW
8400	116 ACW
8432	116 ACW
8464	116 ACW
8528	116 ACW
8560	116 ACW
8592	116 ACW
8624	116 ACW
8656	116 ACW
8688	116 ACW
8720	116 ACW
8752	116 ACW
8784	116 ACW
8816	116 ACW
8880	116 ACW
11248	Unknown user/usage
11280	Unknown user/usage
13680	Unknown user/usage
14448	Unknown user/usage
16112	Tanker Control
64736	Unknown user/usage

Thanks to Mac for the report, and we will be looking for updates the next time you are in the area.

❖ Bradley Going Digital

A source has told *Milcom* that Bradley Air National Guard base near Windsor Locks, Connecticut, is slowly changing their various radio nets to APCO-25 digital. Most of the base radio nets are in the 140-143/148-150 MHz frequency ranges.

Our source also indicated that the security function is using Motorola XTS 3000 portable with encryption capability, although apparently they aren't using the encryption.

Here is a list of land mobile frequencies for

this base courtesy of the *Grove Military Frequency Directory*, 2nd edition:

138.125	Security Department (APCO-25)
148.075	POL Trucks Dispatch Net
148.175	Commanders Net, Repeater out (in 150.125)
148.525	Transportation Net
149.225	Command Post
149.300	Munitions Net
150.125	Commanders Net, Repeater in (out 148.175)
150.200	Maintenance
150.250	Maintenance
150.300	Civil Engineers
150.350	Disaster Preparedness
163.4875	Security Net
173.5875	Fire/Crash Net
407.375	Intelligence Net, Repeater in (out 413.125)
413.000	Miscellaneous Net
413.125	Intelligence Net, Repeater out (in 407.375)
413.450	Aircrew Alerting

Updates from the field for this base, especially any APOC-25 changeovers, would be appreciated.

❖ Rhode Island Air National Guard Profile

An anonymous contributor has forwarded the following list of Rhode Island Air National Guard frequencies used at **Quonset State Airport**:

138.400	Maintenance <Channel 1>
139.375	Supply <Channel 3>
139.750	Maintenance Expediters (AGE) <Channel 2>
141.625	POL Trucks Dispatch Net <Channel 4>
148.125	Aerial Port Squadron (Base Ops/Terminal Services) <Channel 5>
148.225	Base Operations/Ramp Control <Channel 6>
148.500	Medical Net <Channel 7>
148.550	Commanders Net <Channel 8>
149.175	Civil Engineers <Channel 9>
149.250	Security Police <Channel 10>
149.275	Motor Pool <Channel 11>
149.475	Fire/Crash <Channel 12>
141.800	Airshow security/Common repeater output (input 143.800) 151.4 Hz PL tone <Channel 13> Note: this is listed as "SPS Repeater"

❖ 104th Fighter Wing Presets

Our regular reporter "The Researcher," mentioned above, has also passed along the presets from an A-10 aircraft frequency card belonging to the 104th Fighter Wing based at Barnes Municipal Airport in Massachusetts. Here is that extensive listing.

VHF FM Channels

1	139.900
2	141.675
3	41.450
4	36.350
5	36.825
6	41.950 "FOL"
7	34.550 "OPS"
8	38.650

UHF Channels

1	303.000 Hawk Ops
2	289.400 Barnes Municipal Ground Control
3	251.100 Barnes Municipal Tower
4	325.800 Bradley Approach Control
5	379.100 Boston Center (Cummington RCAG-LVH)
6	257.850 Boston Center (Lake George RCAG-LVH)
7	307.200 Albany Approach Control
8	255.400 FSS
9	257.600 Wheeler-Sack Approach Control
10	267.800 Range 35 (Wheeler-Sack AAF-LVH)
11	290.250 Wheeler-Sack AAF Tower
12	338.200 Boston Center (Gardner RCAG-LVH)
13	381.400 Boston Center (Gardner/Lebanon RCAG-LVH)
14	282.200 Boston Center (Berlin RCAG - AR-204/212 ARCP-LVH)
15	343.800 Boston Center (Shelton RCAG-LVH)
16	317.700 Boston Center (Shelton RCAG-LVH)
17	282.300 New York Center (Matawan RCAG-LVH)
18	381.600 Boston Center (Barnstable RCAG-LVH)
19	286.200 Warren Grove (Range Control/ Flight Safety-LVH)
399.800 TOD	

VHF-AM Channels

1	138.050 Ops/MOCC (Viper Ops-LVH)
2	138.250 Inter-Flight
3	(open none listed)
4	127.100 Barnes Municipal ATIS
5	121.700 Barnes Municipal Ground Control
6	118.900 Barnes Municipal Tower
7	134.350 FOL
8	114.000 Westover Air Reserve Base/Metropolitan Airport ATIS
9	118.350 Westover Air Reserve Base/Metropolitan Airport Ground Control
10	134.850 Westover Air Reserve Base/Metropolitan Airport Tower
11	141.900 Bradley International Airport Ops (103FW/118FS Ops-Shark Ops-LVH)
12	118.150 Bradley International Airport ATIS
13	121.900 Bradley International Airport Ground Control
14	120.300 Bradley International Airport Tower
15	132.050 Pease International Tradeport Airport ATIS
16	120.950 Pease International Tradeport Airport Ground Control
17	128.400 Pease International Tradeport Airport Tower

❖ Milcom Frequency Changes

MT Milcom regular Jack NeSmith has survived all the Florida hurricanes from last year and checks in with the following UHF Milair frequency changes:

Beale AFB, CA (KBAB)
256.025 940th Command Post [Callsign Tahoe Control] (ex-351.200)

Biggs AAF (Fort Bliss), TX (KBIF)
342.250 Tower (ex-305.200)

Ellsworth AFB, SD (KRCA)
284.000 RAPCON Arrival (ex-393.000)
289.400 Approach Control (ex-396.000)
375.775 Metro (ex-375.200)

Kaneohe Marine Corps Base, HI (PHNG)
294.700 Clearance Delivery (ex-310.800)

Little Rock AFB, AR (KLRF)
269.075 Tower (ex-348.400)

New River MCAS, NC (KNCA)
239.025 Clearance Delivery (ex-383.550)
244.775 Metro This is a *Milcom* column spectrum hole (ex-250.600)
285.325 ATIS: This is a *Milcom* column spectrum hole (ex-265.200)
323.250 Tower-Secondary (ex-340.200)

North Auxiliary Field, SC (KXNO)
235.775 Tower: This is a *Milcom* column spectrum hole (ex-341.500)

And that does it for this month. I hope everyone had a safe and happy holiday season and that the new year will bring you a room full of *Milcom* intercepts. 73 and good hunting.

Table Two: Where to Look for Activity

I still get snail and email from readers asking where they need to look for military activity and what mode they need to be in. Here is a quick guide to aid you in finding military communications in the VHF/UHF spectrum.

Military VHF/UHF Spectrum Guide

Frequency	Comm Type	Chan Spacing	Mode
29.90-30.55	Land Mobile	20/25 kHz	NFM mode
32.00-32.99	Land Mobile	20/25 kHz	NFM mode
34.00-34.99	Land Mobile	20/25 kHz	NFM mode
36.00-36.99	Land Mobile	20/25 kHz	NFM mode
38.00-38.99	Land Mobile	20/25 kHz	NFM mode
40.00-41.99	Land Mobile	20/25 kHz	NFM mode
46.60-47.00	Land Mobile	20/25 kHz	NFM mode
49.61-49.99	Land Mobile	20/25 kHz	NFM mode
Note: There are also AM mode channels in the VHF low band (30-50 MHz)			
50.00-87.90	Land Mobile	Various (shared with other services)	Digital Modes
118.0-137.0	Civilian aircraft band (military activity peppered throughout this spectrum)		
		25 kHz	AM Mode
138.0-144.0	Land Mobile	12.5 kHz	NFM mode
	Aeronautical	25.0 kHz	AM Mode
148.0-150.8	Land Mobile	12.5 kHz	NFM mode
	Aeronautical	25.0 kHz	AM Mode
162.0-174.0	Land Mobile	12.5 kHz	NFM mode
225.0-400.0	Mil aircraft band	25.0 kHz	AM Mode
240.0-270.0	Mil satellite subband	Various	NFM/Digital modes
380.0-399.9	Land Mobile	12.5 kHz	NFM mode
406.0-420.0	Land Mobile	12.5 kHz	NFM mode

FED FILES

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A New Year For Federal Communications

Happy New Year from all of us at *Monitoring Times* and the *Fed Files*! This begins my second year as the federal frequency guru for *MT* and I would like to thank all of the readers who have responded and contributed to the *Fed Files* columns. Your input to this resource is very important and always welcome. In fact, it seems that quite a few *MT* readers find this column of interest, so the editors have graciously allowed us to get together every other month from now on. Thanks for your support and keep your letters and e-mails coming!

❖ Fed Files Road Trip!

Border Patrol Update

In September, we talked about formation of the Department of Homeland Security and how some federal agencies' communications plans are changing.

One agency that has been absorbed into the Customs and Border Security Directorate of the DHS is the US Border Patrol. Formerly part of the Immigration and Naturalization Service of the Justice Department, the Border Patrol now forms the front line of defense of the US borders, along with the Customs Service.

Even before the formation of DHS, the Border Patrol was in the process of upgrading their radio communications systems. These upgrades included moving towards digital radios and consolidating communications centers. The program is called the Encrypted Voice Radio Project, or EVRP. In at least one area of the country these upgrades have taken changes to the extreme.

Listeners in the San Diego, California, area have reported for some time that the "normal" groups of VHF Border Patrol frequencies have been virtually abandoned and replaced with dozens of new digital VHF frequencies. Some reports have claimed to log upwards of over 100 different encrypted frequencies that seem to be part of this new digital network.

Photo by James Tourtellotte

I have been able to make several trips to the San Diego area to check this new network out and recently traveled along I-8 from San Diego to Tucson, Arizona. After loading up my rental car with computers, scanners and a number of antennas on the trunk lid, I started hearing dozens of new digital frequencies. This new radio network seems to be in use along the southern California border area only, with Border Patrol communications in Arizona appearing to revert back to mostly familiar, analog frequencies once you cross the state line.

Here is some of what I was able to log on my travels. Note that all of the frequencies using P-25 digital mode were using encryption, except where noted:

San Diego County, CA
162.8500 MHz
163.7250 MHz
166.6375 MHz
166.9125 MHz
167.1500 MHz
167.3000 MHz – Busy, most traffic unencrypted
167.3750 MHz
167.4500 MHz
167.5250 MHz
167.5750 MHz
167.7250 MHz
167.7750 MHz – Busy
168.5000 MHz – Busy
168.8500 MHz – Busy
170.3750 MHz
170.7625 MHz
170.8375 MHz – Busy
171.5375 MHz – Busy
172.0250 MHz
172.5125 MHz – Busy
172.9875 MHz
173.1625 MHz – Busy
173.4500 MHz
173.6500 MHz – Busy
173.9750 MHz – Busy

Imperial County, CA
162.6125 MHz
162.9250 MHz
165.5875 MHz
167.2625 MHz
167.3000 MHz – Busy, most traffic unencrypted
167.4500 MHz – Busy
167.6500 MHz
167.7250 MHz
167.7750 MHz – Busy
168.9250 MHz – Busy
170.6500 MHz
170.7625 MHz
170.8375 MHz
172.9875 MHz
173.1625 MHz – Busy
173.6500 MHz – Busy
173.9750 MHz

Once I entered Arizona, things settled back down to "normal" frequencies and modes of operations:
163.6250 MHz
163.6750 MHz
163.7000 MHz
163.7250 MHz – Border Patrol LEMMON repeater (Mt. Lemmon, Tucson area)
163.7750 MHz
165.2375 MHz – Customs NET 1
168.8250 MHz
168.8750 MHz
282.4250 MHz (AM) - Custom Air Operations

Border Patrol communications along the Northwestern US border with Canada still continue to be heard on the usual 163 MHz channels, with some digital encryption heard. If you start noticing a large number of new digital frequencies becoming active in your area, you may be hearing part of the EVRP!

❖ Federal Agency Updates

Transportation Security Administration

I have received some requests from readers wondering what frequencies the Transportation Security Administration (TSA) uses at airports these days.

The TSA was originally formed as part of the Department of Transportation, but is now under the Department of Homeland Security. When the TSA was first formed in 2002, they were using whatever was handy for radios until their federal contract for communications equipment was fulfilled. In their early days, I monitored the TSA on everything from local airport police frequencies to UHF business and even Family Radio Service channels.

The TSA is now using radios with their own frequencies in the APCO P-25 digital mode. So far I have not encountered any encryption, but the federal contract for the radios calls for encryption capabilities. Here is the nationwide channel plan for the TSA radios:

F1 - 172.1500, S/D S1 - simplex, digital
F2 - 172.1500, S/D S1 - simplex, digital
F3 - 172.1500, S/D S1 - simplex, digital
F4 - 172.1500, S/D S1 - simplex, digital
F5 - 172.9000, S/D S2 - simplex, digital
F6 - 169.3000, S/D S3 - simplex, digital
F7 - 169.3000 TX / 172.9000 RX - repeater, digital
F8 - 169.3000 TX / 172.9000 RX - repeater, digital
F9 - 169.3000 TX / 172.9000 RX - repeater, digital
F10 - 172.9000, S/D S2 - simplex, digital
F11 - 172.9000, S/D S2 - simplex, digital
F12 - 166.4625, 103.5 PL - simplex, analog

(DHS COMMON)
F13 - 166.4625, S/D - simplex, digital (DHS COMMON)

You will notice some channels in the radios have the same frequencies listed. They are set up with the same frequencies, but different NAC's or Network Access Codes. These are the digital equivalent of the CTCSS or DCS codes used in analog radios. This means that radios can only communicate with each other if they are programmed with the same NAC. There are no scanners available yet that can utilize the NAC information, but maybe the next generation of digital scanners will have that feature.

TSA radio traffic can vary from airport to airport, sometimes very interesting and other times almost non-existent. The TSA communications I have monitored at the San Diego airport are very professional, with almost military style radio procedure. Other airports are very informal, with only small amounts of radio traffic.

While the above list represents the standard frequency assignments for the TSA, there have been some listener reports of operations on other frequencies. Even after most airports have switched to the new band plan, there are a few that remain a mystery. One of them is DFW International Airport. I have never heard the TSA using their VHF frequencies at DFW. I spotted a few TSA employees with what appeared to be UHF Motorola VISOR radios, but so far their frequency has eluded me. Have you heard the TSA using something other than is what's listed? If so, drop us a line at the *Fed Files* and let us know.

Speaking of TSA radios, there was a recent story on the KUSA-TV news website about four TSA radios going missing from the Denver International Airport inventory and one even showed up on e-Bay! It turns out that one radio was turned in to the DIA lost and found department, but it remained there until it was sold at a Denver County surplus property auction. If you would like to read more, you can take a look at the KUSA-TV website at **http://www.9news.com** and do a search for TSA.

Federal Protective Service

The Federal Protective Service, once part of the General Services Administration (GSA), is now fully integrated into the Department of Homeland Security as part of the Immigration and Customs Enforcement division (ICE). The FPS is in charge of federal building and facility security in many areas of the US. They are dispatched from at least two regional dispatch centers, one in Denver and the other in Philadelphia. There may be others, but these are the only two I've been able to identify.

The FPS is also in the process of switching to an all-digital P-25 radio network. The FPS frequencies in my area of the Pacific Northwest went to P-25 digital almost a year ago, but many cities I visit in my travels still operate with analog radio equipment. Some have switched to new digital radios, and some are even operating with encryption.

The most popular FPS frequencies seem to be 415.2000 MHz and 417.2000 MHz, but some areas may use others. Here's a list of possible FPS frequencies:

406.4125 MHz
417.2000 MHz
407.1750 MHz
417.2500 MHz
407.2125 MHz
417.4250 MHz
407.3625 MHz
417.6500 MHz
408.5375 MHz
419.1500 MHz
415.1750 MHz
419.1750 MHz
415.2000 MHz
419.6500 MHz
416.0250 MHz
419.8750 MHz

If you browse the Immigration and Customs Enforcement website, **http://www.ice.gov/graphics/fps/index.htm** mentions that the FPS is now involved with security planning and support of large public events, specifically the Kentucky Derby and Presidential Inaugurals. I was at the running of the Kentucky Derby in 2004 and did catch some interesting federal radio traffic:

163.0500 MHz, 023 dpl - Mystery frequency. Clear voice traffic. I never figured out who it was, but definitely at the racetrack.
163.8375 MHz - DES encryption
165.2875 MHz - P25 digital mode, ATF Command Post on site
167.5375 MHz - DES encryption
167.5625 MHz, 167.9 pl - Clear repeater that was tied into the Louisville Police repeater on 453.575 MHz. Used for coordination of federal and local police.
168.6500 MHz - DES encryption

While I couldn't confirm exactly who was using the encrypted radio channels, the signals appeared to be Derby related.

ATF

The Bureau of Alcohol, Tobacco and Firearms (ATF) has undergone some changes after the formation of DHS, although the agency did not become part of Homeland Security. The official web site of the ATF, **http://www.atf.gov**, explains that the agency was split into two parts, with the law enforcement functions of the agency now under the Justice Department and the tax and trade functions remaining with the Treasury Department.

How will this affect the ATF communications requirements? We'll have to keep listening and see. For the time being, it looks like the national primary ATF frequency of 165.2875 MHz continues to be used, with some areas now using P-25 digital radios. Here's a gathering of possible BATF radio frequencies:

165.2875 MHz – Nationwide Primary
165.5125 MHz
166.4625 MHz - DHS Common
166.5375 MHz - Input to 165.2875 repeaters
166.8750 MHz
168.0000 MHz
169.5500 MHz
170.1000 MHz
170.2000 MHz
173.8875 MHz
407.1500 MHz
409.1500 MHz
415.2500 MHz
418.2500 MHz
419.0500 MHz
419.2500 MHz

In my area, 165.2875 MHz is busy nearly every morning with units checking in with the office, but most of the units are using P-25 digital with encryption. However, analog communications still show up on the ATF channels. Since the ATF is now part of the Justice Department, it's likely that they will be users of some of the new Justice Department systems that are starting to come on line – read on!

Justice Trunked System

The Justice Department's regional digital trunked system in Washington State is continuing to take shape. I reported in the last *Fed Files* that I was able to receive some traffic on the P-25 trunked sites near my home base in Oregon. There have been more new repeater sites activated and technicians have been heard working on getting the system operational.

I took a couple of *Fed Files* road trips up through Washington State and I was able to find more active frequencies for this system, but since the system is still being built, finding transmitter sites and frequencies can be slow going. Special thanks go to some of the members of the Northwest Intercepts website at **http://www.northwestradio.com** for helping track the progress of this system. Here is what is active so far:

167.0000 MHz – Bellingham
167.1625 MHz – Tacoma
167.2125 MHz – Tacoma
167.2625 MHz – Baw Faw Peak
167.2875 MHz – Tacoma
167.3125 MHz – Blaine
167.3625 MHz – Unknown location
167.4375 MHz – Bellingham
167.4625 MHz – Blaine and Vancouver
167.6125 MHz – Olympia
167.6375 MHz – Bellingham
167.7375 MHz – Baw Faw Peak
168.8250 MHz – Bellingham and Vancouver
168.8500 MHz – Tacoma
168.8750 MHz – Unknown location
168.8875 MHz – Kalama
169.4125 MHz – Tacoma and Vancouver
170.6750 MHz – Kalama
170.7875 MHz – Unknown location
170.9375 MHz – Unknown location

The Justice Department now has a web site with news updates about the progress of this system. The web site is **http://www.usdoj.gov/jmd/iwn/index.html**. This site gives details of the project and information on contractors. The official information indicates that it will be a 15-site trunked system when completed. This is a pilot project for the Justice Department, with more systems like this planned all over the country. Keep watching the federal VHF band for trunking activity in your area, and let us know what you find!

❖ Back in Two Months!

That's all for this installment of the *Fed Files*, but we will be getting together again in the March issue of *Monitoring Times*. Next time we'll talk about some other radio frequency bands that we need to search for federal activity. See you then!

Ron Walsh VE3GO
ronwalsh@monitoringtimes.com

Cold Weather, Hot DX

VE3GO, here is November Eight Fitzgerald, N8F. You are 5 and 9 at the Whitefish Point Lighthouse. The handle is Ralph and the home call is KW8G.

The N8F special event station commemorates the tragic loss of the *Edmund Fitzgerald*, on Nov. 10, 1975. She suddenly disappeared from radar screens during a hurricane force gale on Lake Superior. She was just 15 miles from the shelter of Whitefish Point. Ralph, KW8G, his daughter Laura, and others operate every year. I hope to be there and operate with them in the future.

I took a picture of this vessel in 1958 when, as a 13year old passenger, I made a trip on the freighter *Golden Hind*, along with my parents. This was also where I first got to listen to marine radio.

❖ Great Lakes Fall VHF Traffic

I am reminded that this column will be read in January when the cold has set in to my part of the world and the short days (long nights) are more favorable to HF listening. The Seaway will be shut down, the local Coast Guard Search and Rescue base will be closed, the yachts will all be hauled out for the winter, the harbor will be frozen and the VHF traffic will be at a bare minimum.

We have already had our first snowfall here and several gale warnings. The gales of November are famous on the lakes and hurricane force winds are not uncommon. There is a meeting of cold Arctic air and warm air from the Gulf of Mexico that produces cyclonic conditions right over the Great Lakes.

The VHF radio here is very busy with traffic. Channels 11, 12, 13 and 14 are busy with vessel traffic information as the lakers try to get in end of season cargoes and the salt-water vessels scurry to avoid being caught in the lakes by freeze-up. We will soon have daily bulletins giving the water temperature, ice conditions and number of vessels above certain calling-in points. The race for the ocean will soon begin.

In the Sault Ste. Marie area, monitor channels l2 and 16. These should be active along with the ship to ship channels when the icebreakers are needed for the Dec. and Jan passages of the locks. You might want to make a recording of the UCSG icebreaker *Makinaw,* as this is her last season to operate. The lockmaster is on channel 14 and water levels are supposed to be broadcast on channel 85 every two minutes.

In the Niagara area (Welland Canal), monitor channels 11 and 14. In the Lake Ontario area, channel 11, 12 and 13 can be monitored. Channel 13 is always a good one, as commercial vessels are required to monitor it. Ship to ship channels 6, 8 and 10 are usually active as well. Channel 16 is always active, and the Canadian channels of 83B and 21B, along with the USCG channel of 21A, are the source of notices, weather etc.

❖ Modern Marine Communications

I just returned from a Simulated Electronic Navigation course at Georgian College in Owen Sound, Ontario. This was necessary for continued proficiency certification of my Master Minor Waters Certificate. Capt. Jim Lowe put eight people from the local tour boats through three days of training and radar simulations. We were in simulators that replicated the bridge of a freighter. We had all the equipment, such as radio, radar, GPS charts, etc., and were placed in a series of navigation situations. This marine college also teaches marine officers and engineers through a cadet program.

They also teach the new Restricted Operator's Certificate - Marine Commercial (ROC-MC), which is the radio license required for Canadian commercial marine officers on the great lakes and coastal areas. We got to use some of this equipment, and I looked at the simulated equipment used for the ROC course.

Simulated radio equipment for radio course. Clockwise L to R Dummy EPIRB, Waterproof VHF portable for survival craft, SART, Navtex receiver

The course covers the usual VHF/HF radio information and procedures. However, it also covers the new GMDSS (Global Marine Distress and Safety System) material which all officers have to know. This includes DSC (Digital Selective Calling) Protocols and Distress Alerting, Navtex, NBDP (Narrow Band Direct Printing) for weather information, VHF Portable radios for survival craft, EPIRB (Emergency Position Indicating Radio Beacons and SART (Search and Rescue Transponders), among other items. I was particularly interested, as I teach the course for Marine Radio Restricted licenses for pleasure craft.

Vessels going further off shore will also need people trained to use INMARSAT (International Marine Satellite). The EPIRB runs at 406 MHz and is usually triggered automatically in an emergency. The SART responds when it encounters X band (3 cm) radar transmissions at a range of about 8 miles.

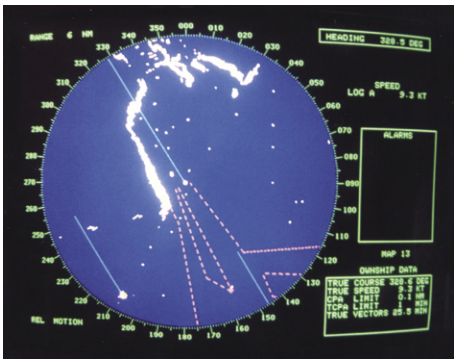
I had an opportunity to witness the above training in real life when I took a very enjoyable cruise to Alaska aboard the *Norwegian Sun* this past summer. Just take a look at her electronic equipment list: She carries two complete HF/VHF radio systems, Navtex, three Comsat Satellite terminals, two satellite telex terminals, two SITOR telex terminals, three satellite facsimile lines, and two complete GMDSS Stations. This, along with many electronic aids such as GPS Navigator, VHF radio Direction Finder, and three ARPA (Automatic Radar Plotting Aid) radars, show how far electronics has come.

Once DSC radios have become installed, the voice watch on channel 16 VHF (156.8 MHz) and 2182 kHz will no longer be mandatory on equipped vessels. However, in the coastal areas and Great Lakes there are many vessels that will not have to have such radios, so these frequencies will be monitored by Canadian Coast Guard radio stations for some time to come. The DCS alert frequencies are channel 70 VHF (156.525 MHz) and 2187.5 kHz. I have begun to see many loggings on this HF frequency in various utility columns. The DSC VHF radios are coming down in price as I have seen several for sale for just over $200. They also can be connected to your GPS, so when the DSC call is made, geographical data can be sent.

All ships in the St. Lawrence Seaway now have to carry an AIS system (Automatic Identification System) which uses radio signals and GPS data to relay your position and speed to the Seaway Authorities. This has produced some lively communications when ships are caught speeding in traffic control zones.

❖ Information from Readers

I received a request for a source for the VHF channel frequencies from Fred Fichman, WA6YVA. There are several places you can obtain these frequencies. There is usually a list with your marine transceiver and there are some web sites which also list them. A good site is **http://www.marinewaypoints.com/learn/VHF.shtml** The list gives the frequencies, channel numbers and the channel use. You can also get this information



ARPA screen for Halifax harbor approach traffic scheme

from the US Coast Guard or Canadian Coast Guard publications. The channel numbers and frequencies are valid world-wide, but the use of some channels varies from country to country. If necessary, a complete list can be added to a future column. A list of US VHF channels is also online at **http://www.monitoringtimes.com/html/mtmarvhf.html** along with other maritime products. I will list any that I use at the end of the column.

William Tompkins, AD5WT, sent me some interesting frequencies he got from his cruising adventures. The ship's crew made use of 450 to 470 MHz handhelds for internal ship communications. I have listed several he sent me and have heard a variety of frequencies used by ships when docking and traversing canals, etc. The deck to bridge communications is definitely interesting to listen to. He also listed a few wireless microphone frequencies. Your portable scanner is always useful when traveling; however, be very aware of the radio laws of countries you visit. This is particularly true if you are a ham operator and have a hand held, etc. with you. I noted that the Norwegian Line asked people not to operate RF transmitting devices on the ship. I assume other lines have the same policy.

Traffic passing Quebec City. Front to back - Levi ferry, Cabot container ship westbound, CSL Laurentien eastbound.

The frequencies will differ with each ship, but a short scan should find some interesting listening on board. Here are some examples (in MHz).

MV Insignia

457.525	Bridge
457.55	Secondary Frequency
457.575	Reception desk

MV Splendor of the Seas (Royal Caribbean)

467.75	Bridge
467.575	Secondary

❖ KPH Still Active

Another interesting Marine Radio History site has to do with the preservation and operation of Marine Station KPH and associated amateur radio station K6KPH. The site **http://www.radiomarine.org** gives all the information, pictures, and details of future operations. KPH is regularly returned to the air, on the old frequencies, by this dedicated group of enthusiasts. They are always active on July 12 or the "Night of Nights" as they call it. This was the night of the last commercial marine Morse transmission. K6KPH is also active on Straight Key Night, International Marconi Day, and most Saturdays when the station is open for visitors. Richard Dillman, W6AWO, has given us a lot of interesting information which we will cover in future columns.

By the way, although Morse code marine transmissions have all but ceased, Canadian Marine Officers still have to know Morse by sound and light at 4 words per minute. I had several marine friends ask me to help them learn Morse last winter.

❖ Winter Monitoring

As the winter monitoring season approaches, here are a few frequencies to try (in kHz):

DSC	Voice	NBDP (SITOR B)
2187.5	2182	2174.5
4207.5	4125	4177.5
6312.0	6215	6268.0
8414.5	8291	8376.5
12577.0	12290	12520
16804.5	16420	16695

We have just had a tug sinking off Texada Island, BC, so you never know when monitoring the distress channels will provide some interesting listening. 4125 kHz is still a good channel for the West Coast. Canadian Coast Guard stations on the West Coast can still be heard on 2182, 2054 and 4125 kHz. VAJ Prince Rupert and VAE Tofino are listed for these frequencies. East Coast Canadian Frequencies listed are 2514, 2538, 2582, 4375 and 6513 kHz. 2670 kHz and 6501 are still good for USCG Broadcasts. 5696 and 8983 are very useful for USCG operations. Canadian East Coast weather broadcasts are on 2598 and 2749 kHz. Bermuda Harbor Radio is still on 2582 kHz.

❖ Here at the shack

Please allow me to bring back a bit of history. While working N8F, I also worked KB8TI in Lansing, Michigan, another station in the special event. Rick, the operator on duty, passed along a hello from Shawn who was helping run the station. Shawn held the SWL call of WPE8CPC. Many of us will remember the SWL calls issued by *Popular Electronics* magazine. Over coffee this past week, Mike, VE3PRW, produced a 1963 copy of the magazine. It contained a recognition for logs sent to the shortwave column from VE3PE1BQ, one Ron Walsh. It sure brought back some memories of listening to a Hallicrafters S-38!

A close friend and SWL colleague, George Kennedy, now VE3GHK, wanted a tower for a beam antenna. He was given one by a ham going overseas and has painstakingly refurbished this windmill type tower. However, when we traced the owners of the tower, we found it was originally used at Marine Coast Station VBH, here in Kingston! At least a bit of this old station is still involved in HF transmissions.

As I sit in the shack, I have monitored the local tour boats heading for winter berths. The marine weather channel has given a water spout advisory for Lake Ontario and several vessels are waiting for pilots. A conversation about a vessel hitting a lock wall and having to be towed to Montreal was just heard on a ship to ship channel. Port aux Basques and Labrador Coast Guard radio have been heard on HF. The Maritime Mobile Service Net on 14 300 is S-9.

USCG cutter in Skagway Alaska

My antennas have been checked, the furnace has come on and the wind is approaching gale force. It looks like the winter monitoring season is here. I wish all my readers good listening and the best of the Holiday season. Please let me know what you heard! I'm off to send some CW on 20 metres.

73's and good DX, Ron VE3GO

VHF Frequencies used in this article (MHz)

Channel	Frequency
	156.3
8	156.4
	156.5
	156.55
	156.6
	156.65
	156.7
	156.8
21A	157.1
21B	161.665
70	156.525
83B	161.775
85	157.275 / 161.875

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.

Catching Up

We covered a lot of ground in 2004, including how to identify beacons, tips on maintaining gear, QSLs, and the pros and cons of various antennas. With only one page each month to cover these topics, space comes at a premium. I simply cannot cover everything that comes my way. This month, I'm devoting a column to catching up on some of the items that have been on hold, including the mailbag.

First, I'd like to say a quick word about correspondence. I always enjoy hearing from readers via e-mail or postal mail. When writing by e-mail, please remember to include some meaningful text in the Subject line of your message, such as "Below 500 kHz" or "Longwave." In this way, I'll know that it is a legitimate e-mail and not one of the many "spam" messages I get each day.

It continues to amaze me how much energy folks put into sending spam. I *never* open such messages, let alone buy the product or service they are hawking. They could be offering me a dream Hammarlund SP-600VLF receiver, but if it arrives via spam, I will not read it!

Mailbag

Our first letter is from Tom Humes (AZ). Tom uses a Yaesu FRG-100 receiver and a steel whip about 20 feet (6 meters) off the ground. Previously, he tried wire antennas, but found their performance lacking. The whip has provided some new loggings for Tom and he is looking forward to upgrading his log.

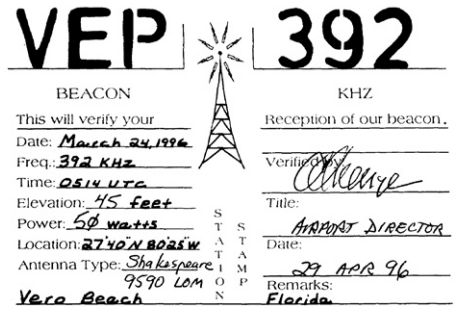
He writes: *"I am preparing to expand my log information. In a recent issue of MT you spoke of watts-per-mile. I thought that would be a decent gauge as to how far out I was receiving. My next thought is how does one measure the mileage. My first thought was to buy a large map and place a pin at my locale with a string attached. Using the scale I could then find the mileage. All other options I thought of had too many restrictions. What do you suggest?"*

The string and pin idea is a good one. It immediately shows what direction the signal is coming from and what terrain it is crossing to reach you. I've used this technique for years. If it's only the distance you want, or if you need a more precise measurement than the string method, then I suggest the following website: **www.indo.com/distance/**. Here, you enter two locations – yours and the beacon's. The distance is then computed automatically, either in miles or kilometers. What could be easier?

Tom also included the list of loggings shown in Table 1. The bolded items are either first-time catches for him, or of significant distance to be notable. Thanks for writing, Tom. We look forward to hearing from you again.

Table 1. Beacon Loggings from AZ

FREQ	ID	LOCATION
305	RO	Roswell, NM
326	MCY	Mercury, NV
326	DC	Princeton, BC
329	TAD	Trinidad, CO
332	FIS	Key West, FL
338	RYN	Tucson, AZ
344	YC	Calgary, AB
344	FCH	Fresno, CA
350	RG	Oklahoma City, OK
350	NY	Enderby, BC
353	LWT	Lewistown, MT
353	LLD	Lanai, HI
359	BO	Boise, ID
362	6T	Foremost, AB
365	AA	Fargo, ND
368	SIR	Sinclair, WY
371	ITU	Great Falls, MT
382	GRN	Guerrero Negro, MEX
388	OCG	Oconto, WI
388	3Z	Taber, AB
399	SRI	St. George, AK
402	MQ	Miquelon, St, Pierre & Miquelon
404	MOG	Montague, CA
413	OEG	Yuma, AZ


VEP 392
BEACON KHZ
This will verify your Reception of our beacon.
Date: March 24, 1996
Freq.: 392 KHz
Time: 0514 UTC
Elevation: 45 feet
Power: 50 watts
Location: 27°40'N 80°25'W
Antenna Type: Shakespeare 9590 LOM
Vero Beach
STATION STAMP
Verified:
Title: AMATEUR DIRECTOR
Date: 29 APR 96
Remarks: Florida

QSL for VEP/392 kHz. Courtesy of Alan Renner (PA)

Our next letter is from Ward Kremer (TN). We've mentioned Ward's work with antique receiving gear a couple of times before. I use the term "antique" instead of "vintage"' because Ward's gear is *really* old – made in the 1920s! This time, Ward writes with news of his latest intercepts with a WWI-era rig. According to Ward, the radio is the actual set that was used aboard the 1926 South Pole expedition, on the *SS President Madison*, and its history is fully documented.

He writes: "*I've recently logged something rather extraordinary on my WW I Robert Dollar/ Heinz Kaufmann rig. Station in question is VR, 365 kHz listed in your BeaconFinder guide. It's listed as Grand Canaria and the state/prov/ITU column indicates CNR. When I check the page where country codes are listed, I find nothing. I am assuming, given Grand Canaria and CNR, this is the Canary Islands. Do you know if this is correct? I thought I'd call it to your attention that CNR is not in the country listings and also hope for a confirmation. I have logged this beacon a few times. Other recent additions are Valdez and Nome Alaska, at about 524 kHz. I used to get nothing there, but recently disconnected the ground cap on my ARBE III and it works much better.*"

Great information, Ward. Yes, CNR does stand for the Canary Islands, so congratulations on a great catch! VR/365 was a late addition to the *Beacon-Finder*, and the ITU chart was not updated before printing. That has now been corrected. A complete chart of ITU Country Codes is available from a link at **http://home.cogeco.ca/~dxinfo/**. Readers may want to print the ITU information and keep it on hand for reference.

Miscou Redux

On my 2003 trip to Miscou, New Brunswick, it was not only the radio conditions that were memorable. During our stay in this French-speaking region, we were joined by local SWL, Roger Roussel, who brought his gear out for some DXing at our chalet. One evening, Roger invited the entire team to his home for dinner. Although I can speak only a handful of words in French, we shared a common bond in radio, and we enjoyed the evening with Roger and his extended family. Jacques d'Avignon, founder of our DXing group, speaks fluent French and served as a translator during our visit. I was thankful for his presence!

A special treat was our visit to Roger's radio room. The walls were *covered* with QSLs, memorabilia, awards, and letters from shortwave stations all over the world. We soon learned that the items on the walls were just the beginning. Roger had entire file cabinets chock full of QSLs and letters from stations. Roger is not a casual listener. He serves as an official monitor for several of the major shortwave stations who wish to monitor the quality of their signals into Eastern Canada.

Recently, I received an e-mail from Roger announcing his new web site at: **http://www.cartesqsl-cards.com**. This site showcases many of his best QSLs, some of which were received many years ago. This is something worth seeing, especially in an age where some broadcasters have abandoned QSLing. Enjoy your visit.

Once again, we've run out of space, but I do want to slip one more thing in. Alan Gale, G4TMV, has recently updated his *Beacon Hunter's Handbook*. It is now 165 pages long, and contains a wealth of information on chasing beacons on longwave and other bands. Best of all, the book may be downloaded free of charge at **http://www.beaconworld.org.uk**. You will find many other items of interest on this extensive site.

See you next month.

George Zeller
georgezeller@monitoringtimes.

Swiss Leave SW to Pirate

With the Sottens transmitter of **Swiss Radio International** leaving the air in October, DJ Stevie's **Radio 510** pirate program is now the only shortwave international broadcaster left on the air in Switzerland. Their web site at **http://www.radio510.org/** is the source for their latest winter schedule, which was unavailable at press time for *MT.* But, DJ Stevie says that they should be on the air this winter.

Your editor has heard rumors that the old Schwarzenberg transmitter site of **SRI** might be eventually turned into a radio museum. But, *MT* confirms this month that these rumors have not yet resulted in an actual museum. The old SRI Schwarzenberg transmitter building is still standing, but currently the site is used for grazing sheep and cows.

Clandestine Address

In DXplorer, Jerry Berg reports that he received a partial data QSL from a 15670 kHz broadcast of the **Voice of Ethiopian Salvation.** The address that worked for this particular clandestine was, "PO Box 13875, Silver Spring, MD 20911." It took creative reporting and follow-ups for Jerry's reply, but the address may be useful for other DXers.

What We Are Hearing

Monitoring Times readers heard a massive deluge of two dozen different North American shortwave pirate broadcasters this month. Those who thought that shortwave pirate broadcasting was a dying genre have turned out to be very wrong.

Pirate radio stations use sporadic schedules, but shortwave pirate broadcasting increases noticeably on weekends and during major holiday periods. 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, hosts more than 90% of all North American shortwave pirate broadcasters.

Iron Man Radio- Scuffy Swab mixes rock music with comedy that includes old cartoon audio. (Belfast)

James Bond Radio- This new rock music station has been heard several times now with programming featuring the movie character, but we still know very little about the station. (None)

KIPM- Alan Maxwell retains a following among some DXers for his elaborate existential dramas, most of which star himself as the major character. But, other DXers are puzzled by his complex original compositions. (Elkhorn)

Old Vampire Radio- It is not yet clear if this one is a seasonal novelty station or whether it is a stable pirate operation. (None)

Radio Free Speech- Bill O. Rights normally combines advocacy for individual rights with comedy shows. Lately he often uses an AM transmitter. (Belfast)

Radio Moshiach and Redemption- John Calabro reports hearing this one on 530 kHz, not on their usual frequency near 1710 kHz. Their orthodox Jewish programming is sometimes mistakenly identified as Lubivitcher Radio. Their web site at **http://www.radiomoshiach.org/** still provides additional information. (Brooklyn)

Radio Three- Sal Amoniac's numbered pirate station showed up last month after a long absence from the pirate bands. We have a couple of additional logs of Sal's station this month. (Belfast)

Random Radio- This new pirate has an ironic parody format thus far. (None; asks for reports to the FRN web site)

The Crooked Man- This classic stream of consciousness pirate has returned to the air with its bizarre mix of insane talk by the Crooked Man and rock music. (None)

The Crystal Ship- This classic pirate station from the 1970's has definitely reactivated, and has been heard on multiple weekends. Their programming is primarily rock music. (Belfast or *tcsshortwave@yahoo.com* e-mail)

Tu Nave Kosmos- This new South American pirate station has been widely heard via North American pirate relays. Station manager Danny Flex's Latin American music is mixed with an announcer who uses a lot of special audio processing to unintentionally disguise the ID's. Most of the programming is in English, surprisingly. (Uses *tunavekosmos@hotmail.com* e-mail)

Undercover Radio- Dr. Benway still primarily transmits rock music, but warning messages from Martians are often mixed into the shows. (Merlin)

Voice of Bob- Ivan Stang's syndicated "Hour of Slack" program was the main idea behind the classic pirate station "Voice of Bob." Stang's show has showed up with pirate relays again, with his "Praise Bob" mocking of religion. It is not yet clear if this is a reactivation of the Voice of Bob, or just a pirate relay of Stang's syndicated Hour of Slack program. (None)

Voice of Laryngitis- Somebody has been relaying tapes of very old shows from this classic pirate radio station, with its stars Genghis Huxley and Cowboy Stanley Huxley. Many think that this station was the best produced and funniest station to ever appear on shortwave. Ignore the defunct Battle Creek maildrop. (Belfast)

Voice of the Purple Pumpkin- Just about every year this classic pirate station ID resurfaces on the pirate bands. But, the station remains mysterious. (None)

VUDU- Many listeners heard this one make some pirate history, with a one watt QRP low power beacon test during late October. (Uses *vuvu11@hotmail.com* e-mail)

WDVL- This new one showed up on Halloween with a documentary on the history of pirate radio on Halloween over the years, with a slogan of the Voice of the Prince of Darkness. (Uses *wdvlsw@netscape.net* e-mail)

WEAK- Leonard Longwire's Chicago station has returned to the air. He covered both the Halloween holiday and the USA elections during the fall. (Belfast)

WHGW- As we see here this month, this new one has a very elaborate QSL. They often relay other programs, such as the old "War of the Worlds" radio drama. (Uses *whgw6925@myway.com* e-mail)

WHYP- The James Brownyard memorial station from North East, PA still mixes comedy, rock, pirate advocacy, and Lake Erie weather reports that are several years old. (Providence)

WKIL- Shows from this unusual new pirate have thus far primarily consisted of audio from a machine gun. (None)

WMPR- Their techno rock "dance party" at this mysterious station is easy to spot, since they are the only pirate currently using this format, and they normally put out a good signal. (None)

XB37- This new pirate has mixed rock music with parody ads and other humor. (Uses *xb37@netscape.net* e-mail)

Y-108- We still are hearing occasional relays of a Hamilton, Ontario FM station on 6925 kHz. The actual broadcast stations are virtually never associated with their shortwave pirate relays. (None)

QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or $2 US to foreign locations. 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; 383 Kingston Avenue, Suite 94. Brooklyn NY 11213; 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 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: Scott Barbour Jr., Intervale,NH; Jerry Berg, Lexington, MA; Artie Bigley, Columbus, OH; John Brewer, no QTH; John Calabro, Melrose, MA; Ross Comeau, Andover, MA; Harold Frodge, Midland, MI; David Gibson, Monroeville, PA; William T. Hassig, Mt. Prospect, IL; Harry Helms, Wimberly, TX; Leonard Longwire, Chicago, IL; Chris Lobdell, Stoneham, MA; Larry Magne, Penn's Park, PA; Greg Majewski, Oakdale, CT; Pancho Villa, Upstate NY; Fred Roberts, Germany; Lee Reynolds, Lempster, NH; Martin Schoech, Eisenach, Germany; Robert Ross, London, Ontario; Arnaldo Slaen, Argentina; John Sedlacek, Omaha, NE; Matthew Weitendorf, Cleveland, OH; and Niel Wolfish, Toronto, Ontario.

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Applying Your Monitoring Skills

Another year has come and gone and there are still a few of you folks who haven't taken up the challenge that Old Uncle Skip makes every year at this time. Once again it is time for the annual tradition of amateur radio resolutions. Don't skip down, because at least one *always* applies.

1. If I do not have an Amateur Radio license I will get licensed this year.
2. If I do have a license I will upgrade it to the next highest license until I am an Extra class.
3. If I am an Extra class I will find somebody who isn't licensed and help them get licensed. (Spend some time trying to track down folks from number 1 above)
4. I will repeat number 3 until I can meet all my friends and family on 2 meters.

And now… This year's special challenge:

5. This year I will apply my radio *monitoring* skills to my amateur radio practice

A little bit of honesty with one another at this point. While I know you folks hang on my every word and cannot wait for the next issue of *MT* to hit your mailbox to read my latest sage ham radio advice, I suspect most of you may have come to reading this magazine by way of the *listening* aspects of the radio hobby and not the transmitting side of the house. After all, this is *Monitoring* Times, not *Ham Radio* Times. (There used to be a fun magazine geared to amateur radio beginners called *Ham Radio Horizons*, but this isn't a nostalgia column, at least not this month.)

It occurs to me that anyone coming to amateur radio by way of listening to shortwave or scanner monitoring should have an obvious leg up on folks without such experiences.

What got me thinking about this was my participation in last Fall's CQ World Wide DX and ARRL Sweepstakes contests. As I have said in the past, I am not a particularly avid contester but I do like the big shows as a place to fill in blanks on my country lists. This last contest season has been particularly exciting for me because I am only a very few entities away from qualifying for QRP DXCC. Nailing down 100 countries with a full gallon amplifier pumping RF into a mega beam antenna mounted on an airplane-spooking tower can be accomplished in a single contest weekend (and often is by many of the *Big Guns* out there in ham radio land). But nailing down membership in the Century Club running 5 watts into a dipole at 35 feet is a whole different can-o-worms.

As I bring this accomplishment to fruition, I can clearly state for the record that the greatest assets I brought to the table were the skills I mastered as a shortwave broadcast listener. I wouldn't be half the ham I am today, nor would I have many of the awards that hang on my walls if I didn't cut my radio teeth on the monitoring side of the business. And while you may not enjoy the masochism inherent in QRP operation, you, too, should find that your radio listening skills will help you get ahead when you key the mike to get that *new one on 20*. Everything I'm going to talk about here can probably be applied equally to the pursuit of any of the other radio activities you will find in the pages of *MT*.

❖ Prepare, Prepare, Prepare

It's happened to the best of us from time to time. We go to get on the air and we can't because something has gone wrong. Oh, we tend to blame it all on Captain Edward A. Murphy, but when you stare into the cold hard reality of the radio hobby, the simple truth is that Murphy gets the blame way more often than he deserves. When push comes to shove we make our own luck in this hobby. Good fortune (and good contacts) go to the prepared among us.

Early on in my shortwave listening days, I came to understand a (very) little bit about propagation. I understood that there were times and seasons when I just wasn't going to be able to hear what I wanted to hear. Not enough or too many ions in the sky between me and Radio Freedonia. Those down times became opportunities for me. Opportunities to go over my equipment, check my antennas, and restock necessary supplies.

These preventative maintenance rituals now include performing system checks and data backups on the shack computers. PC's have become nearly essential for modern amateur radio practice. That being said, I keep plenty of pens and paper around anyway.

What you need to be thinking about are all those things that will facilitate success when the DX Spotting Net lets you know that some rare lump of rock in the Antarctic has just been activated for the first time since Marconi was a pup and you only have a 1 hour window to shout your lungs out before the band goes away. That is *not* the time to discover an intermittent broken wire leading to the 9 pin connector on your microphone. This being a "smart" mike with additional features, every time you key down to make a call, your transceiver now changes frequency.

Capt. Edward A. Murphy, the unfortunate founder of Murphy's Law

Or maybe you thought you could get one more season out of that run of coax up to your antenna. You didn't take the time to (safely) climb up for a visual inspection. Had you done that, you might have noticed that little spot behind the mast where a friendly neighborhood squirrel chewed through to the braid. Of course, Mr. Squirrel decided that it would be best to do this on the windward side of the wire to allow the maximum amount of moisture to enter and run down all the way to your base connector.

You see my point? Captain Murphy was nowhere around. A little time spent on preparation always makes for good results.

❖ Listen, Listen, Listen

This is the greatest skill that a radio *monitoring* hobbyist brings to the amateur radio realm. Run through the bands on any contest weekend. You hear lots of folks shouting, but it becomes very clear that most of them are not doing all that much listening. A rather common occurrence is the station that sends his or her callsign for about 15 seconds and then only listens for a second or two before they start sending their call once again. I always wonder how many multipliers that kind of station misses out on because they don't give anybody a chance to key the mike.

Notice, too, what I just reported about that station. I learned that station's rather dubious operating procedure only by taking the time to listen. With a little patience I can pick up that ham's pattern and timing and then get my call out in that brief moment between his or her key downs. In that way I've put the station in my log and did that ham the favor of getting a contact on the books as well, in spite of poor operating technique. Getting a sense of a station's operating pattern is the key to breaking a pile up. The most successful DXers don't just blindly key the mike and shout in hopes of being heard. Even Big Gun stations can be frustrated by this method, not to mention peanut powered operators like Old Uncle Skip.

A good DX hunter will take the time to listen. To notice such things as the DX station listening for a few seconds and then pulling a call out of the tail end of the pile up. You can also learn when it just isn't your time. If you are operating out of 2 Call Land and the DX station is only coming back to 5s and 6s, you may be a victim of a bad propagation path or the operator is working regions in a pattern that makes sense to his or her needs.

How do you figure out which situation applies? You listen. Someone once said we have two ears and one mouth so we should listen twice as often as we talk. On the ham bands that would be the minimum.

❖ Tune, Tune, Tune

Someone once asked Willie Sutton why he robbed banks. His famous comeback was: "Because that's where the money is." Unless you are operating from a rare DX location, you are a big gun with

the biggest signal coming out of your state, or you are operating a particularly unique special event station, you're going to have to go looking for your contacts.

Folks who come to the ham hobby by way of the listening hobbies know a thing or two about systematically running through a band. Combined with the above mentioned listening skills, you can roam the bands with ease, searching for specific signals or trolling for contacts of opportunity. As I mentioned earlier, I use contests as a way of finding new countries. I am not going to want to spend a half hour shouting at a station from a country I already have in the log. Come to think of it, in many multiplier-based contests this would be bad practice if you were going for a score as well.

Likewise, I am not going to climb into a pileup on a station that is only working Europeans at the moment. What I will do, not unlike shortwave broadcast bandscanning, is make note of what stations I am hearing and on what frequencies. Unless folks are getting QRMed or are bandhopping themselves, they tend to stay put for a good while. After I have tuned through the band, I may drop back to some of the known quantities on my bandscan list.

Propagation, Propagation, Propagation

Atmospheric conditions ... you don't have to like them, but you can learn to live with them. The most successful amateur radio operators, high or low power, HF or VHF/UHF, have been folks who take a bit of time to understand propagation. Learning to put yourself in the path of signals coming from the part of the planet you want to communicate with is the key to success. Even beginning shortwave broadcast listeners have a sense of why you can't hear certain signals at certain times of the day on certain frequencies. Likewise, every scanner enthusiast in the history of the hobby has been both blessed and cursed by tropospheric ducts and E Skip.

Dedicated monitors already know about tuning in to WWV to obtain the A & K indices in order to know where to get the most bang for their listening buck. The last time I took the time to check, I saw more than half a dozen *freeware* programs available for download on the Internet that help a user calculate MUF and LUF to and from any two points on the globe. Such tools have been the hot setup for radio monitors ever since personal computers came into common use. (Come to think of it, I can recall typing in the BASIC program for MINMUF on my Timex Sinclair back around 1980, oops, not a nostalgia column, move along.)

Transferring this knowledge and skill to the amateur radio world is as easy as pie, and you will, more often than not, find yourself in the right place at the right time to do all that listening and tuning I talked about earlier.

What Are You Waiting For?

So there you have it. Even if you have yet to become a ham, by virtue of being an *MT* reader you are probably more than half way to a lot more radio fun. Have fun! I'll be *listening* for you on the bottom end of 40 meters.

UNCLE SKIP'S CONTEST CORNER

ARRL RTTY Roundup
Jan 8 1800 UTC - Jan 9 2400 UTC
North American QSO Party (CW)
Jan 6 1800 UTC - Jan 6 0600 UTC
Hunting Lions in the Air
Jan 15 0000 UTC - Jan 16 2400 UTC
MI QRP January Contest (CW)
Jan 15 1200UTC - Jan 16 2359 UTC
North American QSO Party (SSB)
Jan 15 1800 UTC – Jan 16 0600 UTC
CQ 160-Meter Contest (CW)
Jan 29 2200 UTC – Jan 30 1600 UTC
ARRL January VHF Sweepstakes
Jan 29 1900 UTC – Jan 31 0400 UTC

Clem Small, KR6A
clemsmall@monitoringtimes.

Alternatives to Elevated, Outdoor Antennas

Some folks who would love to get into a radio hobby feel thwarted that they have no place to put up an elevated, outdoor antenna. The good news is that you don't actually have to have an elevated, outdoor antenna to enjoy shortwave listening, broadcast-band DXing, amateur radio, logging low-frequency beacons, or the many other kinds of fascinating radio hobbies that people enjoy. Indoor antennas often can be a good interface between your radio and the multitude of radio signals that are present around us 24 hours every day.

To begin, let's be up front about it and admit that indoor antennas usually don't perform as well as elevated, outdoor antennas. And if the building in which you use them has lots of metal in its construction, that may lead to very poor performance. But, in many locations, indoor antennas do work, and, in some instances, they work quite well.

❖ Some Useful Indoor Antennas

First, let's consider some quick and easy indoor antennas. Sometimes these will surprise you with their performance. For UHF or VHF scanning, almost any length of wire 12 inches (.3 meters) or so will often work quite well. For HF and lower frequencies, a length of wire at least 15 feet (about 4.5 meters) or more in length can be laid out on the floor next to the wall, under a rug, or in the attic or overhead crawl space.

If your receiver has no antenna input connector, it may work okay to connect your antenna to the receiver's whip antenna if it has one. Also, it sometimes works to wrap several turns of wire around the receiver's case, and connect the wire to your antenna.

In buildings which shield their interior from signals, putting a long whip or metal flag pole out a window or on a balcony as an antenna may bring good results. Just putting a wire out the window and letting it hang down toward the ground can be useful for temporary installations.

Small, tunable, table-top loops and active antennas are especially popular with folks like AM broadcast band DXers and lowfers who listen on the MF band and lower in frequency. Table-top loops are noted for their ability to reduce interference through the use of the deep nulls (directions of low response) in their reception patterns. Active antennas, depending on the model, may cover from LF and lower, and on up to the microwave frequencies. And they often rival long, outdoor antennas in their ability to pull in stations. Their weakness is that they may lose sensitivity, or produce inter-modulation distortion in the presence of very strong signals.

There are larger (a yard or a meter or so in diameter), single-turn, tunable loops available which can be used indoors. MFJ* offers two models, both remotely tunable: model 1786 tunes from 10 to 30 MHz, and model 1788 tunes from 7 to 30 MHz. The Bilal Company** has models for several ham bands. Bilal antennas are tuned at the antenna rather than remotely, and cover mainly the ham bands. I have used Bilal loops and the no-longer-produced AEA tunable loop (of the same general type as the MFJ models) indoors. Both performed surprisingly well.

These larger loop antennas can be used for transmitting as well as for receiving. If you use these or any other antenna indoors for transmitting, they should be kept well away from other objects, people and pets. I would recommend only low power for any antenna used indoors. Scientists are concerned about the effects of exposing humans and animals to radiation from antennas. You should familiarize yourself with recommendations for safety in this regard if you use any antenna for transmitting at other than low power levels.

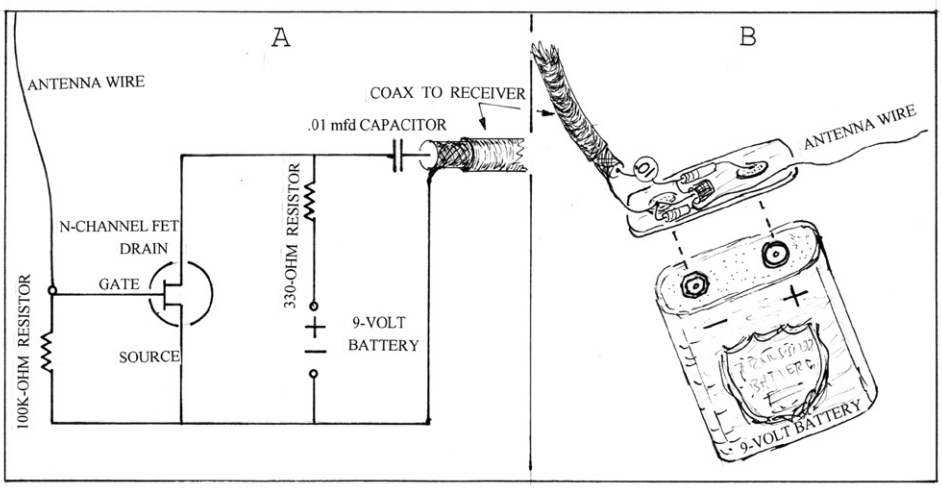

Fig. 1. The wiring diagram for the circuit of a simple active antenna (A), and a pictorial diagram of the antenna circuit showing how it snaps onto its battery (B).

❖ Underground Antennas

There's a rather unusual alternative to elevated antennas, and those are antennas placed on the ground, underground, or even under water! Of course, all underground wires and connections must be well insulated and weather proofed.

At one time, when radio communication was concerned primarily with signals in the MF band and lower in frequency, these antennas enjoyed a limited popularity. The lower the frequency the better these antennas perform, and the deeper they can be "planted." They do have a degree of immunity from lightning damage. And they are reported to be less susceptible to received noise than are elevated antennas.

And, yes, they do work, although they certainly don't perform as well as elevated antennas. But they do come in handy for some applications. For instance, they may be used as emergency backup antennas due to the fact that they are resistant to damage from disasters such as tornados, heavy ice snow storms, or terrorist bombing. I have used HF antennas buried an inch or so underground for local communication and received decent signal reports. I suppose the earth I buried them in was "average," and for resonance the antennas were shorter by a third than elevated antennas. So a half wavelength antenna was 312 ft. divided by the frequency (MHz) (or 95m/frequency MHz in meters).

❖ Let's Build an Active Antenna

The active antenna shown in fig. 1 is easy to make, portable, and a good performer on the LF, MF and HF bands.

The antenna is constructed on a snap-on connector board which has been removed from a discarded 9-volt battery. The connector board

This Month's Interesting Antenna-Related Web site:

This site discusses indoor antennas:
http://www.hard-core-dx.com/nordicdx/antenna/hidden/indoor.html

will snap onto the fresh 9-volt battery which is used to power the active antenna. No switch was included in this design: the circuit was simply un-snapped from the battery to turn it off.

The transistor can be an MFP-102 (Radio Shack #276-2062), 2N3819 (Radio Shack #276-2035), or similar N-channel FET. If you substitute a P-channel FET then you must reverse the battery polarity from that shown in the diagram. Your local Radio Shack, Dan's Small Parts and kits, or other radio-parts supply store should have the required parts.

Make sure all the wires and leads you connect together are clean. You can scrape them with a knife edge to clean them if needed. The unit will probably work more reliably if you solder the connections, but just twisting the leads of the parts very tightly together will work if you can't solder. A small soldering iron is less likely to overheat the components.

Carefully connect the parts as shown in fig. 1, and then recheck to see that the circuit is wired properly. The position on the transistor of the leads to the source, gate and drain varies for different transistors, so check this in the data that comes with your transistor.

The connection to the receiver antenna can be via coax as shown in fig. 1, or you can use a pair of wires twisted together to form a short cable. The wire attached to the capacitor should run to the center conductor of the antenna input terminal, and the wire connected to the battery negative (-) terminal should run to the antenna-connector ground or shell.

Try lengths of from five to twenty feet or more for the antenna wire. If it is too long, you may notice problems with intermodulation distortion or desensitization when strong signals are present at your location. If your building shields the antenna from signals too much for decent reception, try putting a whip antenna in a window to replace the antenna wire, hanging the antenna wire out a window, or attaching the antenna wire to a wire window-screen.

Happy monitoring!

RADIO RIDDLES

Last Month

I said: "Let's say that you are listening on HF, and you receive a very short transmission, perhaps just a dit of Morse Code. Then after only a fraction of a second, say .13 second, you receive that identical transmission again. Is it possible that the short transmission wasn't re-transmitted a second time, but somehow, instead of traveling off into space, it returned to your antenna a second time? Could it even do this a third, or fourth time? Radio waves travel in straight lines don't they? So am I just talking crazy, or could that really happen?"

Well, when propagation is right for it, signals do actually go around the world in about .13 seconds. And after doing this they sometimes arrive back at your station with sufficient strength to be heard. The antenna pioneer John Kraus has mentioned that he used his famous bi-directional W8JK beam to check for round-the-world band openings by tapping the key, and listening for his signal to return in this fashion.

Engineers for the radio pioneer, Marconi, built a very large beam antenna in Australia for Great Britain's world-wide communication system. When using this "Imperial Beam," radio operators could actually hear several round-the-world passages of transmissions which they sent from that beam: the signals made multiple round-the-world trips and were heard several times before they became too weak to be heard!

This Month

Okay, so we can receive a signal a second time after it goes around the world and comes back past our location again in about .13 second. But what about receiving a transmission of our own voice a few seconds after it was transmitted? Sounds spooky, huh? Can it happen?

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.

* MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762. phone: 800 - 647-1800
**Bilal Company, 137 Manchester Drive, Florissant, CO 80816, phone: 719-687-0650
*** http://www.danssmallpartsandkits.net/

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NC-57 Electronic Restoration Completed

We finished the last NC-57 work session with about half of the capacitors replaced before I ran out of time and almost out of capacitors. There's an unusual amount of bypassing in the various circuits, which is an indication of the excellent quality that was built into this fairly low-priced radio. I think I've already mentioned how impressed I was by the professional construction of this set as compared to the Hallicrafters S-40 (restored earlier in this column) – which had a similar price, but which was built more like a household broadcast receiver.

Mica or Paper?

At any rate, with a fresh supply of capacitors on the bench, I went back to work and completed the job. This took quite a bit of time because of the tight construction of the radio, but the result was very satisfying. I know I've told you in the past about the disappointment some folks feel when they open up a recently-purchased receiver to find that all of the original paper caps have been replaced by modern equivalents. They feel that the radio has been somehow violated and, understandably, wonder if the circuitry has been changed, either deliberately or accidentally.

However, I see a radio chassis with a complete set of meticulously-installed modern capacitors as a thing of beauty. (As long as it's a set of capacitors that I put in!) I know that there's an excellent chance that the radio can be aligned to perform like new. It should also give good service for many years without suffering a sudden and disastrous short circuit that might ruin hard-to-replace components.

As you know, most of the paper capacitors in the NC-57 were Bakelite-cased units that look like mica caps, which hardly ever need to be replaced. However, as discussed last time, the Bakelite cased paper caps are no more to be trusted than the wax-covered tubular units. They all tested leaky on my capacitor checker. So it's important that you find and replace any such units present in your restoration project.

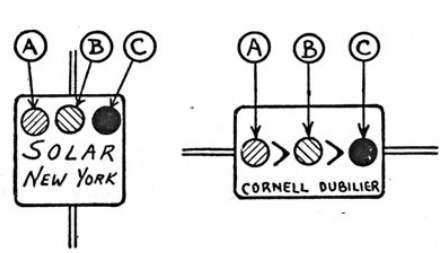


Fig. 1a. Two examples of three-dot coding. If no direction arrows are present, as at left, read the dots from left to right with the manufacturer's name right side up.

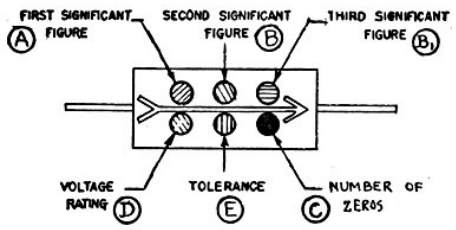


Fig. 1b. Six-dot coding pattern. See text for details.

Generally, the Bakelite-cased paper caps look much larger than similarly-cased mica ones – which makes sense because their capacities are much larger. The paper caps, used as they are for bypass and coupling purposes, typically range from .01 to .1 uf. Mica units, often used in r.f. frequency-determining circuits, might run from 10 to 500 pf (uuf).

So, if in doubt about whether a capacitor is paper or mica, check its size and function in the circuit. Also check the parts list. The NC-57's list helpfully indicates which caps are which.

Reading Capacitor Color codes

The color codes used to identify Bakelite-cased paper or mica caps can be confounding because so many versions have been used. Eventually the system was somewhat standardized by the RMA (Radio Manufacturer's Association). Following are the more common styles.

If the capacitor is the standard garden variety (500-volt; 20% tolerance) as found in most receivers, including the NC-57, then a simple row of three dots is used (Fig. 1a). Make sure you read along the row from left to right with the manufacturer's name right side up or in the direction of the arrows. The first dot (A) is the first significant figure of the rating; the second (B) is the second significant figure; the third (C) tells how many zeros to add following the second figure to give the capacity in pf (uuf). For the specific values to use for the different colors, see the table in Fig. 2. For mica capacitors, the capacity is usually left in uuf. However, the capacities of paper caps are usually so much larger that it they are converted to uf. This is simply a matter of moving the decimal point six places to the left.

For example, a very common Bakelite-cased unit found in the NC-57 has a three-dot color code of brown-black-orange. Since it has just a 3-dot code, we know that it is a 500-volt, 20% tolerance unit. The first (black) and second (brown) significant figures are 1 and 0. The number of zeros after the significant figures is three (orange). So the capacity is 10000 (same as 10000.0, of course) pf (uuf) or – moving the decimal point six places to the left – .01 uf.

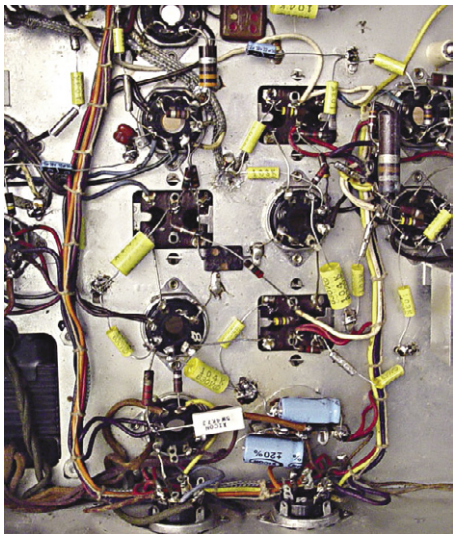
You might sometimes see a row of five dots (less common and not illustrated). This format is used when voltage (fourth, or "D," dot) and tolerance (fifth, or "E" dot) must be specified. See Fig. 2 for the values associated with various colors of these dots. The fourth and fifth dot might be found, instead, on the rear of the capacitor or above the basic row of three.

Finally, you might come across a capacitor coded with two rows of three dots (Fig. 1b). This might be (but see next paragraph) a unit with a capacity requiring three significant figures to express (let's say 325 uuf, just to make up an example). For this unit, the top-row colors would be Orange-Red-Green. The third color (labeled "B1" in the figure) is read from column "B" in Fig. 2 (or the identical column "A.") The number of zeros to be added (labeled "C" as before) is the last dot in the bottom row. In this case it would be brown. The first two dots in that row represent voltage ("D") and tolerance ("E").

Just a few caveats! If you see a six-dot coding

(A)		(B)		(C)		(D)		(E)	
First Dot	First Figure	Second Dot	Second Figure	Third Dot	Number of Zeros following Second Figure	Voltage Dot	Voltage Rating (dc)	Tolerance Dot	Tolerance %
Black	0	Black	0	Black	none	Brown	100	Brown	±1
Brown	1	Brown	1	Brown	0	Red	200	Red	±2
Red	2	Red	2	Red	00	Orange	300	Orange	±3
Orange	3	Orange	3	Orange	000	Yellow	400	Yellow	±4
Yellow	4	Yellow	4	Yellow	0,000	Green	500	Green	±5
Green	5	Green	5	Green	00,000	Blue	600	Blue	±6
Blue	6	Blue	6	Blue	,000,000	Violet	700	Violet	±7
Violet	7	Violet	7	Violet	0,000,000	Gray	800	Gray	±8
Gray	8	Gray	8	Gray	00,000,000	White	900	White	±9
White	9	White	9	White	000,000,000	Gold	1,000	Gold	
						Silver		Silver	±10
						No Color	500	No Color	±20

Fig. 2. Chart shows values corresponding to the various dot positions and colors.



Purists hate to see new capacitors in an a vintage set. But there's no doubt that a meticulous recapping will give a fine old radio a new lease on life and ensure that it will operate for many more years doing what it was designed to do.

where the first dot ("A" position) is white, black, or silver, you are looking at an RMA post-1948 revised coding (white) or a unit made to military standards (black represents mica; silver represents paper). In these capacitors, the first and second significant figures are represented in positions "B" and "B1" (using figure 2 as a position reference only) and the number of zeros is shown in position "C". Tolerance will be found at "E". Position "D" is called "characteristic," and I can find no reference to what might be specified here – perhaps voltage would be included. Can a reader help me out on this?

Oh, and if you find a six-dot coding with the bottom center dot blank, you are really looking at another version of the five-dot code, with the outer two bottom dots representing values "D" and "E."

❖ Other Restoration Issues

With the recapping now complete, the electronic restoration of the NC-57 has essentially been accomplished. But there are a few issues connected with it that are worth mentioning. In spot-checking the values of some of the resistors, I came across a 2200 ohm unit that measured over 6000 ohms. I really couldn't believe my eyes or my ohmmeter! It's true that the values of carbon resistors tend to increase with age. But the problem is generally found in resistors in the megohm range and the percentage increase is usually not so extreme.

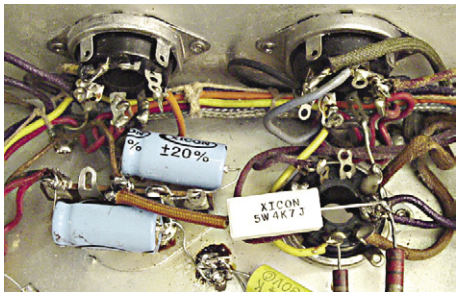
Quite concerned that the effect might be widespread, I did my best to check every resistor in the set. Of course one can't obtain true readings on many of the resistors without disconnecting one end. That's because they are wired in parallel with other circuit elements – which would reduce the resistance shown on the ohmmeter. Such wholesale disconnection would not only be too time consuming, but could also compromise the integrity of the radio.

So I decided to adopt a compromise philosophy learned from a friend who has been restoring radios much longer than I have. Here's his technique for a rough check (keeping in mind that resistors may increase, but do not decrease, in value with age). He puts his ohmmeter across each resistor in turn – leaving it connected in the circuit. If it shows a significant increase over the marked value despite being connected to other circuit elements, he'll replace it.

If it shows significant decrease, the reading is likely to be an artifact caused by circuit interconnections. So he reserves judgment and leaves it alone. Of course some resistors are essentially disconnected at one end because they are connected to tube pins that have no other wiring on them. These can be checked accurately.

I did replace the 2200-ohm resistor of course, but noticed no other outlandish values during the rough check. Later, when the set is powered up and operating, I'll check the voltages at various circuit points against the published readings. Any that are significantly low would be a symptom of an associated resistor that had drifted up to too high a value.

The only other resistor I replaced at this stage was a crudely-wired-in 12,000-ohm, 10-watt wire-wound power resistor that had been installed in place of the dropping resistor for the voltage regulator tube (intended to be 3900 ohm, 2 watt). No sign, so far, of what caused the original to go bad.



The two replacement electrolytic capacitors (left) are mounted on a terminal strip installed under the disconnected capacitor can, left in place for cosmetic reasons. Light-colored rectangular component at right is replacement VR tube dropping resistor (see text).

I also got a chuckle over a shielded cable connected to the wiper arm of the volume control and routed out of the radio through the keyway of the accessory socket. Intended to be a phono input I guess. But in this receiver the volume control is between the first and second audio stages – so there would have been very little gain. Even funnier is that there was a proper factory-wired phono input available at the accessory socket.

After removing the cable, I installed a new line cord to replace the deteriorated one I had cut off early in the game and, electronically speaking, the old girl was ready to go.

❖ How Do You Like Us So Far?

Many of you have no doubt noticed that *Monitoring Times* has recently been taking a hard look at itself in the form of a short survey posted on the Grove Enterprises web site. I know that some readers of this column have responded to it and I appreciate the positive comments that have been made. As it happens, this month marks the beginning of my sixth year of writing "Radio Restorations." So it seems appropriate for me, with your help, to take a personal hard look at the past five years of "Radio Restorations" to see what has gone over well and what hasn't.

The format of the column, so far, is simple and obvious to all. I simply let the reader look over my shoulder as I restore vintage radio receivers and test equipment. I have been stressing the restoration of communications receivers because I figure that's what *MT* readers would like most. These restorations are not done in advance and edited for publication later. Everything is done in real time – so you share my triumphs and frustrations as they happen. Recently, in response to a reader suggestion, I've begun to look back and develop some columns on general restoration topics synthesized from my experiences with various previously-discussed projects.

So how do you like us so far? What would you have me do differently? Are you happy with the type of gear chosen for restoration? What about the pace of the projects – too drawn out? – too fast? – about right? Would you be interested in my including mention of vintage radio clubs and radio events in different parts of the country? How about the inclusion of an occasional radio history tid bit? Anything else I may not have thought of to ask?

Finally, I'd be curious to know what role this column plays in keeping you as a *Monitoring Times* subscriber or reader. Do you find it a major attraction? – or an interesting sidelight to your work with modern, high-tech receiving equipment? – or would you not find it much of a loss if we went away?

Take a few minutes right now and write me a note! If you don't happen to be e-mail equipped, send snail mail to me at PO Box 1306, Evanston, IL 60204-1306. I'll look forward to hearing from you, whatever your opinions.

This is your equipment page. Monitoring Times pays for projects, reviews, radio theory and hardware topics. Contact Rachel Baughn, 7540 Hwy 64 West, Brasstown, NC 28902; email editor@monitoringtimes.com.

Build These Timely Additions to Your Listening Post

By Ken Reitz

Anyone who becomes involved with the radio hobby eventually becomes obsessed with three things: radios, antennas, and time. Radios are bought according to budget, antennas are put up according to space, but a clock is often an afterthought.

Obsessive Clock Watchers

International shortwave broadcasters and amateur radio nets are all concerned with time. With two dozen time zones around the world to take into consideration, it's important that everyone's reading from the same clock. That's why hams and international broadcasters use one global time standard.

Global time was originally known as Greenwich Mean Time (GMT) because Greenwich, England, is situated on 0° longitude, site of the Greenwich observatory where the concept of global time gained prominence in the world of the British Empire. Eventually GMT became Coordinated Universal Time which is often abbreviated as UTC or UT. However, to save time and space it's often written as the letter Z and, when announced, is said as the word "Zulu." To beginners it may seem confusing, but if you stay with it long enough it eventually seems natural.

The need for a single universal time is obvious when applied to radio. For logging shortwave radio reception and amateur radio contacts it's essential to have the time correct. Whatever clocks hams and SWLers use, they're set to any of the world's time signal stations such as those of the National Institute of Standards and Technology (NIST), formerly known as the National Bureau of Standards, which transmit on specified frequencies throughout the radio spectrum (see chart).

The frequencies themselves are also a standard and can be used to align receivers. Even the tones transmitted are official tone standards. The time signal clocks used by the Bureau are sophisticated clocks with atomic based accuracy.

Clock Options

An assortment of radio related clocks are available through many mail order radio catalogs (see list) and prices range from just a few dollars to several thousand dollars. Thanks to the proliferation of quartz controlled movements and liquid crystal display (LCD) technology, an inexpensive clock can come with all manner of extras: date and time, 12 or 24 hour display, hour, minute and second display, even dial lights are common. All this can be crammed into a tiny, inexpensive, lightweight case which can be stuck onto virtually anything with a piece of double sided tape and which may run for years on a watch battery.

Some radio hobbyists prefer analog clocks which show the traditional clock face with hour, minute and second hands. These clocks are typically driven by a very small and very accurate quartz movement which is usually powered by a single AAA or AA battery. The advantage of the analog clock is that it's easier to read from across the room and adds an aesthetic appeal to the radio room.

The current rage in radio room clocks is the so-called atomic clock which is a quartz movement governed by an impossibly small radio receiver

Radio controlled "atomic" quartz movement gives you unbeatable accuracy. Buy the movement for just under $15. Build a fancy case clock or a use a single piece of wood. (Courtesy Klockit)

tuned to the aforementioned NIST time signal station WWVB transmitting at 60 kHz. These clocks are battery operated and self-adjusting. Once set, they will continue to adjust themselves according to changes made at the Master Clock at NIST. These clocks also change time automatically when the switch is made between Daylight Savings and Standard time.

Originally expensive, these clocks are now among the cheapest available. The technology for these clocks has evolved to such an extent that radio controlled wristwatches are now available at reasonable prices. The biggest drawback to these clocks is that they must be able to receive the time signal and may not work well in RF unfriendly environments such as mobile homes or large office buildings with an abundance of steel and concrete.

Do-it-yourself Timepieces

Radio enthusiasts who enjoy home brewing their radio gear might enjoy building their own clocks. It's an opportunity to be creative or customize a time piece tailored to their own needs. There are two sources for the would-be clock builder (see below) who, with a few tools, a little time, and not much money, can build his or her own radio shack clock.

In this article I'll show you how to build three clocks, each requiring a different order of skill and type of movement. I would encourage you to take the basics of these ideas and use whatever is available to make your own clocks. When you begin, make a sketch with the general dimensions of the finished clock on a piece of paper and refer to this when planning to cut the pieces. If you don't feel particularly creative or lack any of the basic tools, you might enjoy putting together any of the clock kits which are also on the market. You can substitute different clock works in many of the kits.

And, finally, you can customize your clock with special brass plaques etched (available through Klockit) with your call sign or other call sign if you use the clock as a presentation piece with your local radio club.

The Three Piece World Time Clock

Here's a little desk clock which is made of three pieces of wood. The clockworks, a Klockit World Time insert (stock #15046), simply fits through a hole in a piece of wood in a friction fit. A simple top and bottom piece are glued on for a decorative look. You can use any wood for this project. I used some walnut scraps I had in the wood shop, routing the edges of the top and bottom for a more formal touch. This project works well with wood from Lowe's or other home building supply house. Look in their "wood shelving" section for finished oak, pine and poplar in a variety of dimensions.

Using a table saw or simple hand saw, cut the three pieces to the dimensions in your sketch. Using a hole saw or circular cutter in a drill, cut the hole in the upright piece of wood. If you don't have a drill, you can use an inexpensive coping saw and do it by hand. Drill a small starter hole tangential to the inside of the insert circle.

If you have a router, you can rout the three facing edges of the top and bottom pieces for a finished look. If you don't have a router just skip to the next step.

Apply glue to the top and bottom edge of the upright piece and hold them together with two furniture clamps. Small, cheap clamps can be purchased at your local hardware store. Be sparing with the glue, as dripping glue will be hard to clean up and does not allow stain or varnish to penetrate the wood, making an uneven appearance in the finish.

Leave the wood in the clamps overnight to let the glue cure. If you use a particularly nice wood such as walnut, cherry, oak or maple, you may want

The three piece desk clock in furniture clamps. These clamps are overkill, you can use much smaller (and cheaper) clamps for a project this small. Rout a space on the back of the dial board on the 24 hour clock to insert the special quartz 24 hour movement. (Courtesy Author)

to apply only a clear varnish finish. Apply three coats of a satin varnish sanding lightly between coats with 220 or higher grit wood sanding paper. If you want a bolder look, use a spray paint of any color. Apply as directed on the can. Three coats are usually sufficient to cover the grain of the wood. Hint: Poplar doesn't stain as well as oak or maple but it takes paint very nicely.

Once the wood is finished, simply insert the movement, add the appropriate battery and set it according to the time signal from WWV. Because this clock is completely finished, you can even make this a one piece wood clock by simply taking one thick piece of decorative wood – driftwood for example – and simply drill the correct size hole and insert the works. It's the ten minute clock project!

❖ The Analog 24 Hour Radio Clock

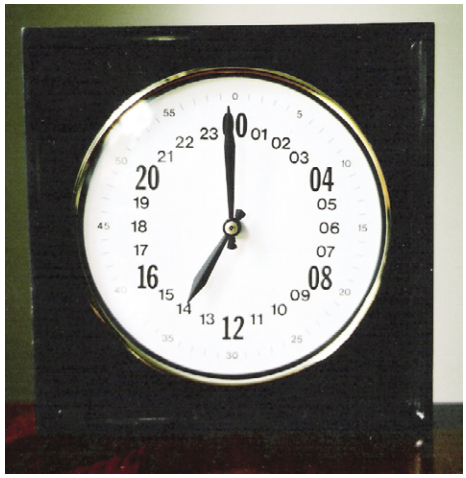
This is a clock with a real "retro" look. It harks back to a time of Hammerlund, Hallicrafters, and Collins radio gear with their analog dials and glowing tubes. I made this clock out of leftover oak scraps from another clock project. It's made of only five pieces of wood, all glued and clamped together. A space on the back is routed out for the clockworks, the dial is glued to the wood and the glass bezel is simply a pressure fit into three small guide holes in the clock dial board. Here's how it's done:

For this clock I used the Klockit 24 hour quartz movement (stock #34089 comes with 6-1/2" dial and hands) I also ordered the #27032 7-1/16" friction fit glass & bezel.

For the dial board I cut a piece of oak 7-3/4" square. I made the trim pieces by routing a design along the edge of a piece of scrap oak. Again, this is just to add a finished look. You can buy this trim in six foot lengths with a variety of decorative designs already formed into the wood.

I cut the four trim pieces with a cheap ($10) hand miter saw from Sears to form neat mitered corners (a miter joint is where two ends cut at 45° angles are glued together to make a 90° joint). I glued and clamped the four trim pieces to the square dial board and let them cure. Because the wood I used for the dial board was so thick, I had to rout out a hole to insert the movement. However, if you use a half inch piece of plywood with an oak face, you can skip that part by simply making the trim pieces hang over the back of the dial board to allow the movement to be covered.

Once the pieces were set, I spray painted the surface with a black lacquer finish. After inserting the movement and attaching the dial to the dial board, I marked the three holes to be drilled to set the glass and bezel. With the holes drilled I attached the hands and then set the bezel in place. All done!



Special 24 hour quartz movement from Klockit. Order the 6-1/2" version with dial and hands for just under $10. (Courtsey Klockit)

❖ The Atomic Clock in Traditional Wood Case

This last clock requires only a table saw and a router to build. Made of only 12 pieces of wood, I designed this clock based on a traditional Shaker style. The basic case of the clock is only five pieces: a top, a bottom, two side pieces, and the back. The front is simply a four-piece wooden frame around a piece of glass. The remaining pieces are just trim pieces to finish the look. I made this clock out of native cherry, but you can buy the 1/2" finished oak pieces at Lowe's or other home builder supply.

The last piece is the dial board, to which the decorative dial is affixed. Try to avoid using a metal dial when outfitting your clock with an atomic clockworks as it will act as a shield and inhibit reception. The dial I used is aluminum and I found that it was difficult to find a place in the house where the clock had good reception. A styrene or paper stock dial eliminates that problem. Increased power at the WWVB 60 Hz transmitter has also greatly improved reception in these clocks. Order different models according to the thickness of the dial board you are using. For example, I used the atomic clock movement from Klockit model #10143 which is for 1/4" dial boards.

The size of this clock is determined by the face you choose to use. I chose the decorative floral face from Clockparts.com as a change of pace from the traditional Shaker face with Roman numerals which I usually use with this design. That made this clock considerably smaller than similar ones with larger faces.

Case for the Shaker style atomic clock is just 5 pieces glued together. Facing edges of the top and bottom are routed for a traditional look. (Courtesy Author)

Again, following the sketch I had made regarding overall dimensions, I first made the case and attached the dial board (made from 1/4" plywood as is the back). Since the wood is cherry, I had only to apply several coats of clear satin varnish to bring out the great cherry color and grain. When I made the door, I painted

"World Clock Insert" makes clock making a breeze even for beginners. Sells for about $20. (Courtesy Klockit)

the inside of the bottom half of the door glass with black lacquer spray paint. When I use a pendulum movement (mechanically or quartz driven), I keep the glass clear to show the moving pendulum. Now, with movement in place I had only to attach the hardware to finish the clock.

The most critical thing to using the atomic clock movement is to follow the explicit directions which come with the movement. Aligning the movement and attaching the hands so that the time is correct is essential. There is a locking pin which comes with the unit which is used to keep the movement from moving until the clock is finished. Don't lose the locking pin, as you may need to remove the battery to transport the clock and you'll want the movement to stay right where you left it. Just make sure the locking pin is removed before you insert the battery.

Of course, the original Shaker design included a wooden hanger on the back so that the clock could be hung on a Shaker peg. I dispensed with the wooden hanger and instead drilled a one inch diameter hole dead center in the back so that the clock could hang as a wall clock or sit on a shelf or mantle. Shaker clock cases were usually painted and the faces had only the hour hand. However, with their penchant for perfection, I think they would have loved the addition of the atomic clock movement.

This movement may be used in any design. You could use it with the one piece, two piece or three piece designs mentioned earlier. You can use it, for example, with an old radio advertisement or other related memorabilia *decoupaged* to the surface of a piece of plywood. You're limited only by your own imagination.

Time Signal Stations

Government funded and operated time signal stations around the world provide a constant time standard and serve as propagation beacons to indicate how well (or poorly) the bands are performing at any given moment. These stations transmit in the multi-kilowatt range, 10 kW in the case of WWV, and if you can't hear them there's little chance of hearing the low power beacons or amateur radio operators. An excellent list of time signal stations world wide is found at **http://www.ac6v.com/standard.htm**. Of interest in North America are the following:

Freq (kHz)	Call sign	Location
60	WWVB	Fort Collins, CO
1510	HD2IOA	Guayaquil, Ecuador
2500	WWV	Fort Collins, CO
2500	WWVH	Kekaha, Kauai Hawaii
3330	CHU	Ottawa, Ontario Canada
3810	HD2IOA	Guayaquil, Ecuador
5000	HD2IOA	Guayaquil, Ecuador
5000	WWV	Fort Collins, CO
5000	WWVH	Kekaha, Kauai, Hawaii
7335	CHU	Ottawa, Ontario Canada
7600	HD2IOA	Guayaquil, Ecuador
10000	LOL	Buenos Aires, Argentina
10000	WWV	Fort Collins, CO
10000	WWVH	Kekaha, Kauai, Hawaii
14670	CHU	Ottawa, Ontario Canada
15000	LOL	Buenos Aires, Argentina
15000	WWV	Fort Collins, CO
15000	WWVH	Kekaha, Kauai, Hawaii
20000	WWV	Fort Collins, CO

The National Institute of Standards and Technology has a fact sheet about radio controlled clocks at: http://www.boulder.nist.gov/timefreq/stations/radioclocks.htm

WWVB's 60 kHz antenna system cranks out 50 kW (ERP) from its 38 kW transmitter in Boulder, CO. (Courtesy NIST)

RESOURCES

Mail Order Catalogs carrying radio related clocks. Prices are as advertised; model numbers are in parentheses.

Amateur Electronic Supply 800-558-0411 **http://www.aesham.com**
Carries numerous quartz digital analog and LED, LCD displays including:
Jumbo display LCD 24 hour clock (118): $24.99
DXer's World Map Clock with LCD world map (112B): $24.99
MFJ Dual quartz digital LCD display (108B): $19.99

Grove Enterprises 800-438-8155 **http://www.grove-ent.com**
Carries MFJ 12" 12 hour analog Atomic Wall Clock (CLK01): $59.95 plus shipping

Universal Radio 800-431-3939 **http://www.universal-radio.com**
Carries wide assortment of quartz analog and digital clocks including:
MFJ analog quartz 12" 24 hour clock with day of week and month dials (MFJ-125): $27.95
MFJ analog quartz 10" 24 hour clock (MFJ-105C): $19.95
MFJ digital quartz 24 hour 5/8" numerals ((MFJ-107B): $9.95
MFJ digital Eternity Atomic Clock solar powered/WWV controlled (MFJ-123): $74.95

Heartland America 800-229-2901 **http://www.heartlandamerica.com**
Always a wide assortment of quartz movement LCD and analog display clocks with and without WWVB control. 12 hour movements as low as $19.99

Clock Parts and Movements

Klockit 800-556-2548 http://www.klockit.com
Carries everything from grandfather clock kits in cherry for $2,524.95 to 1 7/16" mini LCD display inserts for $2.80 each. Issues new free print catalog every month and has special discounted items via web site and 800 number. Also has line of analog/quartz clock inserts and matching weather instruments (barometer, thermometer, hygrometer).

Clockparts.com 800-421-4445 http://www.clockparts.com
Offers an extensive free print catalog of quartz movements and parts. Specializes in replacement parts for clock repair. Carries atomic clock movements, a large assortment of weather instruments with matching clock inserts and a few complete clock kits.

Three Software Radios

By John Catalano

In this final part of our Software Definable Radio series, we have a surprise for you: instead of including the Yaesu FRG-100 in our comparison as promised last month, we have another new SDR which has just entered the market, RFSpace's SDR-14. Using the highly unscientific "Mark I eardrum" and lots of antenna switching, we will do some monitoring for real-time comparisons of FlexRadio Systems' SDR-1000, RFSpace's SDR-14, and one of the first computer-controlled receivers, ICOM's IC-PCR1000.

Let's start by introducing RFSpace's SDR-14 SDR and Spectrum Analyzer.

A Small Black Box

RFSpace recently introduced the SDR-14 to the market with these words, "The SDR-14 is a 14-bit software defined radio receiver. It offers a broad range of spectrum analyzer and demodulation capabilities. The hardware samples the whole 0-30 MHz band using a sampling rate of 66.667 MHz. The digital data from the ADC is processed into I and Q format using a direct digital converter (DDC). The I and Q data is then sent to the PC for processing using a USB 1.1 interface. All of the demodulation and spectral functions are done on the PC side."

The block diagram in Figure 1 clearly shows that, like FlexRadio's SDR-1000, the SDR-14 is a software defined radio with the amplified RF signal being fed into a fast analog to digital converter (A/D) without a heterodyne IF stage between it and the antenna! This configuration is defined as the **Ideal Software Radio** or ISR, a step up from the basic SDR concept. (*See sidebar definitions - ed*) Also notice the difference between the two software radios in the use of the PC's sound card by the SDR-1000. This processing is done internally by the SDR-14.

A direct input to the A/D converter is also provided which can be used to sample signals directly up to 200 MHz for use with downconverters. The SDR-14 can be used as a panoramic adapter by connecting this input to a communications receiver with an IF output, such as the ICOM R-71.

The included Windows software provides for demodulation of USB, LSB, AM, FM, WFM, CW, CWr and DSB. DRM is available via the use of third-party software (DREAM). The software also provides continuously adjustable filter bandwidths. Linux drivers are also available. The complete command structure is available so that anyone can write their own applications.

FlexRadio started this trend in early 2003 of providing completely open-source software. This allows any user complete access to all aspects, functions, algorithms and demodulation methods of the radio system, in contrast to manufacturers who do not provide access to their system source code and just allow users to interface with via "controlled" application modules. The analogy is similar to the difference between Windows and Linux. The Windows product is compiled software. It is an operating system that can be used and customized, but cannot be modified. Linux, on the other hand, allows the user full access to its operational source code/algorithms.

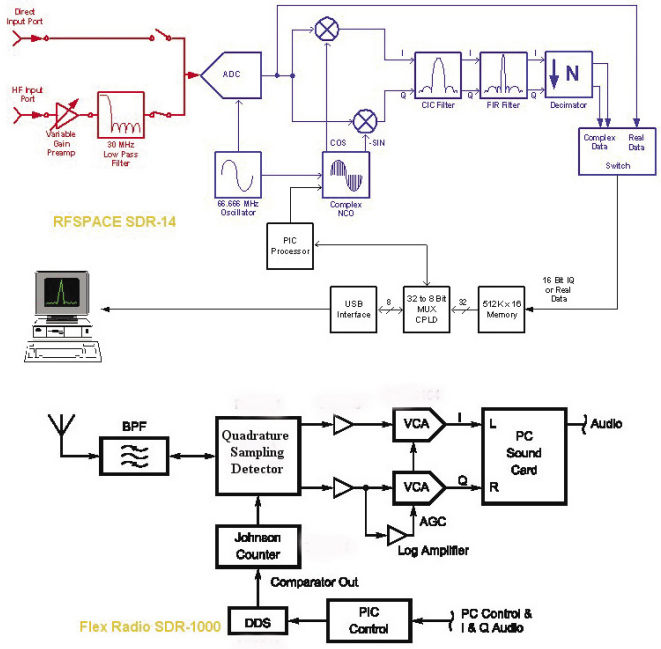


Figure 1 - RFSpace's SDR-14's Block Diagram (Top). Looking a lot like FlexRadio's SDR-1000 (bottom), with digital circuitry connected to the antenna. Notice SDR-14 does not use sound card in processing chain.

The SDR-14 is supplied with SpectraVue software by Moetronix, Figure 4. This software includes Raw I&Q, 2D, 3D, Continuum (power vs. time) and waterfall displays. Operation is very basic and does not include a frequency/mode database function. On the plus side, all operations are very intuitive and do not require any manual reading before you can begin SWLing. However, don't expect receiver monitoring features such as memory storage or direct access database. It does not yet exist. I'm sure with the openness of the software we will see many enhanced versions on the Internet.

Figure 2 - FlexRadio SDR 1000 Transceiver with RFSpace SDR-14 and ICOM PCR1000 receivers sitting on top.

The SDR-14 is capable of recording up to 150 kHz of spectrum to a hard drive in real-time at a rate of 52 GB/day. The stored file can later be played back and analyzed, using full frequency tunability in 1 Hz steps and changeable demodulation modes, just as if the 150 kHz worth of signals were being received "live."

The SDR-14 is about the size of the ICOM PCR1000. It comes with a small wall 12 volt power adapter, USB cable, 14 page *User Guide* with Circuit Basics and software on CD-ROM. One thing you may need to buy is an SMA to BNC adapter, since the SDR-14 uses all SMA connectors.

The SDR-14 was operated on a number of Pentium III PCs in the 800 MHz range, with 256 MEG RAM and Windows 95SE and XP. It operated without a problem on all systems. The software loaded quickly and is well behaved.

Comparing the Radios

The first thing that you will notice from Figure 2 is the size difference between the Flex Radio Systems SDR-1000 on the bottom, the RFSpace SDR-14 top right and the ICOM IC-PCR1000 top left. Remember, the SDR-1000 is a fully functional transceiver, with a 1 watt transmitter included. Space for a 100 watt power amplifier is provided for in its box.

Looking at the two block diagrams of the SDR-14 and the SDR-1000's receiver section in Figure 1, similar design philosophies are obvious. Less obvious is the method that two companies have chosen for their data link to the PC. The SDR-1000 uses the PC's parallel or printer port and the PC sound card input. The SDR-14 uses the USB port for digital signal transfer. The USB method is capable of processing up to 150 kHz

Summary of "Live" Monitoring Results

Receiver	SDR-1000*	SDR-14	PCR1000
WWV	1	1	3
AM - Strong Sig in Clear			
NY Aviation Radio	2	1	3
USB Strong Sig - QRM			
20 Meter Ham	1	2	3
USB strong sig - QRM			
40 Meter Ham	2	1	3
LSB very very weak sig			
QRM & QRN			
Overall			
Max sensitivity	3	2	1
Usable sensitivity	2	1	3
Selectivity	1	2	3
Sound Quality	2	1	3

*=transceiver

Figure 3 - Table of "Parallel" Monitoring Results - Using MK 1 eardrum and forty years experience

of signal bandwidth.

The SDR-14 comes with a power supply. The SDR-1000 does not.

The SDR-1000 uses BNC connectors; the SDR-14 uses SMA.

Top end of the SDR-1000 is 65 MHz. The top end of the receiver input of the SDR-14 is 30 MHz.

The resolution, or accuracy, of the A/D converter is different between the two SDRs. FlexRadio's SDR-1000 utilizes the sound card which typically has a 16 bit resolution, but can be as high as 24 bit, while RFSpace's SDR-14 uses a 14 bit A/D converter. On paper, the high bits should result in a listening difference. However, sound card qualities vary wildly. As we saw in Part 1 (Nov 2004), some sound cards will not work with the SDR-1000, and some give less than optimum SDR-1000 performance. The SDR-14 removes the sound card issues by performing that processing internally.

❖ Setting Up Listening Tests

Since each radio had a different interface to the PC (USB - SDR-14; Parallel - SDR-1000; and Serial - PCR1000) they were all connected to the same PC simultaneously. Some interference was noted from the SDR-14's USB port. In order to minimize cross interference, only one radio software was operational at a time. The PC used was an 800 MHz Pentium III, with 256 MEG of RAM running Windows XP Professional.

The antenna used was a coax-fed dipole cut to 7 MHz and connected to the radios via a B&W 5-position sealed antenna switch. Propagation conditions during most of the tests were terrible as a result of a severe solar storm.

The A-B-C testing of these radios were done within seconds of each other, using the same antenna and PC and the MK 1 eardrum. Although test equipment was available for exact measurements, even military contractors use on-air listening by experienced operators as the final test. As a shortwave listener with experience using receivers from many manufacturers over the past forty years, I guess I might qualify.

❖ The Test Performed

The receivers were controlled using the manufacturers' "stock" programs; therefore, the ICOM PCR1000 revision 2.2 software was used, not RadioCom. We will reflect on this choice later.

The radios were used in four different and varied monitoring situations:

1. WWV - Strong and in the clear AM signal.
2. NY Aviation Radio - Utility station, nearby stations QRM, USB signal
3. 20 Meters - Strong Ham station with nearby stations QRM, USB signal
4. 40 Meters - Very weak Ham station with noise QRN and nearby stations QRM, LSB Signal

These four presented varied listening environments while providing a challenging testing procedure.

❖ The Test Results

The test results are seen in Figure 3. As was previously stated, these tests were made while a major solar storm was coming off its peak, with reports of communications black-outs in all shortwave bands around the globe. The numbers in Figure 3 give relative ranking of the three receivers – a "1" grade being the top in producing the most intelligible signal.

In a number of situations, two receivers were so close in performance they should have been awarded ties. However, in order to give a level of performance differentiation, we made an admittedly subjective judgment. We made one exception. If you look at the "WWV" row, you will see that both ISRs performed perfectly equal in all respects and were both given a "1". In fact, the PCR1000 only missed a "1" because of its lack of variable filtering, giving the ISRs the ability to see and decode the signal sidebands.

The "Strong Ham USB signal on 20 Meters" was surrounded by lots of weaker, but still copyable ham stations. Here the SDR-1000 gave the cleanest results with the SDR-14 right on its heels. On both, the DSP filters gave a clean, stable result, but the SDR-1000 seemed to have finer filtering capabilities. The PCR1000 had some problems with the adjacent signals and what may have been front-end overloading, but it still gave acceptable results. In many tests, the PCR1000 indicated the most front-end gain. However, in a number of cases it was too much, allowing strong

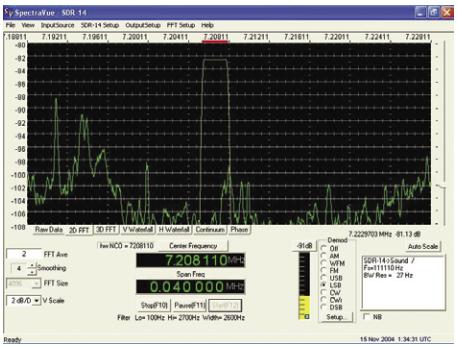


Figure 4- SDR-14's main operational screen showing a very, very weak signal that is still copyable.

WiNRADiO SDR Comment

Dear Editor,

In our view, the November, 2004 article, "Software Definable Radio Now Available to the Public" presented incorrect and misleading information to your readers. The statements "the world's first SDR that anyone off the street can buy," and "right now, you cannot get another SDR on the consumer market at any price," are not factual.

As correctly defined by the author, SDR is essentially a technology where a significant portion of the signal processing functions (especially demodulation) is performed in agile software, as opposed to traditional hard-wired circuitry. He refers readers to a good web site to view the professionally-accepted definitions of SDR: http://www.sdrforum.org/tech_comm/definitions.html

The writer also correctly states that a soundcard and PC-based software can be used to perform a SDR task to advantage. This is exactly what the WiNRADiO G3 series receivers has been doing for a long time – the first of three such products, the G303i, was released approximately two years before this article was printed (see http://www.winradio.com/g3).

The reviewer's impartiality is brought into question when he asks, "Is there a company providing an 'out of the box' software definable radio?", then answers "yes," and selects one recent manufacturer, even though our receiver has been extensively reviewed by MT and other reputable magazines.

The fact that our G303i receiver was the first commercially-available SDR was reported by the highly-respected WRTH (2004 edition), which awarded it a five star rating. Our prices, which have been lower than comparable stand-alone equipment, underscore our claim of the "first commercially available SDR receiver."

WiNRADiO appreciates this opportunity to correct the misstatements in the article. In addition, we invite fair competition, and this comment is in no way directed against the manufacturer being mentioned in the article.

Sincerely,
Milan Hudecek, Managing Director
WiNRADiO Communications

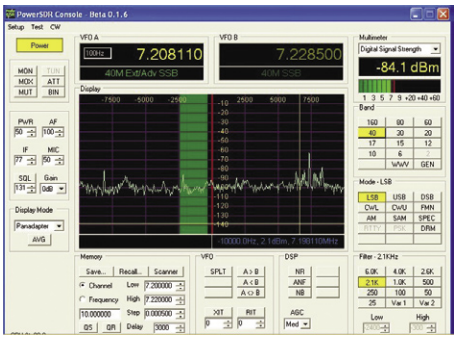


Figure 5 - SDR-1000 pulling the same extremely weak signal from out of the noise.

adjacent signals to enter.

Interestingly enough, the two SDRs switched rankings on the "NY Aviation Radio" medium strength USB signal. Here, there was a strong shortwave broadcast station nearby. All receivers again acquitted themselves with acceptable performance. The PCR1000 had the most problems, again possibly a result of overloading. However, the SDR-14 seemed to give better results on this medium strength signal during conditions of signal fade. This may be indicative of a sensitivity edge over the SDR-1000.

❖ Separating the Crowd

The toughest test was monitoring a very, very weak 40 meter (7 MHz) ham signal in the LSB mode. Weak signals were all around and on top of the target signal. Atmospheric noise was terrible. For all purposes the band should have been considered *dead*. Lots of signal fading was also present. During most of the time the PCR1000 did think the band was dead; words were intelligible about 10% of the time, only on signal peaks.

The surprise came when the antenna was switched to the SDRs. Both gave almost 90% copy, although their displays hardly indicated the presence of a signal (see figures 4 and 5). Notice that both signal meters and displays are indicating -84 and -91 dB, right down in the noise. The SDR-14 again seemed to have the edge. But here the SDR-1000's filtering methodology made up for some of the sensitivity difference for a very close race.

❖ Overall

Here we have to be very careful. The PCR1000 gave the impression of having the hottest front-end sensitivity. However, in some situations it was too hot, dragging in unwanted signals. It should be noted that the SDR-1000 was operated with its front end preamp in its lowest setting – 0dB versus a possible 24 dB gain setting.

For best "usable" sensitivity, both software radios were great. The SDR-14 receiver seemed to edge out the SDR-1000 transceiver. This small difference may be a result of loss in receiver/transmitter switching circuits.

❖ Be Selective

Selectivity was clearly won by the software radios, especially in high noise conditions. All three receivers have at least one form of noise reduction. The SDR-1000 has three. However, these tests were made without noise filtering. The SDR concept, coupled to the continuously variable DSP filters, make for an unbeatable combination. In selectivity, the SDR-1000 edged out the SDR-14, which may be a result of its high bit A/D converter.

Performing the selectivity test made me reconsider the choice of the PCR1000's software. If RadioCom, with its DSP filtering, had been used instead of the ICOM software, the selectivity results might have been closer. However, due to the software radios' open source programming there will no doubt be many third party programs springing up that may improve on their performance as well.

❖ Personal Taste

Sound quality – that intangible, personal preference – is hard to define. The SDR-14 seems to provide a more pleasing sound in most monitoring situations. This may be a result of its use of the PC sound card for an audio-only purpose, or it may be my taste.

❖ Conclusions

Don't sell the PCR1000 short. It performed adequately, took almost no computing power and is the least expensive of the lot. The IC-PCR1000 is available from a number of dealers, priced at around $400 plus shipping.

However, Software Definable Radios are here and rapidly developing. As compared to a computer-controlled receiver, they are the clear performance winners and the future of radio.

The SDR-1000 transceiver and the SDR-1000/RO receiver are available from Flex Radio Systems (**http://www.flex-radio.com**) for $875 and $676 respectively, plus shipping. The software is very monitoring friendly since it is designed for the Ham market. See their website for decoding programs which directly interface to it (such as MIXW reviewed in *Computers & Radio* July 2004 column).

The SDR-14 by RFSPACE (**http://www.RFSPACE.com**) costs $999 plus shipping. Its software is more in the style of test equipment with provision for screen capture. Currently no receiver frequency/mode storage database is provided. We will look more closely at the SDR-14's many features and functions in more detail in a future *Computers & Radio* column.

Enjoy being part of the biggest revolution in radio technology in the past 75 years – Software Definable Radios!

Four Tiers of Software Radios

From the SDR Forum website FAQ
http://www.sdrforum.org/tech_comm/definitions.html

The term "Software Radio" and many variants ... have been proposed to reflect various qualities of radio systems whose functionality is partially implemented in software ... A hierarchy of "Tiers" is proposed to describe various degrees of SDR implementation.

Tier 1. Software Controlled Radio

Radios in this category have control functionality implemented in software, but do not have the ability to change attributes, such as modulation and frequency band without changing hardware. This includes models with a switcher and a group of independent multiprocessors in a common case.

Tier 2. Software Defined Radio

The Tier 2 system provides a broad operational range under software control without hardware change. These systems are typically characterized by a separate antenna system followed by some wideband filtering, amplification, and down-conversion prior to receive analog-to-digital conversion ... This front-end equipment represents a constraint on the frequency coverage of the system and its performance. It may be necessary to switch antennas to obtain the entire frequency range.

Except for these constraints, however, the system is fully capable of covering a substantial frequency range and of executing software to provide a variety of modulation techniques, wide-band or narrow-band operation, communications security functions (such as hopping), and meet the waveform performance requirements of relevant legacy systems.

An SDR is also capable of storing a large number of waveforms or air interfaces, and of adding new ones to that storage through either disk or on-line load ... The system software should also be capable of applying new or replacement modules for added functionality or bug fixes without reloading the entire set of software.

Tier 3. Ideal Software Radio

This system has all of the capabilities of the Tier 2 system, but eliminates analog amplification or heterodyne mixing prior to digital-analog conversion. It provides dramatically improved performance by eliminating analog sources of distortion and noise.

Tier 4. Ultimate Software Radio

This system description is intended for comparison purposes rather than implementation. It is a small lightweight component with very small current drain that can easily be incorporated into personal devices. It requires no external antenna, and no restrictions on operating frequency. It has a single connector that delivers the desired information in the desired format, typically digital. The connector also accepts information, uses it to modulate a signal, and radiates that signal in the desired waveform or air interface.

The ultimate software radio also accepts control information through its connector to operate and reconfigure the operating software ... Further, it has a large amount internal processing capacity, so with appropriate software it can perform a wide range of adaptive services for its user.

John Catalano, PhD
johncatalano@monitoringtimes.com

DeLorme's Earthmate GPS

Miniaturization. If there is one word to define our 21st Century world, miniaturization may be it. Fifty years ago the Regency TR-1 was launched, heralding the first truly portable consumer electronics product – the AM (medium wave) transistor radio.

The other so-called portable radios used tubes and were never designed specifically for portability; in most cases, their batteries simply substituted for high line voltages. However, with the advent of the TR-1, a radio designed for portability was available to the public. Astoundingly, the TR-1 was so small it could be held in one hand. In fact, it was smaller than the high voltage battery that powered "portable" tube radios of the day!

This month we have the chance to use the very miniature DeLorme Earthmate GPS receiver. The Earthmate is the latest in DeLorme's line of GPS receivers, which were first introduced in this column a decade ago.

❖ In the Beginning

DeLorme's first GPS receiver was about the size of brick – a yellow brick. All of the subsequent versions are also yellow. Unique for the time, it had no display or controls and attached to a computer via the serial port. It was the "first" GPS receiver to be designed for use exclusively with a computer. It stopped me cold in the computer store when I first saw it.

Operating on its own set of batteries (lots of batteries), it only took about 5 minutes to receive and then align itself with the GPS satellites constellation.

DeLorme's main business is map making, and it showed in the feature-rich GPS receiver software that they produced. Although in the initial product, the resulting maps were in only two dimensions, they were the best non-military maps I had seen.

But the DeLorme's first GPS computer receiver also distinguished itself in another manner. It ate batteries. It seemed that the batteries just lasted long enough to get through the initial satellite alignment. (Not really. They actually lasted for about five hours of operation.) Not exactly "portable friendly." In fact, a battery eliminator which plugged into a vehicle's cigarette lighter was sold as an accessory.

A few years later in this column we tried DeLorme's next GPS offering. This time the yellow box was smaller, about the size of a pack of cigarettes. The number of batteries required also decreased. But the real news was the 3-D software that DeLorme had produced for use with it. This provided real, three-dimensional presentations that could be rotated and elevated to give 3-D color topographic of your location determined by the GPS receiver. Of course, these mapping programs could be used in a standalone mode without a GPS. But watching the "dot" move along the map as we used the laptop in the car was real high tech. Later software enhancements added operation on a Palm PDA with limited mapping capabilities.

Figure 1 Close-up of DeLorme's Earthmate on the left. The arrow points to Earthmate attached to laptop for relative size comparison …It's tiny

❖ Less IS More

The latest DeLorme GPS, Earthmate GPS is a mere 1-7/8 by 2-3/32 by 13/16 inches and easily fits in the palm of a hand. Figure 1 is a composite photo. A close-up of the Earthmate is shown on the left. But, its actual tiny size can be seen on the right of the laptop where it is connected to a laptop's USB port. It is really small. But size is not the only thing that DeLorme has improved.

The Earthmate GPS is a 12 Channel receiver that does a lot very quickly. It uses a SiRFstar IIe low-power chipset that takes 175 mW max and allows it to be powered from the USB port. Gone are the batteries. Hooray!

The chip-set boasts high sensitivity, giving Earthmate improved reception. Considering its diminutive size and the fact that it receives signals from over 12,000 miles away (up), this receiver easily beats my "longest DX per receiver cubic volume" record.

DeLorme's info says that the chip-set also allows for faster constellation lock-on times. We found that the first-turn-on lock-on times dropped from around three minutes in the last version to less than one minute, better than a 300% reduction. For higher positional accuracy Earthmate GPS is WAAS-enabled.

❖ What is WAAS?

WAAS, Wide Area Augmentation System, is a network of satellites and ground stations providing GPS signal corrections. The WAAS system uses twenty-five ground stations scattered around the USA that monitor and compare GPS satellite data. The Master stations, located on the East and West coasts of the USA, correlate the received data from all stations. Differences due to propagation, orbit anomalies, time standard drift and other factors are then computed and an "error correction" signal is transmitted up to a geostationary satellite. This additional "correction" data is then retransmitted to GPS receivers with WAAS capability. The result is positional accuracy of better than 12 feet from a receiver the size of a box of matches!

Okay, enough talk. Let's try Earthmate GPS.

❖ Connecting Earthmate to PC

Using the included six-foot long cable, the Earthmate connects to the PC's USB port. A suction cup, which attaches to the cable, allows positioning of the small yellow box on a windshield. If you are using a Windows 98SE PC, you may have to install a USB Human Interface Device driver from the original Microsoft Win98 disk. My Windows XP Sp2 PC recognized the Earthmate and already had the driver in the system.

The bundled DeLorme mapping software, *Street Atlas 2005 USA*, automatically reads GPS positional data from the Earthmate GPS receiver when it is connected to the USB port. The program can also be used manually without GPS data input. The minimum system requirements are: Windows 98/2000/Me with 64 MB RAM or Windows

Figure 2 – Navigating through Boston using Earthmate GPS and Street Atlas USA 2005

XP with 128 MG RAM, Pentium 300 MHz, CD ROM drive, 700 MB hard drive space and Internet Explorer 5.01 or later.

Of course, to use the Earthmate GPS the PC must have a USB port. However, you can purchase a cable that connects the Earthmate to a serial port and power via a connection to a vehicle's cigarette lighter.

The Earthmate GPS hardware "display" is simplicity itself. It consists of a tri-colored LED that indicates satellite acquisition modes: red for searching, yellow for two satellites lock, and green for at least three satellites lock.

❖ Using Street Atlas 2005

First, let me start by saying that this program has so many features and screens that it would be impossible to cover them all in one column. We will look at one mode of operation, GPS Trip Routing. We had to make a round trip from Concord, New Hampshire, to Randolph, Massachusetts, which is just south of Boston. On the way back to Concord we turned on the computer and Earthmate GPS.

Using a Pentium II 366 MHz laptop and with the Earthmate GPS sitting on the dashboard of the car, we started our trip back north, which took us through Boston. Figure 2 shows the main screen of Street Atlas 2005, just as we passed Exit 25 on Route 93 in Boston. The main two sections of the screen are the left and right map areas.

Figure 3 – The Real Deal. Topo USA's main screen. The right display shows an aerial photo of your actual position.

The map on the right has been zoomed in to a magnification of 12-4 as seen in the upper right. Our position, as determined by the Earthmate GPS, is indicated by the dot in the center of the screen next to the "25", marking exit 25. Our exact latitude, longitude and elevation can be seen on the right side of this screen. The dark line, which is actually brown in color, is our planned route. The map is rich in color detail. This map shows major highways, local streets, highway exits and markers for exits with lodging, food and fuel. Points of interest are also detailed, such as the *USS Constitution, Old Ironsides*, which can be seen just across the water to the northeast of our location. The user has the option of selecting what features to display. As we travel, so does the GPS "dot". The color of the dot corresponds to the acquisition mode of the GPS. (See above.)

The map on the right can be configured in a number of modes. Here we have a wider area of view centered on our actual position. There are many more features that can be displayed, including "turns" along the route. The program can also "speak" to you when you are approaching one of these route turns. That's pretty strange the first time it breaks the silence by giving you directions!

Not only does it speak, but it listens, too. The program can be trained to identify a number of voice commands. This is just one of many features we didn't try.

The large section along the bottom of Figure 2 holds many of these features under menus titled Map Files, Find, Print, Draw, GPS, Route, Info, Netlink, Voice, Map and Display. Most are self-explanatory, opening into detailed menus concerning their topics. The Handheld Expert reduces maps so they can be downloaded to PDAs. The NetLink menu becomes really interesting when used with DeLorme's other program, *Topo USA* version 5.0.

❖ A Picture = 1000 Words

Topo USA is another DeLorme program that can be used with the Earthmate GPS receiver. The instructions do not give minimum system requirements. However, it seemed to run slower than Street Atlas on my laptop, which may be indicative of its CPU hunger.

Just look at Figure 3. The right map again shows our GPS position on the now familiar Boston map. We have moved a bit farther north in our journey. But the left side is really something!

❖ Aerial Imagery

You are looking down at a picture of our exact location taken from an aircraft! Now not only can we follow our progress on a drawn map, but we can track our travel over an actual image of the area. Until recently this technology was reserved for military users. The left image can be zoomed in to a resolution which allows you to see the roof outline of individual houses.

A satellite image is also available, but was far less impressive, reminding me of blurry flight simulator landscapes. Both aerial and satellite images must be downloaded via the NetLink menu from DeLorme at an additional cost per square mile of photo downloaded. A few demo images are included with Topo USA v5.

The Topo USA comes with two other image formats, USGS Quads and Topo USA 5.0 Data Series, which are just as impressive when the terrain is mountainous. Rotatable and variable view angle three-dimension presentations again give 3-D color topographic presentations. But as we can see from the "Elevation" boxes in the figures, 14 and 10 feet, Boston sits near sea level and is graphically uninteresting.

❖ Just the Beginning

Earthmate GPS, coupled to these two programs – Street Atlas USA 2005 and Topo USA Version 5.0, is a winning combination. It was very other so-called portable radios used tubes anddifficult to narrow down the twenty-three screen shots I thought were interesting to two, and to leave out many useful and unique features.

Both programs are available separately. The Earthmate GPS receiver bundled with Street Atlas USA 2005 is reasonably priced at $129.95. Street Atlas alone is priced at $49.95. Topo USA version 5.0 costs $99.95. All three items are available from the DeLorme website **http://www.delorme.com** or by phone at 800-561-5105 or fax 207-846-7051.

Above all (sorry for the pun), I was most impressed with the sensitivity of the little Earthmate. This receiver grabbed satellite signals where other GPS receivers have failed. In fact, just laying on a desk inside the house near a window it was able do its stuff. Very impressive and very, very miniature.

What's NEW

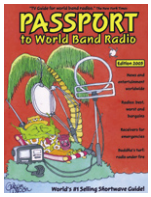
Tell them you saw it in Monitoring Times

Passport 2005

With hobbyists in the midst of the DX season, it's nice to have a reliable reference companion at your listening post. *Passport to World Band Radio*, entering its twenty-first year of publishing, continues to appeal to the casual program listener and advanced DXer.

The opening features, *Thailand-Radio Active and Laos: Radio Under Fire* will appeal to those interested in their respective radio scenes. I found both features fascinating and of interest even to the casual listener.

For the beginner, *Compleat Idiot's Guide to Getting Started* is an excellent intro. World times, finding stations, best times and frequencies for 2005, and finding the right radio will set you in the right direction. Now you're ready for the *Ten Easy Catches and Ten of the Best Top Shows* or *What's On Tonight* for program listeners



A large section covers *How to Choose a World Band Radio.* Radios covered include shortwave portables, table tops, and antennas in many price ranges. Trust me, you will find a plethora of receivers to add to your "want list."

The *Addresses Plus* sections contains by-county listings of addresses, key contact personnel, website addresses, and verification policies.

Passport's "blue pages," contain listings of stations in by-frequency order, a plus for bandscanning. Because of routine seasonal frequency adjustments, no reference guide can remain a definitive source. To compensate, *Passport* includes frequencies that contributors have previously observed being active. This should assist the listener.

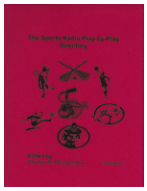
Passport 2005 continues to be an excellent reference to hobbyists for advice, receivers, and seasonal frequencies. *Passport to World Band Radio* is available through Grove Enterprises (7540 Hwy 64 West, Brasstown, NC 28902) at **http://ww.grove-ent.com** (or) 1-800-438-8155 for $22.95.

- Gayle Van Horn

The Sports Radio Play by Play Directory

Edited by Charles B. Montgomery

If you are a dyed-in-the-wool sports nut and like to listen to your favorite team on radio, then we have found the book for you. Charles Montgomery and Montgomery Publishing has recently released his first publication – *The Sports Radio Play by Play Directory*, *1st Edition*.



This unique directory contains listings for AM-FM radio stations in North America that carry play by play broadcasts for Major and Minor League sports teams in the following sports: Baseball, Basketball, Football, Hockey, Soccer and Lacrosse.

The user will find listings by sport, then by league and team. There are two cross reference listings, (1) sorted by state and city and (2) a by-frequency listing for both the AM and FM broadcast bands. Individual listings in each of the sections include station call sign, operating frequency, city/state of each station and Sport Team broadcast being carried. A random check of the listings found the directory to be accurate and up-to-date.

This comprehensive directory is available in two formats, print and Adobe Acrobat electronic portable document file (or PDF). The printed version is $19.95 plus $5 shipping in the United States. The electronic version, which is the same as the printed version, is only $14.95 and can be emailed at no extra charge. If you want the electronic version on CD-ROM add $5.

For more information you can contact Montgomery Publishing via email at: *orderinfo@montgomerypublishing.com.* Order forms are available at: **http:www.montgomerypublishing.com**. You can also reach the company through their mailing address at: 2311 North Millbrook Ave, Fresno, CA 93703.

- Larry Van Horn

2005 Tower Site Calendar

You missed getting for the best radio hobbyist calendar under the tree for Christmas, but you're still in time to order one for yourself for 2005. Now in its fourth year, the calendar features full-color pinups of broadcast transmitter sites throughout the US and Canada. The pictures are all distilled from photos taken by Scott Fybush, creator of Tower Site of the Week **http://www.fybush.com/featuredsite.htm** and NorthEast Radio Watch **http://www.fybush.com/nerw.html**

In addition to tower photos, each monthly page includes significant dates in radio and television history, as well as civil and religious holidays and major industry trade shows and events.

To order your copy of the Tower Site 2005 Calendar, send $16, postpaid ($17.32 includes sales tax for New York State residents) by check or money order payable to Scott Fybush to 92 Bonnie Brae Avenue, Rochester, NY 14618; or orders can be placed by credit card at **http://www.fybush.com**

Ease the Strain

Thinking about erecting a wire antenna? MFJ has a new line of Ceramic Strain Insulators for Constructing Wire Antennas. The insulators come in three sizes to accommodate different wire diameters from 3/15 to 5/16 inches and can be ordered separately or in packs of three. Prices range from $1.95 each to $3.95.

MFJ has lots of other nifty accessories like 12 pairs of Anderson PowerPole connectors for $10.49 (yes, the kind "Bright Ideas" keeps touting) and the Anderson PowerPole crimping tool for $9.95, 100 feet of 14 Gauge Copper Strand Antenna Wire for $11.95, or a 6-pack of the above bone-insulators for $3.95.

To order, get a free catalog, or for your nearest dealer, call 1-800-647-1800; or write to: MFJ, 300 Industrial Park Road, Starkville, MS 39759; or go online: **http://www.mfjenterprises.com**; or fax to: 1-662-323-6551.

Utility CD to be Released

The World Utility Network club is celebrating its 10th anniversary by releasing a new version of their CDROM. The previous two versions of the CDROM were widely recognized as exceptional products, including all the WUN newsletters and WUN's special topics reports, many info files, sound samples and pictures as well as several radio related computer programs. The last edition was released in 1999. The new edition is expected to be released before the end of 2004 and will reflect 10 years of utility loggings. Check the website at **http://www.wunclub.com** for price and availability. The CD is also available from Grove Enterprises **http://www.grove-ent.com**

Monitoring Times 2004

The anthology of all *Monitoring Times* issues for 2004 is now available in full color, searchable PDF format. If you're a current subscriber, this $19.95 CD can be yours at the discount price of $14.95. Take advantage of active links, printable pages, and all the benefits of owning the entire year contained on one CD. Call 1-800-438-8155 or email order@grove-ent.com to order or visit **http://www.grove-ent.com**

Updated with the help of some of the world's leading DXers and BCLs, we are proud to present the 2005 edition of the bestselling directory of world broadcasting on LW, MW, SW & FM

688 pages full of information:

- National and International broadcasts and broadcasters by country with frequencies, powers, languages, station addresses, email, web, phone and fax, leading personnel, QSL policy, and more
- Clandestine and other target broadcasters
- MW frequency listings by region
- International and domestic SW frequency listings
- International SW broadcasts in English, French, German, Portuguese & Spanish, listed by UTC.
- Equipment reviews, and articles on *Ancillary Equipment*, *Managing the HF Spectrum*, *World Music Radio*, and more
- TV by country
- Reference section with Transmitter Site Location Table, Standard Time & Frequency Transmissions, DX clubs, Internet Resources, and much more

Available December 2004

SOME COMMENTS ON WRTH 2004:

Again this year, I can recommend serious DX-ers to buy this "DX-ers Bible"! I have all Editions of the WRTH since 1961 in my collection and I am pleased to say that the 2004 Edition is the best! *Anker Petersen, Danish SW Club International*

I just got WRTH for 2004. It is so well done, I can't believe it! As I flip thru, picking various stations and countries - it's all there. I thought last year's WRTH was the end of the line, it could not get any better - this 2004 is superb! *H Ragan, USA*

The WRTH 2004 is super! *J Slavik, Czech Republic*

WRTH is excellent as usual *L Reeves, USA*

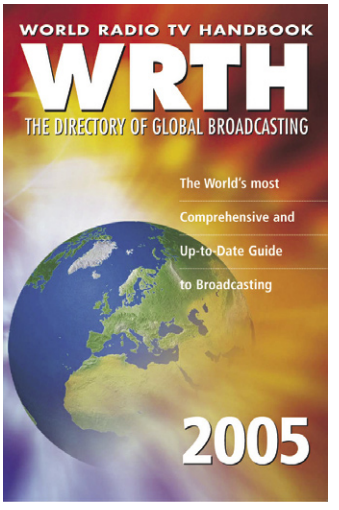
I highly recommend the World Radio TV Handbook as a convenient place to look up addresses - and much else. I often grab my copy and find stuff fast
Glenn Hauser, DX Listening Digest

WRTH 2004 is the first world class radio directory I ever came across *M Nanayakkara, Sri Lanka*

The bible for DXers is very, very good
P Bouças, S.Tomé and Principe

A great reference work for all radio hobbyists – the World Radio and TV Handbook 2004
Adrian Peterson, AWR Wavescan

Excellent publication
J Easterly, USA



Stock Exchange

LINE ADS
NON-COMMERCIAL SUBSCRIBER RATES: $.25 per word. All merchandise must be personal and radio-related.
COMMERCIAL, NON-SUBSCRIBER, AND MULTIPLE SALES RATES: $1.00 per word. Commercial line ads printed in bold type.

Ads for Stock Exchange must be received 45 days prior to publication date. All ads must be paid in advance to *Monitoring Times*.
Ad copy must be typed for legibility.

1-3/4" SQUARE DISPLAY AD:
$50 per issue if camera-ready copy or, $85 if copy to be typeset. Photo-reduction $5 additional charge. For more information on commercial ads, contact Beth Leinbach, 828-389-4007.

Satellite TV - Large selection of items at reasonable prices. We specialize in Big Dish TVRO C & Ku Band equipment. Check us out at:
http://www.daveswebshop.com

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