WWW.MONITORINGTIMES.COM

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

Monitoring® Times

A Publication of Grove Enterprises

Volume 32, No. 10
October 2013
U.S. $6.95
Can. $6.95
Printed in the United States

Build This 40-Meter, 2-Watt, CW Transceiver

In this issue:

- God and Shortwave Radio
- Chasing the Mysterious Dotcom Flights
- MT Reviews: AOR AR6000 Receiver

10
7 25274 74654 5

RETIREMENT SALE!

Bob and Judy are finally retiring! Their entire inventory is being offered at incredible savings to say thank you to our thousands of friends who have supported us for 35 years! Inventory will not be restocked and all sales are final, so order now before these bargains are gone!

www.grove-ent.com

Call 800-438-8155 or email order@grove-ent.com

The WiNRADiO *EXCELSIOR*™.

Nothing compares.

- **9 kHz to 3.5 GHz** (optionally extensible to 20 GHz)
- **16 MHz real-time spectrum**
- **1 GHz/s search speed**
- **2 simultaneous channels**
- **USB and PCIe models**
- **Optional APCO P25 decoder**

Is it a great receiver with an added spectrum analyzer?
Or a great spectrum analyzer with an added receiver?
You decide:

www.winradio.com/g39

WiNRADiO® by RADIXON®: Great receivers ahead of their time.℠

Monitoring Times

Vol. 32 No. 10 October 2013

Build This 2-Watt, 40-Meter, CW Transceiver 8

By James Kretzschmar AE7AX

Several years ago, retired dentist and amateur radio experimenter, James Kretzschmar AE7AX, got the thrill of his amateur life when he put his homebrewed, one-watt, 40-meter, direct-conversion, battery-operated, CW transceiver on the air.

Using just a dipole tossed on the roof of his house, his expectations were low. Then, booming out of his headphones, came his call sign right back to him. The other ham was 350 miles away! Using simple, easy to find parts, James shows how you, too, can join the homebrew, QRP fun. James writes, "We are amateurs and should experiment, gain experience, and learn something new!

About the cover:

With careful construction, excellent layout and a professional looking finished project, James Kretzschmar AE7AX, wants you to enjoy the fun of building this 40-meter, CW transceiver. (Photo courtesy of James Kretzschmar AE7AX).

C O N T E N T S

Chasing the Mysterious "Dotcom" Flights.....11

By C. L. "Cory" Koral K2WV

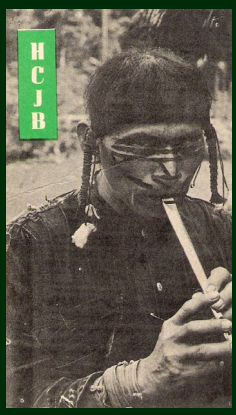
The more we monitor the radio frequencies, the more we think we know. But, that is not always the case. Over the years, lifelong air-band monitor, Cory Koral K2WV, has heard many strange things on the air-band. He's been a ham and a licensed pilot since he was a teenager and thought he understood every abbreviation used by Air Traffic Control (ATC).

Then, one day, he heard ATC giving approach instructions to a plane identified only as "Dotcom" followed by a number. At first, he believed it to be a start-up, low-fare airline, but soon discovered that he couldn't discover anything about the "Dotcom" identifier.

What was going on? How can some flights hide their tail numbers? Is this legal and, if so, why? Obsessed by finding out all he could behind this air-band mystery, Cory turned air-band detective to uncover a story of wobbly FAA rules, high-roller shenanigans, a public-interest watchdog that got to the bottom of the affair, and a powerful lobby that can change FAA rules to protect business interests.

In the Beginning: Shortwave and Religion 14

By Edward Kelly, Jr.



Today, American shortwave broadcasting is dominated by religious broadcasters. They pay the bills for many U.S.-based commercial shortwave stations and some are well enough endowed to host a global network of their own shortwave stations.

Starting with the first ever religious broadcast, which aired on KDKA, Pittsburgh, Pennsylvania, former pastor and longtime shortwave listener, Edward Kelly, Jr., explores the history of God and shortwave. In telling the story, Edward shows that some broadcasters from the beginning, even into today, may not be as close to godliness as they might wish.

R E V I E W S

AOR AR6000 Wide-Frequency Desktop Receiver 56

By Bob Grove W8JHD

With the current media frenzy regarding the National Security Agency's (NSA) global snooping, Bob Grove takes a look at a receiver you're not likely to ever see; the AOR AR6000. Available only to government agencies (NSA, for example), this receiver tunes continuously from 40 kHz through 6 GHz in steps as low as 1 kHz in AM, Synchronous AM, FM, Wideband FM, FM stereo, USB, LSB, and CW with an optional P25 decoder built-in.

Its 2,000 memory presets store frequency, mode, step, de-emphasis, AGC mode, CTCSS, DCS, auto-notch, antenna port and attenuator settings. But wait, there's more: it features five VFOs, DTMF tone decode, CW pitch control, noise reduction, noise blanker, keypad entry, a precision signal meter and an SD card port that can record enough data for an eight hour shift at the stakeout.

AR6000 Professional Grade 40 kHz ~ 6 GHz Wide Range Receiver

Now tunes to 6 GHz

Continuous Coverage That Goes Far Beyond!

The AR6000 *delivers continuous tuning from 40 kilohertz to 6 gigahertz in a wide variety of modes for professional monitoring performance that's nothing short of amazing in terms of accuracy, sensitivity and speed. Standard modes include AM, FM, WFM, FM Stereo, USB, LSB and CW. An optional module can add the capability to receive APCO25 digital communications plus an optional I/Q output can be added to capture up to one megahertz of bandwidth onto a storage device for later listening or signal analysis.*

Designed for the monitoring or technical service professional, there are no interruptions in the AR6000's tuning range. With exceptional tuning accuracy and sensitivity throughout its tuning range, the AR6000 begins at the floor of the radio spectrum and continues up through microwave frequencies so it can be used for land-based or satellite communications. It works as a measuring receiver for those seeking a reliable frequency and signal strength standard. To support its broad spectrum, the AR6000 has two antenna ports, with the added capability of an optional remote antenna selector from the front panel of the receiver.

With its popular analog signal strength meter and large easy-to-read digital spectrum display, the AR6000 is destined to become the new choice of federal, state and local law enforcement agencies, the military, emergency managers, diplomatic service, lab technicians, news-gathering operations and security professionals.

Continuously amazing, the AR6000 professional grade receiver features:

- 40 kHz ~ 6 GHz coverage with no interruptions
- Multimode AM, FM, WFM, FM Stereo, USB, LSB and CW
- Tuning steps of 1 Hz up to 3.15 GHz; 2 Hz from 3.15 ~ 6 GHz
- Receiver is programmable and manageable through a USB computer interface
- Up to 2,000 alphanumeric memory channels
- Analog S-meter, large tuning dial, front panel power, volume & squelch controls
- Direct frequency input
- Fast Fourier Transform algorithms
- An SD memory card port can be used to store recorded audio
- Two selectable antenna input ports plus optional remote antenna selector

Add to the capabilities of the AR6000 with:

- Optional APCO-25 decoder
- Optional interface unit enables remote control via the internet
- Optional I/Q output port allows capture of up to 1 MHz onto a computer hard drive or external storage device

AOR® Authority On Radio Communications

The Serious Choice in Advanced Technology Receivers

AOR U.S.A., Inc.
20655 S. Western Ave., Suite 112
Torrance, CA 90501, USA
Tel: 310-787-8615 Fax: 310-787-8619
info@aorusa.com • www.aorusa.com

Available in the US only to qualified purchasers with documentation. Specifications subject to change without notice or obligation.

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

Copyright © 2013 Grove Enterprises, Inc. Periodicals postage paid at Brasstown, NC, and additional mailing offices. Short excerpts may be reprinted with appropriate credit. Complete articles may not be reproduced without permission.

Address: 7540 Highway 64 West, Brasstown, NC 28902-8079
Telephone: (828) 837-9200
Fax: (828) 837-2216 (24 hours)
Internet Address: ***www.grove-ent.com*** or ***www.monitoringtimes.com***
Editorial e-mail: ***editor@monitoringtimes.com***
Subscriptions: ***order@grove-ent.com***

If your subscription extends into 2014 and you desire a refund for that extension, please call (800) 438-8155 toll free, or (828) 827-9200 direct, or email belinda@grove-ent.com.

Monitoring Times is no longer accepting article submissions.

Postmaster:
Send address changes to *Monitoring Times*, 7540 Highway 64 West, Brasstown, NC 28902-8079.

Disclaimer:
While *Monitoring Times* makes an effort to ensure the information it publishes is accurate, it cannot be held liable for the contents. The reader assumes any risk for performing modification or construction projects published in *Monitoring Times*. Opinion or conclusions expressed are not necessarily the view of *Monitoring Times* or Grove Enterprises.

Subscription Questions?
belinda@grove-ent.com

Owners
Bob and Judy Grove
judy@grove-ent.com

Publisher
Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Managing Editor
Ken Reitz, KS4ZR
editor@monitoringtimes.com

Assistant and Reviews Editor
Larry Van Horn, N5FPW
larryvanhorn@monitoringtimes.com

Editor Emeritus
Rachel Baughn, KE4OPD

Art Director
Bill Grove

Advertising Services
Larry Van Horn, N5FPW
(828) 837-9200
advertising@monitoringtimes.com

Table Of Contents

Letters 6
A sampling of reader's comments on the close of MT; Upset over fluorescent bulb replacement; More narrowbanding fallout; Missing TV channels on Roku.

Communications 7
More Public Safety Radio Follies; DoD Ends "Space Fence," Saves $14 million; SpaceX Snags more Satellite Contracts; Cord-Cutters Fleeing Cable, Satellite-TV; California CB/Ham Shop Busted; FCC Invades NYC: 21 Pirate FM Stations Busted; GPS Jammer Use: $31k Fine.

Scanning Report 16
By Dan Veeneman
Monitoring Virginia STARS and Erie County, PA.

Ask Bob 19
By Bob Grove W8JHD
Reduced reception with fiberglass whip; Is DES still authorized for public safety?; Mounting an external antenna for SWL; Proper use of RF gain control on receiver; VOA sub-audible tones during the 50s and 60s?; Natural gas detectors; Gold-plated audio and antenna connectors; Embassy antennas prior to WWII.

Utility World 20
By Hugh Stegman NV6H
U.S. Coast Guard Drops 2 MHz Services

Digital Digest 23
By Mike Chace
The Army MARS TSA HF Network

On the Ham Bands 24
By Kirk Kleinschmidt NT0Z
Adventure Beyond PSK31

Beginner's Corner 26
By Ken Reitz KS4ZR
Repeater Silence, Missing WiFi Radio Stations, FTA-OTA-TV Reception and Rural Broadband

Programming Spotlight 28
By Fred Waterer
Two Stalwart SW Broadcasters Keep the Quality High

QSL Report 29
By Gayle Van Horn W4GVH
QSL Contact Updates

English Language SW Guide 30

Milcom 42
By Larry Van Horn N5FPW
Military Tanker Call Signs and Frequencies

Fed Files 44
By Chris Parris
Internal Revenue Service Radio System Update

Boats 46
By Ron Walsh VE3GO
End of Some Eras

Below 500 kHz 48
By Kevin O'Hern Carey WB2QMY
Gearing Up

Radio Restorations 50
By Marc Ellis N9EWJ
Read This before You Plug it In!

Broadcast Bandscan 52
Doug Smith W9WI
What is Interference?

Antenna Topics 54
Dan Farber
The Big Dipole Revisited: What I Did On My Summer Vacation

First Look 56
By Bob Grove W8JHD
AOR AR6000 Wide-Frequency Desktop Receiver

Global Net 58
By Loyd Van Horn W4LVH
The "Other Side" of Internet Radio

What's New 59
By Larry Van Horn N5FPW
ALPHA~NODE™ Hub; MFJ SSB Adventure Series Transceivers; MFJ-941EK Antenna Tuner Kit; World's Largest HF+6M SWR/Wattmeter; Cushcraft R9 Antenna (6-80 Meter Vertical); DZKit Releases its New Sedona Enclosure; Ten-Tec Announces Two New Products

You may contact any *MT* staff writer by email by combining their ***first and last name @ monitoringtimes.com.*** By postal mail, you may write them in care of *MT* Headquarters in Brasstown. Please enclose a self-adressed, stamped envelope if you wish the columnist to reply.

SEE More and HEAR More!

With the SR2000A and AR8200MkIII from AOR

SR2000A Color Frequency Monitor

The SR2000A is an ultra-fast spectrum display monitor that lets you SEE received signals in FULL color.

Using the power of FFT (Fast Fourier Transform) algorithms with a sensitive receiver covering 25MHz ~ 3GHz, the SR2000A features a color monitor that displays up to 40MHz spectrum bandwidth**, a switchable time-lapse "waterfall" display or live video in NTSC or PAL formats.*

Ultra sensitive, incredibly fast, yet easy to use with a high quality internal speaker for crisp, clean audio signals. Scans 10MHz in as little as 0.2 seconds! Instantly detects, captures and displays transmitted signals. PC control through RS232C serial port or USB interface. With 12 VDC input, it's perfect for base, mobile or field use.

AR8200MkIII Handheld Receiver

From inter-agency coordination to surveillance, you can't know too much. The world-class AR8200MkIII portable receiver features a TXCO that delivers solid frequency stability and performance not found in most desktop units. With 1,000 alphanumeric memory channels, it covers 500 KHz ~ 3GHz. Improved RF circuits combine greater sensitivity, resistance to intermod and enhanced Signal to Noise ratio. It offers increased audio frequency response and includes NiMH AA batteries that can be charged while the unit is in use.*

Optional internal slot cards expand the AR8200MkIII's capabilities. Choose from Memory Expansion (up to 4,000 memories), CTCSS Squelch and Search, and Tone Eliminator.

The AR8200MkIII offers "all mode" reception that includes "super narrow" FM plus wide and narrow FM in addition to USB, LSB, CW and standard AM and FM modes. It also features true carrier reinsertion in USB and LSB modes and includes a 3KHz SSB filter. The data port can be used for computer control, memory configuration and transfer, cloning or tape recording output.

A special government version, AR8200MkIII IR features infra-red illumination (IR) of the display and operating keys. The IR illumination function is selectable, allowing operation by users wearing night vision apparatus without removing goggles and waiting for the eyes to re-adjust. Ideal for military, law enforcement and surveillance operators.

AOR®
Authority on Radio Communications

AOR U.S.A., Inc.
20655 S. Western Ave., Suite 112, Torrance, CA 90501, USA
Tel: 310-787-8615 Fax: 310-787-8619
info@aorusa.com http://www.aorusa.com

** Government version, cellular blocked for US consumer version.*
***No audio is available when the frequency span is set to 20MHz or 40MHz.*
Specifications subject to change without notice or obligation.

SEE more and HEAR more with AOR, the serious choice in Advanced Technology Receivers™.

to the editors

editor@monitoringtimes.com

This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com

Happy monitoring!

Ken Reitz, Editor

MT Farewell

Many *MT* readers wrote following the announcement of the magazine's closure with the December, 2013 issue. Bob and Judy appreciate all the good wishes for their retirement that poured into *MT* headquarters. Here are just a small sample of the comments received:

Jim Gershman, K1JJJ, Warwick, Rhode Island:

"Your mag just got better and better over the last few years. It's no exaggeration to say that I'll miss *MT* almost as much as I would a regular letter from a friend who's gone."

Robert Gulley AK3Q, Bellevue, Kentucky:

"This is a sad day indeed. The world will be, for me, just a bit dimmer."

David Whitten, Waco, Texas:

"This is like losing one of the Rolling Stones or Beatles, a heavy weight in the scanning industry. I will certainly miss you all. Nobody has come close to your standards of excellence."

John Antonuk, Two Rivers, Alaska:

"I've been a reader since about 1980. Thanks for all the hard work and inspiring information."

Michael Elcsisin KK2DOG, Philadelphia, New York

"Thanks, Bob, you're one of the true 'hero's' that this hobby has and you're going to be sorely missed."

Bud Stacey KC4HGH, Satsuma, Alabama:

"Saying 'thank you' seems so inadequate, but I wanted to say it any way."

Stan Farley N0ABA, Wichita, Kansas:

"My wife is a retired middle school teacher, and we always kept the most recent issues of *MT* next to the shortwave receiver in her classroom. A lot of kids had a lot of fun and education thanks to your magazine."

Lynn Kelly:

"The end of *MT* and Grove Enterprises creates a void in what's left of this hobby and in the hearts of your readers."

Jerry Berg:

"You folks have done a tremendous job serving the monitoring community and will be sorely missed."

John Maikisch K2AZ, Seattle, Washington:

"We are all, of course, very sorry to see *MT* go the way of the times. It is refreshingly unique and there is really no single replacement."

Robert Crain N3HFP, Annapolis, Maryland:

" As a charter subscriber, I wanted to thank you for a long run."

Don Schimmel:

"I recall way back when I wrote for *MT*, it had started in a newspaper format. Through the years you excelled in keeping the SWL community up to date with the latest details on the various phases of monitoring and monitoring equipment. *MT* will be sorely missed by all. Best of luck in your retirement."

J. J. Owens, North Carolina:

"I have been with you since 1982 and I own every *MT* ever printed. I was always an *MT* fan and a Bob Grove fan."

Upset over LED Bulbs

Dale Svetanoff WA9ENA from Monticello, Iowa, writes:

"In the July, 2013 'Ask Bob' column, you replied to a reader that 'conventional' fluorescent tubes were being phased out. Unfortunately, you did not indicate that replacement types would be available that meet the efficiency requirements. This situation is given in the very link you provided to the reader (and the rest of us). I came away with the impression that I would have to replace all of my 4-foot linear tube fixtures (about 18 of them!) with LED-equivalents. I am glad to see that is not the case.

"I don't mind that I may have to settle for the higher efficiency tubes as replacements, but I most definitely do not want LED lamps as replacements. Why? Because, thanks to Energy Star requirements and el cheapo/sleazy manufacturers, those LEDs will almost surely be powered by switching power inverters that scream hash all over the HF radio spectrum (and often into the VHF spectrum, as well). How do I know? I am an EMC engineer by profession, and these switching supply disasters are popping up all over. The best cure is to deposit any such power supply in the nearest trash can and design/build a linear equivalent with a real iron core transformer and associated components. Sadly, not many folks can or will do that these days.

"Thank you for the link to the Philips info page. I am now a lot less upset than when I first read your comments."

Bob Grove responds:

Thanks, Dale, for bringing this oversight to light. Hopefully, the LED marketers will reduce the RFI radiation to a minimum. Only time will tell. For those who missed the aforementioned link, here it is: ***http://applications.nam.lighting.philips.com/cmolegislation/index.php#2***

More Narrowbanding Fallout

Jeff Rehm, an EMT from St. Louis, Missouri, writes:

"I just wanted to comment on my own reception issues now that narrow banding has taken effect. I have to agree for the most part with the other reports coming from your readers as well as those people I know and work with.

"Overall, reception has been degraded a bit and it is making it harder to listen especially to VHF high-band frequencies. It is hard to put my finger on it because different technical situations mean different results for each person trying to monitor new narrowband frequencies. I can still hear the voice and the end result is that the transmissions are getting through, but it's like I am listening to the same channel, same frequency, same agency, but now someone has moved the transmit tower 25 miles farther away.

"There is a distinctive hiss, if you will, and I just can't get the volume up like before the change, even after changing my settings to NFM from FM. Most of what I hear, but not all, is not the big, loud and strong signal from eight months ago. Even the two-way professional radios I use at my local EMS agency seem degraded. The 'distance' we used to have on our UHF signal has been degraded quite a bit. We start getting broken transmissions/reception much sooner than before the switch."

Bob Grove responds:

This is typical of reception on a wideband receiver when listening to narrowband signals. It is similar to using the wideband FM (WFM) position to hear narrowband FM (NFM) signals – the hiss is much greater, thus interfering with voice reception, because the receiver is sampling too wide a swath of spectrum to hear just the narrow channel being used. Most of what it hears is the noise on either side of the signal frequency. Older scanners designed for 25 kHz deviation (bandwidth) are now hearing 6.25 and 12.5 kHz signals, so the noise on either side diminishes receivability, especially on fringe signal strengths.

Missing TV Channels on Roku

Clark Rennie writes:

"After reading your story on the Roku (*MT* August, 2013), I purchased a refurbished 2XD from Roku, which operates perfectly, for $60.00. I added some private channels and have a question. Two of the channels that you mentioned, Aljazeera and BBC will not load. Is this a common problem?"

Author John Biggs responds:

"The problem with the private channels is that they come and go without warning. Up until July 17th, the BBC World News channel was working. According to ***streamfree.tv****, it has been added to their group of "dead" channels, meaning that it has become no longer available, or as they put it "broken." I checked into Al Jazeera and I also could not get the code to work on my Roku LT. However, BBC World News, BBC News and Al Jazeera are still available on Nowhere TV (code:H9DWC) in the International Channels under BBC. In addition, Al Jazeera is also available on LiveStation (code:livestation) in English and in Arabic languages.*

"Google 'private channels on roku' and you'll find several resources for private channel codes. I frequently check ***streamfree.tv/apps*** *and* ***http://mkvxstream.blogspot.com/2013/03/roku-private-channels-2013-roku-channel.html*** *for new channels. I hope this information helps!"*

COMMUNICATIONS

by Ken Reitz KS4ZR

Communications is compiled and edited by Ken Reitz KS4ZR (kenreitz@monitoring-times.com) based on clippings and links provided by our readers. Many thanks to this month's fine reporters: Anonymous, Bob Grove, Norm Hill, Lynn Kelly, Steve Karnes, and Larry Van Horn.

More Public Safety Radio Follies

The Riverside California *Press-Enterprise* detailed the woes of that California county's public safety communications system in an article from July 23, titled, "Riverside County: $173 million Radio Network Remains Offline." That county's board of supervisors allocated $148 million in 2007 for a system that was to be finished in 2010. Six years later the system is three years overdue and has somehow added another $25 million to the tab. Not only that, but the system is now expected to need $14.2 million per year in maintenance, instead of the originally projected $6.7 million per year upkeep.

DoD Ends "Space Fence," Saves $14 Million

According to an announcement from the U.S. Air Force Space Command (USAFSC), it plans to discontinue its Space Surveillance System (AFSSS). The system, known as the "Space Fence," has been in operation since 1961 and consists of three transmitters and six receivers on the 33rd parallel, stretching along the southern U.S. The transmitters include ones at Jordan Lake, Alabama.; Lake Kickapoo, Texas, and Gila River, Arizona. The six receivers are located at Tattnall, Georgia; Hawkinsville, Georgia; Silver Lake, Mississippi; Red River, Arkansas; Elephant Butte, New Mexico, and San Diego, California. The two receiver sites at Tattnall and Silver Lake were deactivated in April of this year.

The radar transmitters used in this system were also used by amateur radio astronomers in tracking meteors and other objects entering the atmosphere from space. *MT* amateur radio astronomy columnist, Stan Nelson KB5VL, noted, "I have been planning for the demise of AFSSS, so now is a good time to get on with the newly discovered fact that digital TV (DTV) has a carrier to use instead. I am listening to the echoes on a monitor right now and getting good results." USAFSC noted that closure of the outmoded system would save $14 million each year. To hear meteor echoes on Space Weather Radio go here: **http://spaceweatherradio.com**.

SpaceX Snares More Satellite Contracts

The private space launch company known as SpaceX, founded by Elon Musk, also the brains behind Tesla Motors, has signed a number of contracts for additional space launch activities. August 8, according to a company press release, SpaceX was awarded the 2018-19 launch of a German radar reconnaissance satellite system which will serve the German Ministry of Defense. The company earlier received a launch reservation contract for the largest Canadian space program to date: the launch of three RADARSAT satellites aboard SpaceX's Falcon 9 launch vehicle, also in 2018. According to a company press release, "the three satellite configuration will support Canada's need for maritime surveillance, disaster management and ecosystem monitoring."

The company continues to supply the International Space Station via its unmanned supply vehicles and has been testing its own unmanned, 10-story, rocket (codenamed, Grasshopper), designed take off, fly missions and return safely to the launch pad. On August 13th, Grasshopper completed a divert test, flying to 250 meters altitude with a 100 meter lateral maneuver before returning to the center of the pad from which it was launched. You can see video of that launch here: **www.spacex.com/news/2013/08/14/grasshopper-100m-lateral-divert-test.**

Cord-Cutters Fleeing Cable, Satellite-TV

According to an article in *Media Daily News,* more than a half-million cable-TV subscribers and 162,000 satellite-TV subscribers cut the cable and satellite cord in the second quarter of 2013. This compares to a nearly equal amount of cable-TV defections in the same quarter 2012, but a considerable rise in satellite-TV defections: 62,000 in 2Q, 2012. Cable-TV providers such as FiOS and U-Verse also supply high-speed Internet to millions of homes, but allow customers to de-bundle Internet service from cable service.

It's believed that most of the defections are keeping their Internet service and taking advantage of online streaming of content such as Netflix and Hulu. Satellite-TV provides no such option, though a certain amount of monthly subscription cancellations has to do with normal "churn," accounts shifting from one satellite-TV provider to the other to take advantage of special "teaser" rates.

Among the cable-TV defectors were those subscribers affected by Time-Warner Cable's carriage dispute with CBS Network TV. That caused a run on OTA-TV antennas in the New York metro area that saw some stores' stock of antennas depleted, according to media reports. What's available for free, Over-the-Air (OTA), where you live? Check out this site: **www.gomohu.com** and enter your Zip code. A list of stations, and a map of their transmitter locations relative you where you live, is displayed.

California CB/Ham Shop Busted

DNJ Radio of Fremont, California was issued a Citation and Order (C&O) by the FCC on August 15, 2013, for offering for sale non-certified linear amplifiers and linear amplifier kits capable of operating on both the Citizens Band and amateur radio service 10 meter band. The C&O notes that the website included a disclaimer that such devices were not legal on the 11 meter band in the U.S. The C&O also states, "The amplifiers in question, however, are being offered for sale from within the United States and anyone within the United States could buy the devices regardless of the disclaimer."

FCC Invades NYC: 21 FM Pirates Busted

Camped out in the New York City area from July 22 to August 1, FCC field agents cast their nets about the boroughs and dragged in 21 big-time FM pirate broadcasters. The haul included 15 stations in Brooklyn operating on 15 different frequencies. All operated at over 250,000 micro-volts per meter (uV/m) with most stations putting out more than 400,000 uV/m. One station was cranking out more than 1,000,000 uV/m at three meters.

Comparatively smaller operators in the Bronx included one operating on 92.1 MHz at over 300,000 uV/m at three meters and a realty corporation on 88.7 MHz at nearly 500,000 uV/m. One lone AM pirate was busted operating on 1710 kHz at 3,100 uV/m at 474 meters. Maximum allowed at that frequency under Part 15 rules is 30 uV/m at 30 meters. Operators out of Queens were busted on 91.9 MHz at over 500,000 uV/m at 516 meters and one lowly operator on 105.7 at a mere 77,000 uV/m.

But, one New York City operator may have the all-time QRO (high-power) FM pirate award. That station, measured by the FCC field agents, bent the needle on 95.3 MHz at an astounding 6,962,908 microvolts per meter (uV/m) at three meters. Maximum allowed under Part 15 rules is 250 uV/m at three meters. That station was probably heard in three states.

GPS Jammer Use: $31,000 Fine

On August 3, 2012, the FCC's New York office received a complaint from the Federal Aviation Administration that the Port Authority of New York and New Jersey had been experiencing interference during pre-deployment testing of a ground-based augmentation system (GBAS) at Newark Liberty International Airport. The GBAS provides enhanced navigation signals to aircraft in the vicinity of an airport for precision approach, departure procedures, and terminal area operations.

Agents, using signal direction-finding equipment, pinpointed the location of the interference to a New Jersey man's pick-up truck. Stopped at the security gate at the airport and inspected by Port Authority police, security personnel and FCC field agents, according to FCC documents, "The man admitted he had installed and operated the jamming device in his company-supplied vehicle to block the GPS-based vehicle tracking system that his employer installed in the vehicle. He voluntarily surrendered the jammer to the FCC agent. After the jammer was removed from the [vehicle] and turned off, the agent confirmed that the unauthorized signals had ceased." The FCC finally got around to assessing a fine, one year later in the amount of $31,875.

Build This 2-Watt, 40-Meter CW Transceiver

By James Kretzschmar AE7AX
(Photos, diagrams and schematics are courtesy of the author.)

One of the biggest thrills in my life was my very first CW amateur radio contact. It was a cold, winter day in Fort Worth, Texas and I was calling CQ on a homemade, one-watt, direct conversion, battery operated, transceiver that I had built. The dipole antenna was laying on the roof and I was pretty certain that my signal was not getting out much beyond the house. To my great surprise my call sign came booming out of the headphones from another amateur operator in Wichita, Kansas. Imagine, a homemade radio, constructed from gathered-up parts, that reached over 350 miles away! With this project, maybe you too could experience such a thrill.

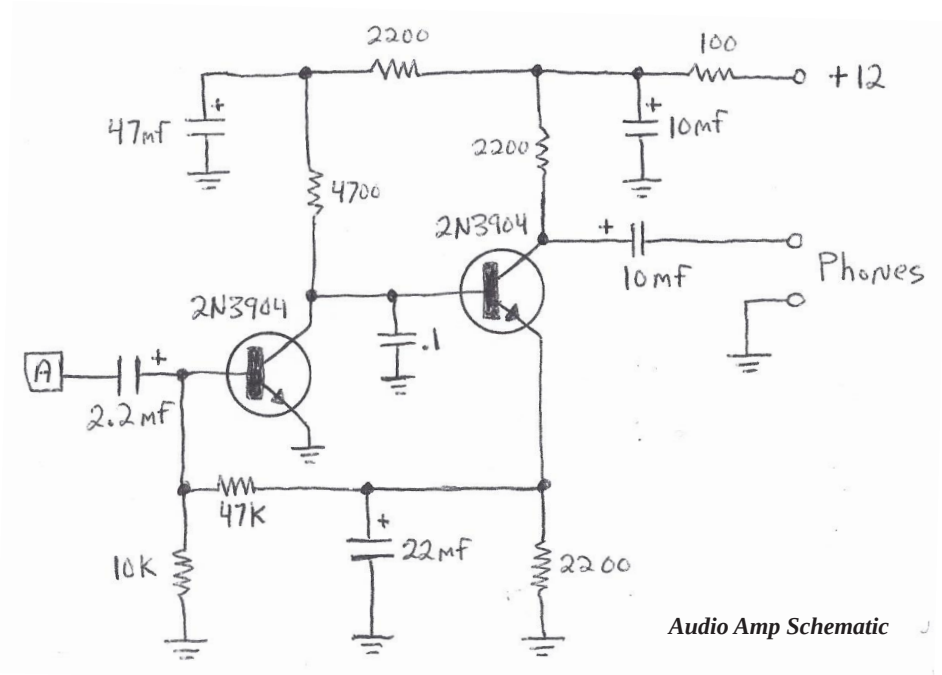
These days, there are a variety of low-power (QRP) kits available that provide amateurs with the opportunity to dabble in radio construction. However, nothing beats the experience of planning out your project the way you would like it to be, gathering up the parts, and experimenting. In the process, you will also learn a great deal about electronics.

The intent of this presentation is not to provide an article for exact duplication of the transceiver that I built, but to provide enough information so that someone who has never ventured into building, could reasonably expect to have success. I have included templates for circuit boards that I prepared using a motor tool with a small cutting disk. No etching is required, or drilling of holes, because the parts are soldered on the foil side of the circuit boards.

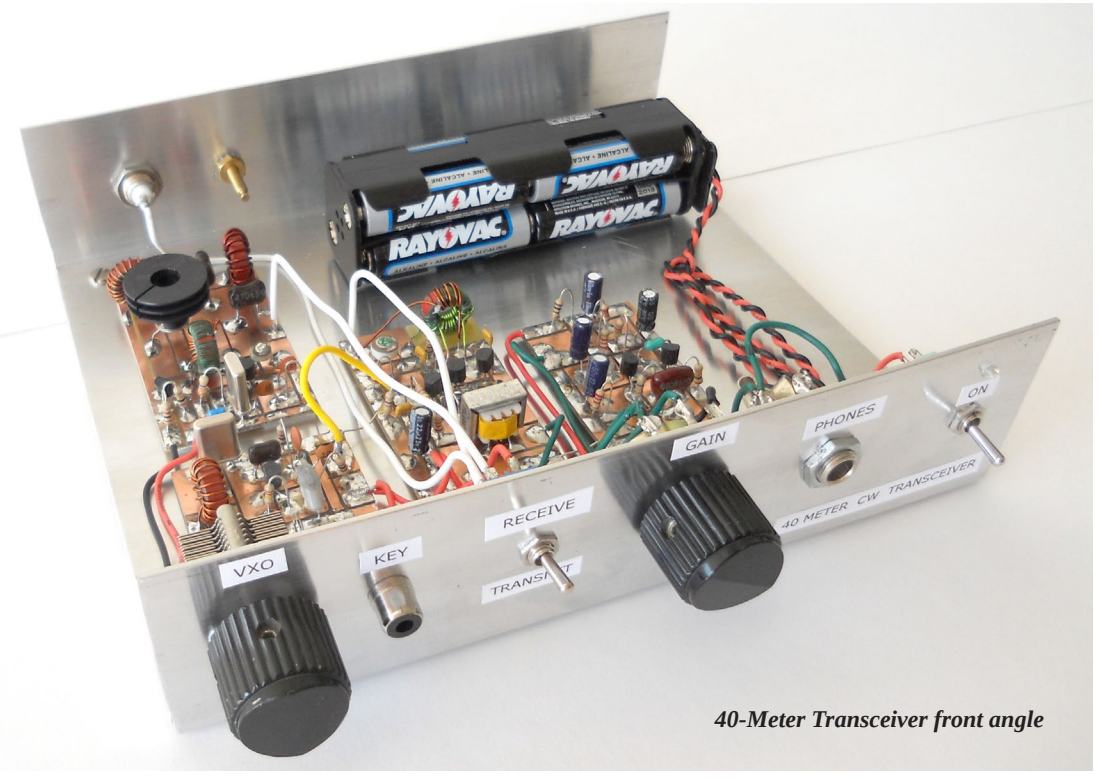
Description

Direct conversion receivers have been around for a long time and work well. Most of the time, the receiver and the transmitter share the oscillator in order to decrease the number of parts and to save space. However, if someone is calling you on your exact frequency, you won't be able to hear them. I have seen different ways to slightly vary the oscillator frequency, but when you adjust to receive their signal, the next time you transmit, the amateur you are communicating with will be chasing your signal. To get around this issue, I have left the transmitter oscillator fixed and use a separate oscillator for the receiver that can be slightly varied.

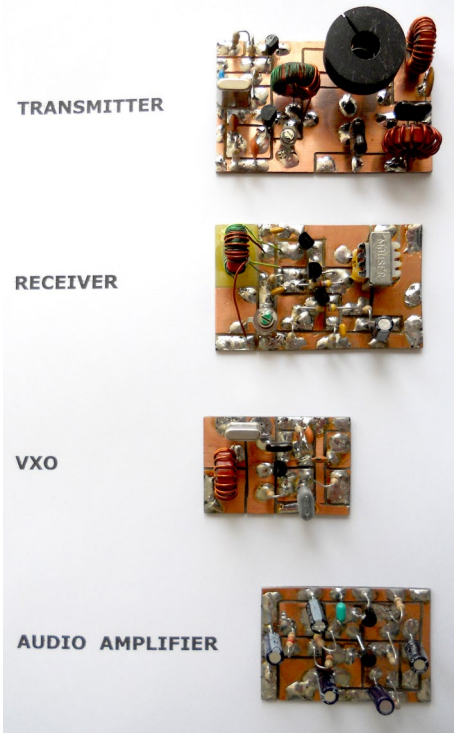
Many years ago, some direct conversion circuits used a CA3028A integrated circuit (IC). This now obsolete IC had a differential amplifier used as a product detector. The internal schematic diagram consists of three NPN

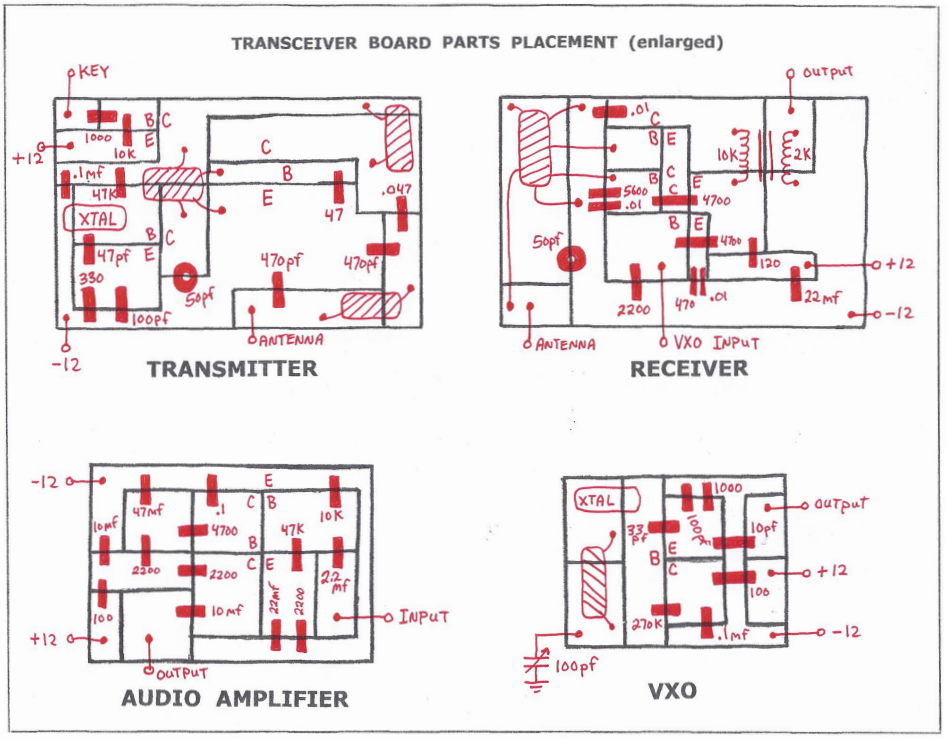


Audio Amp Schematic



40-Meter Transceiver front angle





transistors and three resistors. Following the internal diagram of the CA3028A, I experimented one day and configured three 2N3904 transistors and the appropriate resistors into a direct conversion receiver and it worked great.

This receiver uses that same configuration. The two-transistor audio amplifier provides enough gain to adequately power a pair of 8 ohm headphones. The transmitter is a simple oscillator and power amplifier circuit that draws about 250 ma and generates roughly about 2 watts of RF power. With the PNP transistor keying both the oscillator and the power amplifier, the signal is clean and does not chirp.

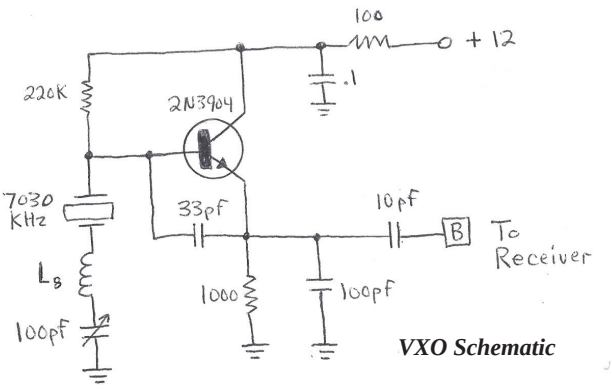
Parts

I have been building small, electronic projects for many years and I am very fortunate to have well-stocked parts drawers. I acquired most of my parts by scavenging parts from discarded or very inexpensive, obsolete electronic equipment. Hamfests are a great source for parts and, many times, good parts can be obtained for free. Some parts, such as particular crystals, toroids, or transformers have to be obtained elsewhere. There is a list of suggested parts suppliers and at one time or another I have placed orders with these companies. Sometimes you just cannot find the exact part called for in a schematic diagram and you have to get creative.

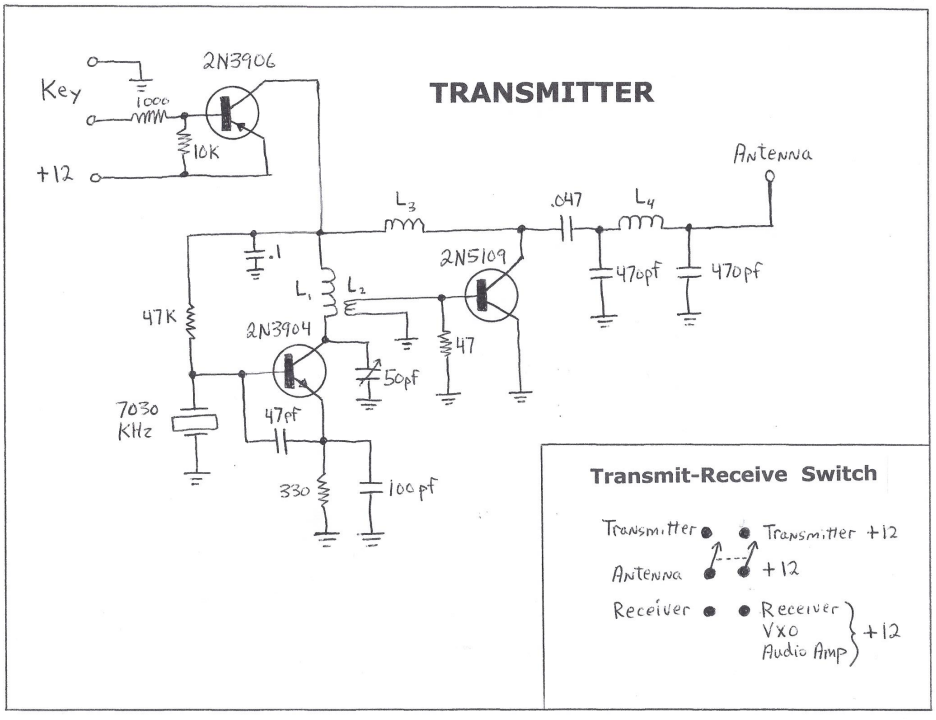
Generally, in circuits such as this one, anything relatively close to the called-for value will work just fine. For example, the 2N3904 transistors can be replaced with generic NPN transistors (2N2222, 2N4401, etc.) and everything should work. Other RF amplifier transistors to try would be 2N3053, 2N2102, 2N3553, or 2N4427. We are amateurs and should experiment, gain experience, and learn something new!

The variable capacitor for the variable crystal oscillator (VXO) will be the hardest part to find. Suggestions may be to remove plates from a larger capacitor that you may have, or salvage one from an old AM radio. The transformer in the receiver section may also be found in an old AM radio. Just imagine the stories you will be able to tell about how you obtained the parts for your QRP transceiver!

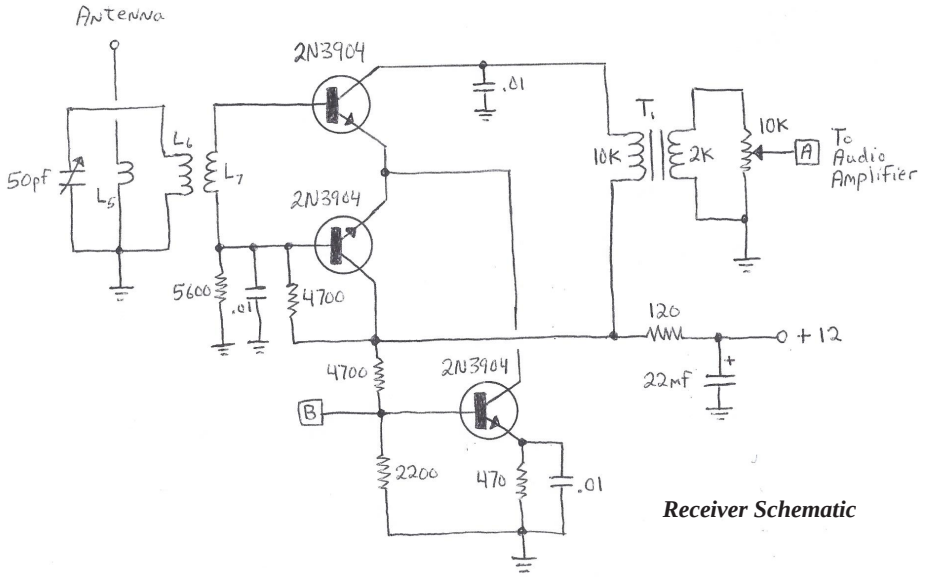
The enameled wire for



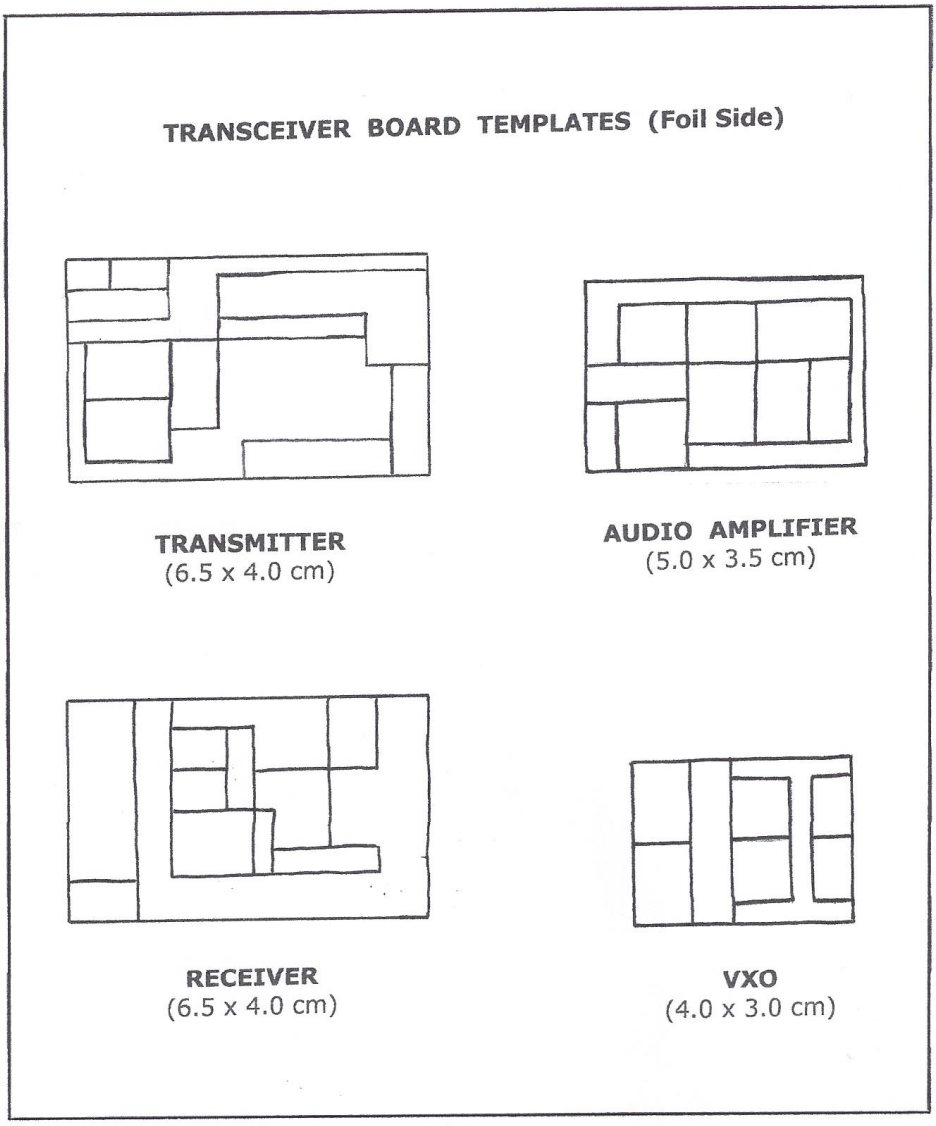
VXO Schematic



the toroids can be salvaged from old motors, transformers, or the yokes from the older picture tube type televisions. Another source for small amounts of wire will be the jewelry/bead making section of your local craft store, they have a variety of sizes and colors of enameled wire. For salvaged wire that you do not know the size of; wind one inch on a pen or drill bit, count your turns and look up the size in a wire table.



Receiver Schematic



Operation

Once you have each section built and tested, the variable capacitor on the receiver board needs to be tweaked for resonance around your crystal frequency. This is easily done by attaching a long piece of wire to the antenna and listening for signals when the 40 meter band is active. You will be surprised by this little receiver's sensitivity. Next, tweak for minimum current draw from the variable capacitor in the oscillator circuit of the transmitter. As you tweak this capacitor you should see a dip at some point. Make this adjustment without any current going through the RF amplifier transistor.

Next, connect the RF amplifier transistor and a dummy load and check for output on a receiver or signal strength meter. Different transistors will draw different amounts of current, and it will probably be somewhere around 250 ma. Be sure to use a heat sink as the RF amplifier transistor will get warm.

Because there are many variables when building receivers and transmitters, it may be necessary to change the coupling capacitors between the VXO, receiver, and audio amplifier for optimum results. Sometimes, too much coupling causes feedback in the audio amplifier. Do not be afraid to experiment to achieve the best results. Once things are wired together and working, attach an antenna, get on the air and have fun!

About the Author:

James Kretzschmar AE7AX is a retired USAF general dentist and currently works part time for the Alaska Native Medical Center in Anchorage, Alaska, and for the Wyoming Air National Guard. He has been a licensed radio amateur since 1972 and holds an Amateur Extra class license. His interests include building anything electronic, mostly small QRP transmitters and receivers, as well as tube stereo amplifiers. He considers himself a true amateur because he has no formal training in electronics … lots of reading and experimenting.

PARTS LIST

L1 45 turns #30 on T50-2 toroid
L2 10 turns #24 over L1
L3 20 turns #24 on T50-2 toroid
L4 14 turns #20 on T50-2 toroid
L5 5 turns #24 over L6
L6 45 turns #30 on T50-2 toroid
L7 10 turns #24 over L6
L814 turns #24 on T50-2 toroid
50pf trimmer capacitor (JAMECO #136979)
Transformer 10K:2K (Mouser #42TL002)

SUGGESTED PARTS SUPPLIERS

Jameco Electronics **www.jameco.com**
DigiKey Electronics **www.digikey.com**
Mouser Electronics **www.mouser.com**
Radio Shack **www.radioshack.com**
Kits and Parts (toroids and transistors) **www.kitsandparts.com**
Expanded Spectrum Systems (amateur frequency crystals) **www.expandedspectrumsystems.com**
Joann Fabric and craft stores (various sizes of enameled wire)
Michael's craft stores (various sizes of enameled wire)

Learjet 85, typical of corporate aircraft often assigned a "dotcom" identifier . (Courtesy: Learjet)

Chasing the Mysterious Dotcom Flights

By C. L. "Cory" Koral K2WV

Living in northern Virginia, I'm afforded a rich variety of aircraft monitoring opportunities. Being just 70 miles west of Washington, D.C., I can hear all manner of approach, departure and enroute traffic and, with my beam antenna, I can even receive Dulles International Airport's Tower and ATIS (Automatic Terminal Information Service), even though it's 35 miles away. It's great to be able to look up individual aircraft call signs on **FlightAware.com**, to find out the type of aircraft communicating with the tower, its complete flight history and actually see a picture of that particular aircraft.

Occasionally, however, I'll hear Air Traffic Control (ATC) contacting a flight, indentified as "dotcom," with a number attached, that I can't track or identify. Could this be some kind of low-budget, start-up airline? A Google search revealed nothing. And, when I punch the identifier into FlightAware, I'm told they don't have any data on the flight and to try using their take-off or destination locations to narrow the search. Since I don't know those either, I'm at a dead end.

There's only one thing to do. I grab my air-band radio, camera and binoculars, hop into the car and head to Dulles to see if I can solve this mystery. The four-lane divided highway that leads to the terminal runs right under the final approach courses to runways 19L (left runway) and 19C (center runway), so I figure this is the best place to stalk the elusive dotcom flight. I pull off near the first approach tower to 19C, certain I'll eventually catch a glimpse of my prey.

Unfortunately, within five minutes the local airport safety patrol shows up and tells me I can't park there. He's nice enough, providing mostly roadside assistance to disabled vehicles, and not law enforcement, so he lets me stay another five minutes. I snap a picture of a McDonnell Douglas MD-80 on final approach and then drive around to the south side of the airport. There's an exit to the Udvar Hazy Air and Space Museum that takes me right under the approach ends of runways 1R and 1C. It's not the best vantage point – all I'll see are the departing flights unless the wind changes and they start landing to the north, but it's worth a try.

Again, within five minutes I'm intercepted, this time by the Fairfax County Police who want me out of there and are a bit more stern than the last encounter. I can't believe I've come all this way for nothing. However, since the museum is only 300 feet away and it's after 4 pm, when parking is free, I might as well stop in.

I go up into the sixth floor observation tower but, from that distance, it would be very hard to identify a dotcom flight, even if one does show up. In hindsight, I realize that this was not one of my brightest ideas. Since 911, it's not a good idea to be snooping around airports of any size and I don't recommend anyone do so.

So, it's back to the Internet for more research. I find a blog about dotcom aircraft registration and get my first break. It turns out that a dotcom identifier refers to a *blocked* aircraft identification. That means that, for whatever reason, the aircraft operator does not want to be tracked or identified.

Dotcom Flight History

In the late 1990s, technology allowed the FAA to change the way it managed air traffic. Using computers, it became possible to collect all the information about any particular flight with what's called the Enhanced Traffic Flow Management System (ETMS). The data is compiled from a flight's filed flight plan and on-board transmitters and includes the location, altitude, airspeed, destination, estimated time of arrival and tail number of the air carrier or general aviation aircraft. This data is used to create a Traffic Situation Display (TSD) or visual depiction of aircraft flying on instrument flight plans and it's very handy for traffic flow management. It's also very handy for commercial flight management services and for the general public, who might want to track a particular airline flight, and of course, monitoring enthusiasts.

In December of 1997, the FAA made this information, known as the Aircraft Situation Display to Industry (ASDI), available as a feed to vendors who in turn could create websites where the general public could track flights. Some sites show only airline flight information, some show airline and general aviation while some provide pilot flight planning services. In any event, each vendor has to sign a Memorandum of Agreement (MOA) with the FAA, agreeing to its rules of use.

Once the ASDI feed became available, websites sprung up everywhere. But concerns were also surfacing about making real time flight tracking available to the public. Various aviation groups began to petition the FAA to restrict flight information for privacy, competition and security reasons. In 2000, the FAA responded with the BARR (Block Aircraft Registration Request) Program, which allows operators to prevent the general public from identifying their flights (**www.nbaa.org/ops/security/barr/background**).

The FAA has always blocked certain aircraft registrations, such as Air Force One, law enforcement flights and any registration listed in the ominous-sounding "File of Forbidden Call Signs," non-military aircraft of a "sensitive" nature, from the public. However, now it was allowing general aviation aircraft to also participate.

When an owner/operator of an aircraft files a request to the FAA that their tail number be blocked from tracking, they can choose "ASDI Vendor Level" or "FAA Level" blocking. If they choose "FAA Level," no information about that aircraft would be passed to any ASDI vendors, and therefore, it would not show up as identifi-

ATC Tower, Bradley International Airport, Hartford, Connecticut. (Courtesy: Brian Topolski)

able or trackable by the general public. The downside is that, with this option, the owner would not be able to track his own aircraft! Naturally, the FAA and law enforcement will always be able to track and identify any flights.

Suppose you had a fleet of Learjets performing oil well inspections, world wide. Under FAA Level blocking, the general public wouldn't be able to track those flights, but neither would you or your maintenance and flight departments – very inconvenient for your business. To remedy this, you would choose ASDI Vendor Level blocking in your initial request to the FAA. The FAA will now pass this information to the vendors which you could go to in order to request *selective* unblocking of your tail numbers. You could now track your own flights, but the public couldn't.

There is no fee to block an aircraft registration number at the FAA regardless of which option you choose. However, for selective unblocking, the vendor charges a fee. FlightAware charges $720 plus a $250 set up fee for an annual blocking of each aircraft. **FltPlan.com** charges between $14.95 and $29.95 per month depending on which service package you choose. (For a complete list of ASDI vendors see **www.fly.faa.gov/ASDI/asdidocs/ASDI_Active_Subscribers_and_Contacts.pdf**).

Call Sign Cat and Mouse

Let's say that you want to be able to track your own aircraft, so you have selectively unblocked your fleet at, for example, FlightPlan, which then issues each of your aircraft a DCM or "dotcom" registration number which is displayed on their tracking screen at their website. Now, suppose your tail number is N8029F, it will now have its own DCM identifier, such as DCM1453. The relabeled dotcom flight can be seen moving across the screen along with all the other aircraft tags as DCM1453. All of the same information is displayed as the other aircraft on the screen; aircraft type, altitude, airspeed, departure point and destination; the only difference is that only you will know the identity of the aircraft owner of DCM1453. The pilot will file the flight plan as DCM1453, and will identify himself as "Dotcom 1453," not as N8029F, in all air traffic communications. Pretty foolproof, right? Not quite.

Anyone can still track a DCM flight. All they have to do is punch in DCM1453 to see where it is, its altitude, destination and estimated time of arrival (ETA). In fact, if you want to know where all of the airborne DCMs are, just go to **http://flightaware.com/live/fleet/DCM.** FlightAware not only shows this information, but a complete history of any DCM flight as well. They will even supply an email notification to you before your DCM takes off!

In fact, the minute you file a flight plan, an email will be generated showing the route of your flight, destination and ETA. If you're planning a long, cross-country flight and you file your flight plan an hour before take off, that'll give air-band monitors time to get to your destination airport, and be ready with binoculars to read your tail number the minute you touch down.

Unblocked, Blocked, and Blocked and Cloaked Aircraft Flight Tags - as they would appear on a radar screen:

UNBLOCKED	
N8029F LJ45 410 430 KDBQ KCLT	N8029F is a Lear Jet 45 at 41,000 ft, speed 430 knots departed Dubuque, IA for Charlotte, NC
BLOCKED	
DCM1453 LJ45 410 430 KDBQ KCLT	Note the only difference is the dotcom call sign
BLOCKED & CLOAKED	
DCM1453 UNK EST KDBQ KCLT	All you can tell from this is there is a dotcom heading for Charlotte, NC

If you subscribe to selective unblocking through FlightAware, however, they do not issue a DCM, or any identifier. The public view of the tracking screen shows no aircraft tag of your flight at all, but ATC can still see and communicate with you as N8029F. Theoretically, however, your tail number could still be determined by monitoring ATC communications.

For example, if ATC is handling five aircraft and one of them is blocked, by jotting down these call signs, the identity of the blocked aircraft could be determined through a process of elimination. But this would require you to be at the destination airport or have access to the tower communications at that airport. While not impossible, determining the aircraft identity using DCM identifiers and aircraft communications would still be difficult and tedious. Also, if filed as a DCM, the owner can specify that FlightAware not show the aircraft type, altitude or airspeed, cloaking this information to make things even harder. Those values are replaced with the letters "UNK" (unknown) or "EST" (estimated) in the flight tag.

The mouse still had the advantage until 2008. Late that year, *ProPublica*, a non-profit, independent news organization that produces investigative journalism in the public interest, submitted a Freedom of Information Act (FOIA) request to the FAA for the release of the list of blocked aircraft registrations. The big three automakers had just made headlines by using pricey corporate aircraft to travel to Washington, D.C., to ask for federal bailouts, and *ProPublica* felt that the BARR program was being used to prevent public scrutiny of such aircraft usage. Despite an 18 month battle by aviation groups, in February 2010, a Federal District Court in Washington, D.C., ruled that the list had to be surrendered. Now, theoretically, tracking of blocked tail numbers was made easier.

Unlike automobile license numbers, anyone with Internet access can look up the name and address of the owner of the tail number of any aircraft. In reviewing the 1,100 blocked aircraft registrations, *ProPublica* uncovered a number of apparent abuses, such as politicians who used private jets for personal trips at taxpayer's expense, and tax exempt ministries that used charitable donations to buy such aircraft, along with mansions and expensive cars.

But, what about legitimate privacy concerns? One of the blocked aircraft fleets belonged to a restaurant chain that makes surprise visits to its restaurants. Why shouldn't they be allowed this privacy? The use of the national airspace is generally considered public information because pilots rely on a system of air traffic controllers, radar, runways, lighting systems and towers that are all paid for or subsidized by taxpayers.

Chuck Collins, of the Institute for Policy Studies, was quoted in a *ProPublica* article from April 8, 2010, titled, "Off the Radar: Private Planes Hidden from Public View," as saying that the public has a right to monitor such flights because taxpayers and commercial passengers heavily support business aviation. "It's the use of the public commons," said Collins, "It belongs to all of us. It's not a private preserve. It's not a country club." In January of 2011, the Wall Street Journal obtained the current list of blocked aircraft registrations, over 7,000 aircraft in all.

In August of 2011, the FAA decided to restrict the BARR program only to aircraft owners who could demonstrate a "valid security concern." However, under pressure from aviation organizations, the FAA reversed its position later that year, once again allowing anyone to block their aircraft registration.

Despite the availability of the blocked tail number list, identifying and tracking these aircraft is still a considerable challenge. For example, even if you know that N1234A belongs to XYZ Corporation, if it flies blocked under FlightAware, you won't see it on your screen and won't be able to track it. If you don't know when or where it's arriving, you can't be there to read its tail number. If it flies blocked on FltPlan and has a DCM number, you'll be able to track it, but you won't know which aircraft that DCM number belongs to. If a hundred air-band monitors were staked out a hundred airports and jotted down all the tail numbers of arriving and departing flights and then compared them with tower communications, eventually the DCM number and the tail number could be matched up.

Geeks to the Rescue

However, two computer experts have come up with a novel solution. Dustin Hoffman (not the actor), who runs the IT consultancy Exigent Systems, and Semon Rezchikov, a student at MIT and a Thiel Fellow, have used an open source system developed at Carnegie Mellon, called Sphinx, to recognize air traffic control vocabulary, especially aircraft call signs.

At the 2012 DEF CON® security conference, they presented a talk, "Tracking 'Untrackable' Private Aircraft for Fun and Profit," in which they outlined the system they are using to identify blocked aircraft registrations. Their web site, no longer available, showed a list of blocked domestic and foreign call signs that they have uncovered. At this time, however, their surveillance is limited to three Las Vegas airports.

DIGITALLY TRACK IN-FLIGHT AIRCRAFT

Aircraft information systems help Air Traffic Control and Air-Band monitors.

MODE S - Transponder mode that transmits flight information continuously via data link on 1090 MHz without having to be interrogated or tracked by a radar facility.

ADS-B - (Automatic Dependent Surveillance Broadcast) A system of air traffic control that uses Mode S to manage air traffic, completely backwards compatible with the existing Mode A/C system.

ACARS - (Aircraft Communications Addressing and Reporting System) Aircraft "email" system that allows manual and automatic communication of weather, ATC clearances, aircraft maintenance and other information to reduce cockpit workload and voice frequency congestion. Messages are limited to a maximum of 220 characters per transmission and use narrow-band pulses on VHF, HF and satellite radio links. ACARS has been in use since the 1980s and is slated to be replaced over the next 20 years with ATN -Aeronautical Telecommunications Network.

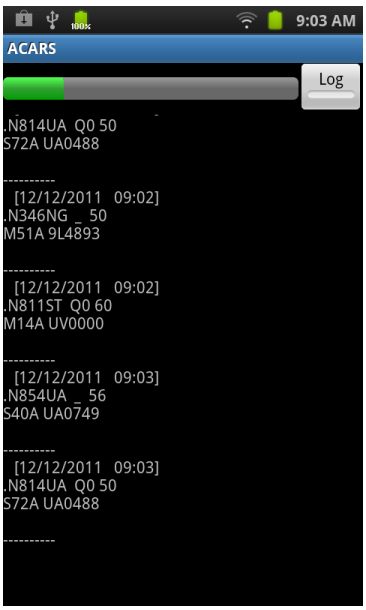
HFDL - (High Frequency Data Link) High-frequency version of ACARS which is used when an aircraft is out of range of a VHF ACARS network, such as during transoceanic flights.

AirNav Systems Radar Box Pro ($470) comes with hardware unit, USB cable, antenna, quick installation guide, setup CD with software and one year free network access. (Courtesy: AirNav Systems)

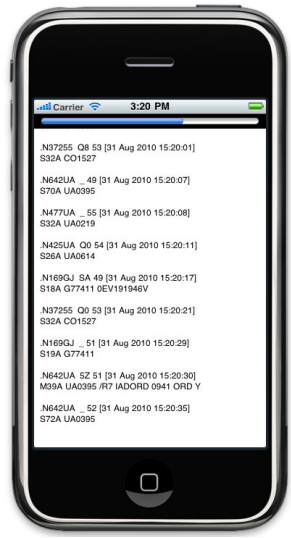
In order to read the Automatic Dependent Surveillance Broadcast (ADS-B) data, you'll need an ADS-B receiver. This is a device that picks up the data sent from all aircraft which includes a unique, traceable, identifier. For about $800 you can get a complete ADS-B package that includes a receiver, antenna and software to display the results on your computer. If you Google "ADS-B receivers," you'll find quite an assortment, including hand held models and ones designed to run on an I-Pad.

For the purposes of this article, I'll just mention two, Air Nav System's Radar Box (**www.airnavsystems.com/radar/box**), and Kinetic Avionics SBS-3 (**www.kinetic-avionics.com**). Each of these two models comes with an easy to install receiver, which simply plugs into the USB port of your computer, and comes with an antenna that plugs into the receiver. You also get the software to run it.

Since you're not plugged into an ASDI vendor, the range that you can intercept aircraft will be limited to the antenna you're using. While some users have reported 50 miles or greater range, using the supplied small antenna, you would do well to purchase a larger, external antenna. Both companies offer external antennas which are sold separately. And, Kinetic Avionics even has a pre-amplifier to further boost the signal. **www.4cellular.com/product_info.php?products_id=135&osCsid=bcea223bbecc2c15da8eba59107b9cb7**. Some users have reported ranges as far as 250 miles, much greater than radar range with these options.



ACARS decoding on Android systems ($2.99) at iTunes store. (Courtesy: Blackcat Systems)



ACARS decoding for iPhone, iPad systems ($2.99) at iTunes store: https://itunes.apple.com/app/acars/id386825917?mt=8 (Courtesy: Blackcat Systems)

AirNav offers a free one-year subscription to their ASDI feed, which expands your coverage world wide, but since it's a vendor feed, you won't get all the information you're looking for. However, AirNav has found a way around this with their own AirNav server which allows other Radar Box users to not only share their data with each other, but do it in real time (ASDI feeds are required to delay their displays five minutes). Depending on how many Radar Box users are nearby, you can expand your raw, real-time data feed beyond your antenna range. AirNav will also look up Mode-S codes for you.

Theoretically, the power of the program could be increased and the coverage widened to include the entire U.S., but, since the system relies on voice communications, it would still be unable to decode DCM call signs, unless operatives could read the DCM tail number on arrival. Also, just knowing the tail numbers of blocked aircraft does not allow you to track them.

So, what options do the determined air-band monitor/dotcom buster have? You can check the DCM list regularly, waiting for a DCM to arrive at an airport near you. Hopefully, you'll have enough time to hop in the car and check it out before it lands. However, unless you're single and independently wealthy, it's unlikely you're going to be able to drop everything and run to the airport on a moment's notice. Also, for larger airports with a multitude of taxiways and gates, sorting the dotcom aircraft out could be very difficult, even if you do get there on time.

Does the mouse win? Maybe not. There are still other avenues to pursue. Business and commercial aircraft transmit not only voice communications, but a multitude of digital communications as well. For example, The Mode S feature of the aircraft's transponder allows it to be selectively interrogated for certain information. In order to access this information, each aircraft's transponder has a unique six digit code. For example, tail number N638SF (an unblocked Learjet 31) has a Mode-S code of A85D0A. Since the Mode S code is not listed along with the tail number in the aircraft register, how can you find out what it is? Just go to: **www.gatwickaviationsociety.org.uk/modeslookup.asp** and look it up! Now you have a unique identifier that links you to that particular aircraft whether it's blocked or not.

Lessons Learned

There are some very active dotcom flights; some flying four or five flights per day, so there's a good chance one will be landing near you soon. It is possible to chase dotcoms in your car, but in the long run, it's more cost effective and less time consuming to save your pennies and get a good quality ADS-B receiver so you can bust dotcoms from the comfort of your listening post. And, here's another option: Join the AV Geeks -**www.cnn.com/2013/06/04/travel/plane-spotters-versus-terrorists?iid=article_sidebar**. These are volunteer plane spotters and air band monitors who help with airport security and at the same time get to monitor and take all the pictures of aircraft they want. Right now, there are only two major airports, Minneapolis and Chicago O'Hare that have these teams, but interest elsewhere is growing.

About the Author:

C. L. "Cory" Koral K2WV is a lifelong air-band monitor and holds an Extra Class amateur radio license. He received his private pilot's license in 1968 and Commercial pilot's license in 1983. His previous article, "Beginner's Guide to Monitoring the Air Band," appeared in the March, 2010 issue of MT.

In the Beginning: Shortwave Broadcasting and Religion

By Edward Kelly, Jr.

From its inception, shortwave radio has been a tool of religion. At times this has been both a blessing and a curse. For better or worse, religion has tied a knot to radio revealing a history, like any marriage, full of passion and vengeful spats.

In the beginning, KDKA (Pittsburgh) flipped the switch and made history; the dawn of God on the radio. In 1921, the first religious broadcast on the radio occurred live from the Calvary Episcopal Church, Pittsburgh, Pennsylvania. It was chosen because one of the Westinghouse engineers was a member of the church choir.

The first problem occurred because Senior Pastor, Rev. Edwin Van Ettin, did not believe it was a good idea, so he passed it down to the Associate Pastor, Rev. Lewis B. Whittemore, who preached the first sermon on radio. Two KDKA radio engineers wore choirs robes so as to not to distract the worshippers. One of the engineers was a Catholic, the other a Jew, so it became an ecumenical affair. The broadcast was an immediate hit and soon the pastor took over the program which became a weekly event that continued through 1962.

On a more technical and historical level, KDKA used shortwave in 1923 to relay the evening programs to other stations across the country. For example, Cleveland's KDPM and Hasting, Nebraska's KFKX picked up the signal and replayed it on their local AM stations. The problem for shortwave in this early stage of development was that equipment to receive a shortwave broadcast was hard to find. It was not until the early 1930s, with the introduction of all-wave AC sets, that shortwave took off. Early radio history was dominated by the Trinity of Radio: Westinghouse, GE (RCA) and AT&T, all seeking to cash in on this new communication device.

HCJB QSL (Courtesy: Ken Reitz KS4ZR)

Timeline of American Evangelists on the Air

Two pioneer shortwave radio evangelists were Paul Rader and Aime Semple McPherson. The year was 1922, when Rader spoke over WHT (Chicago) and, shortly after, negotiated with other Chicago stations to carry his message. One Chicago station, WBBM, allowed him to use its studios for 14 hours every Sunday. Rader had a tremendous influence on winning acceptance of radio as a means of evangelism and also in the vision and development of international shortwave religious broadcasting (HCJB).

That same year, 1922, Aime Semple McPherson made history, becoming the first woman to preach on the radio. And, in 1923, the first radio station in America owned and operated by a religious organization- KFSG – *Kailling Foursquare Gospel*. It is here that three other elements of radio history enter the scene: conflict with the government, conflict with other stations, and scandals.

In response to criticism of her radio station by Herbert Hoover, then Secretary of Commerce (in which department the Federal Radio Commission, the forerunner of the FCC, resided), for changing frequency (which was a common occurrence at that time), she sent the following telegram: "*Please order your minions of Satan to leave my station alone. You cannot expect the Almighty to abide by your wavelength nonsense. When I offer my prayers to Him I must fit into His wavelength. Open this station at once*!"

McPherson also ran into conflict with other radio evangelists such as "Fighting Bob" Shuler who made it a point in his broadcast to attack her personally. What really catapulted McPherson into the public eye was her sudden disappearance after going for a swim. A media frenzy ensued. One has to understand the time to understand this mysterious story, because this woman preacher had become more popular than any movie star at the time.

Six weeks later she showed up, claiming to have been kidnapped and escaped. The police did not buy the story and soon she was brought before a grand jury. In the end, the charges were dropped and, to this day, no one knows the true story; whether it was a kidnapping, a sexual affair or she just wanted to get away for a rest.

Vatican Radio QSL (Courtesy: Ken Reitz KS4ZR)

In 1934, a rule, known as the "doctrine of sustaining time," began which affected religious broadcasting. With the establishment of the Federal Communications Commission and the Communications Act of 1934, the mainline denominations, in the form of ecumenical bodies, wanted a fairer distribution of allocated free airtime for their programming, because there was not enough to go around. What happened in practice was that fundamentalists found themselves locked out of the free system and were forced to buy airtime to get their message on the air.

Decades later, FCC rules changed which brought about an explosion of shortwave broadcasting in the 1980s and 90s. Prior to that, most shortwave stations were supported by large religious organizations (Adventist World Radio, WYFR, WEWN, KTBN and WMLK). But, in the 1980s private shortwave stations began proliferating and some stations were formed to sell airtime to religious groups. Among the group that made it onto the airwaves at this time were: WINB (PA), WHRI (Indiana), KJES (Mexico), WWCR (Tennessee), WRNO (New Orleans) and WBCQ (Maine).

International Timeline of Religious Stations

The British Broadcasting Corporation began broadcasting from London in October, 1922. Although not a religious station, there were many religious programs broadcast in the BBC's early years. One notable celebrity was Dick Sheppard, an Anglican minister who first broadcast on July 1923, which by 1927, became a regular program on the BBC.

In the 1930s came the development of international religious shortwave stations. The first such station was HCJB (*Heralding Christ Jesus' Blessing*) in Quito, Ecuador. This station was founded by Clarence Jones, a musician and broadcaster who had assisted Paul Rader in Chicago and Reuben Larson, a Christian Missionary Alliance missionary to Ecuador. They converted a sheep shed into a studio and, with a 250 watt transmitter, began to broadcast the "Voice of the Andes."

Although the principle language of the station was English, it did broadcast in Quechua, the native language spoken in Ecuador, Bolivia and Peru and became very successful in starting churches without physical missionaries being present.

In 1931, The Catholics entered with Vatican Radio. It was the Italian inventor Guglielmo Marconi himself who planned and oversaw the construction of the station. Pope Pius XI took the microphone and was the first Pope to make an international radio broadcast. Programming was short, usually fifteen minutes, but it was Vatican Radio during World War II and the Cold War that played a role in communicating to Catholics behind the Iron Curtain.

In 1945, Robert Bowman and John Broger established the Far East Broadcasting Company with the vision of taking the Gospel to other areas of the world. In 1948, the first station was located in Manila (Philippines). Since then it has expanded its operations using Shortwave, FM and AM, essentially covering every part of the globe in 130 different languages.

In 1954, Paul Freed with his father, Ralph, a Christian Missionary Alliance representative, started a religious radio station with a 2,500 watt transmitter in Tangiers, Morocco, called the "Voice of Tangiers." In 1960, their organizational name was changed from International Evangelism to Trans World Radio. Since that time it has expanded, covering 160 countries and 230 languages. It is probably the largest Christian media organization in the world.

In 1959, the Family Radio Network (FRN) began with the purchase of KEAR-FM in San Francisco, California. There were two primary originators of FRN, Richard Palmquist, an amateur radio missionary, and Harold Camping, a retired civil engineer. What made FRC unique was it was the first listener sponsored Christian radio station in the world. Through multiple FM, AM and a shortwave station in Okeechobee, Florida (WYFR), this station had become known for end-time apocalyptic prophecy. Mr. Camping, the general manager and President of FRN and, its chief spokesman, has been the center of controversy since 1994 when his first prediction of the end of world failed. Another date was given in May 2011, and when that failed, another date, October, 2011. Since then, income from sponsors has dwindled and station after station have been dropped. The big question is, will FRN make it? (I occasionally listen to KYFR-AM 920, located in Shenandoah, Iowa. I enjoy listening to the old hymns!)

Some Radio Personalities

Ralph G. Stair (Walterboro, South Carolina), originally ordained as a Methodist minister, was one of the first "interesting" preachers I came across in the 1990s when I was scanning shortwave. It was the late-90s that "Brother Stair" was probably at the height of his radio ministry which is known as Overcomer Ministry. He refers to himself as, "the voice of the last day prophet of God," and has made more prophetic apocalyptic predictions than Harold Camping. He has been embroiled in many legal court battles with ex-Church/commune members over finances and the 2002 conviction of unlawfully touching two female members, which caused his radio coverage to drop significantly from an estimated 120 stations in the 1990s to currently six shortwave, eight FM, and 17 AM stations. (Some radio ministries just won't die!)

Dr. Eugene Scott was a notable preacher on shortwave during the 90s. He began as an Assembly of God minister and was Pastor of Faith Center in Glendale California. In 1969, he started the first American 24-hour religious television station (KHOF-TV). In was during this time he began to appear with his signature cigar in his mouth. He lost his broadcasting license in 1983 due to troubles with the FCC. But by 1990, he was broadcasting his World University Network via satellite to AM, FM and shortwave stations covering over 180 countries. Although he died in 2005, his wife, Mellissa Scott continues as teaching Pastor and broadcaster. (I must add, I am very impressed with her teaching and her mastery of languages.)

Pastor Pete Peters (Peter John "Pete" Peters) also dominated shortwave radio in the 90s and established himself as the leader of the Christian Identity movement. He was Pastor of the LaPorte Colorado Church of Christ and produced the radio program called *Scriptures for America*. He preached a white supremacist message, that whites are God's chosen people and all other races are inferior. The Anti-Defamation League, in a 2005 report, described him as "the leading anti-Jewish, anti-minority and anti-gay propagandist in the United States." He died in 2011 and the LaPorte Church of Christ continues the radio ministry. (Again, some radio ministries never die, they just fade into reruns!)

The list of shortwave radio personalities and their various zany battles with government, the devil and each other could go on and on: Texe Marr, David J. Smith, James Lloyd, Steve Quayle, Rick Strawcutter and, last but not least, Pastor Butch Paugh, the "Pistol Packin' Preacher."

Yes, shortwave radio has had its share of the wacky, the bizarre and the sleazy, but, it also must be said that shortwave radio has hundreds of religious broadcasts that are wholesome, uplifting and reflects the spirit of the Gospel. Here I am thinking of some of my favorite programs: *Unshackled*, *Wonderful Words Of Life* (Salvation Army), *Pat Boone Show*, *Tell it from Calvary*, *Old Fashioned Revival Hour*, the *Hour of Decision* (WRNO) and *Hymns of Worship* (WYFR).

Timeline of other International and Domestic Stations

1962 – WINB (World International Broadcasters) Red Lion, Pennsylvania. Probably the oldest privately owned shortwave station in America.

1971 – Adventist World Radio (AWR) came into existence when the mission arm of the Seventh Day Adventist Church went to shortwave by leasing airtime in Portugal. Since then, it has expanded operations via AM/FM and shortwave to reach the estimated 4 billion people who live in the "10/40 window," the area of Africa, Asia, the Mid-East and Europe between 10 and 40 degrees north of the Equator, earlier identified by Christian missionaries as the "resistance belt." The "Voice of Prophecy" can trace its origins to its first AM broadcast in 1923 from Emmanuel Missionary College in Michigan.

1982 – WRNO, New Orleans, which began broadcasting as the first privately owned shortwave station in United States. The original owner Joseph Costello III began with a rock'n'roll format, but during the 90s switched to leasing airtime to religious and political programming. WRNO came into hard times and was finally sold in 2001 to Good News World Outreach (Dr. Robert Mawire) which has had an off and on schedule due to hurricanes and damaged transmitters. It is now operating with a very short schedule, a few hours a day.

1983 – KNLS, "*New Life Station,*" Anchor Point, Alaska which broadcasts the Gospel message daily with 10 hours in Chinese, 5 hours in Russian and 5 hours in English.

1985 – WMLK, "Messenger" Bethel, Pennsylvania, operated by the Assemblies of Yahweh, started with a 50 kW transmitter and recently increased to 250 kW.

1985 – WHRI, "*World Harvest Radio, International,*" Cypress Creek, South Carolina, operated by LeSea Christian broadcasting group. In 1993, KWHR became operational in Hawaii and in 1998- WHRA went on-air in Greenbush, Maine.

1987 – World Service of the *Christian Science Monitor,* began broadcasting its award winning news service Monday through Friday. On the weekends it switched to religious programs. I remember listening from my church office in Vinton, Iowa to CSM news during Operation Desert Storm in 1991. Sadly, Monitor Radio ceased its shortwave activity in 1997.

1989 – WWCR, *"World Wide Christian Radio,"* from Nashville, Tennessee. This was my favorite shortwave station that I listened do back in 1993. Owned by F.W. Robbert Broadcasting, it operates four 100,000 watt transmitters and leases airtime.

1998 – WBCQ, "The Planet," from Monticello, Maine, which is owned and operated by Weiner Broadcasting. The owner, Allan Weiner has an interesting history, starting out with a pirate radio station. Programming is varied and follows their philosophy of First Amendment Free Speech rights.

About the Author:

Edward Kelly, Jr., lives in Red Oak, Iowa, with Rose, his wife of 35 years. He is a U.S. Army veteran who served as a combat medic during the Vietnam War, a former Pastor (Vinton, Iowa) and has enjoyed listening to shortwave religious programming for twenty-seven years. He has a BA from Buena Vista University, MBA from Columbia Southern University and a Master in Theology from Franciscan University in Steubenville, Ohio. His previous article, "Why I Listen to Shortwave: Musings of a Preacher-DXer" appeared in the April, 2013 issue.

Dan Veeneman
danveeneman@monitoringtimes.com
www.signalharbor.com

Monitoring Virginia STARS and Erie County, PA

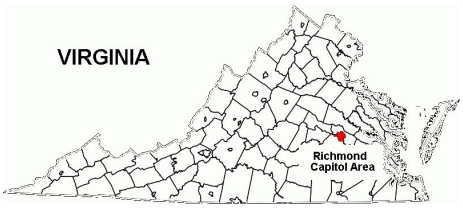
Here's a note I received recently from Richard, in Virginia:

"Within the next few months I plan to buy the GRE PSR-500 or PSR-600 scanner. My problem is that I haven't got the ability to get the P-25 frequencies I need for the Virginia State Police, Richmond City, and the counties/cities of Henrico, Chesterfield and Hanover because I don't have access to the Internet. A friend pulled up ***radioreference.com*** *but he was unable to find what I need. All that was there was the old conventional analog frequencies (State Police). Also, will the scanners I named above be able to receive analog and digital and be able to do it at the same time?"*

To answer your last questions first, both the PSR-500 and the PSR-600 are fully capable of tracking and monitoring systems with mixed analog and digital traffic. At any particular moment the scanner is only tuned to a single frequency, but it will automatically select the appropriate method for monitoring. The scanning process is fast – 60 channels per second – so you can check a large number of frequencies, both analog and digital, very quickly.

The Virginia State Police are now using the Statewide Agencies Radio System (STARS), which is a fully digital radio network using the APCO Project 25 Common Air Interface (CAI) and trunking protocols. STARS has a large number of repeater sites, but the Richmond site, located in Chesterfield County, uses the following frequencies: 151.1525, 151.3175, 152.0375, 158.9925, 159.1125, 159.1875, 159.2625, 159.3375, 159.4275 and 159.4575 MHz.

STARS
STATEWIDE AGENCIES RADIO SYSTEM



There are hundreds of talkgroups active on the system supporting dozens of state and local agencies. Some of those talkgroups are as follows:

Decimal	Hex	Description
1	001	State Police (Richmond Dispatch 1)
2	002	State Police (Richmond Tactical 2)
3	003	State Police (Richmond Dispatch 2)
4	004	State Police (Richmond Tactical 2)
5	005	State Police (Richmond Division 1)
6	006	State Police (Richmond Blue 1)
7	007	State Police (Richmond Red 1)
9	009	State Police (Richmond General Investigation Section 1)
11	00B	State Police (Richmond Drug Enforcement Section 1)
12	00C	State Police (Richmond Surveillance 1)
13	00D	State Police (Richmond Surveillance 1A)
14	00E	State Police (Richmond Surveillance 1B)
15	00F	State Police (Richmond Surveillance 1C)
16	010	State Police (Richmond Tactical Team 1)
84	054	State Police Executive Protection Unit
86	056	State Police Management
88	058	State Police Training A
89	059	State Police Training B
90	05A	State Police Training C
91	05B	State Police Training D
92	05C	State Police Training E
93	05D	State Police Training F
94	05E	State Police Training G
95	05F	State Police Training H
96	060	State Police (Richmond Dispatch 3)
97	061	State Police (Richmond Tactical 3)
1804	70C	Capitol Police (Dispatch)
1805	70D	Capitol Police (Tactical 1)
1806	70E	Capitol Police (Fox 1)
1807	70F	Capitol Police (Red 1)
2206	89E	Department of Corrections (Central Operations)
2207	89F	Department of Corrections (Central Transport)
2208	8A0	Department of Corrections (Central Work Gang)
2209	8A1	Department of Corrections (Central Blue)
2210	8A2	Department of Corrections (Central Red)
2212	8A4	Department of Corrections (East Operations)
2213	8A5	Department of Corrections (East Transport)
2214	8A6	Department of Corrections (East Work Gang)
2215	8A7	Department of Corrections (East Blue)
2216	8A8	Department of Corrections (East Red)
2218	8AA	Department of Corrections (Statewide Transport)
2306	902	Department of Corrections (West Operations)
2307	903	Department of Corrections (West Transport)
2308	904	Department of Corrections (West Work Gang)
2309	905	Department of Corrections (West Blue)
2310	906	Department of Corrections (West Red)
2312	908	Department of Corrections (Administration)
2407	967	Department of Emergency Management (Operations 1)
2408	968	Department of Emergency Management (Tactical 1)
2411	96B	Department of Emergency Management (Red 1)
2413	96D	Department of Emergency Management (Operations 2)
2414	96E	Department of Emergency Management (Tactical 2)
2417	971	Department of Emergency Management (Red 2)
2419	973	Department of Emergency Management (Operations 3)
2420	974	Department of Emergency Management (Tactical 3)
2423	977	Department of Emergency Management (Red 3)
2425	979	Department of Emergency Management (Operations 5)
2426	97A	Department of Emergency Management (Tactical 5)
2429	97D	Department of Emergency Management (Red 5)
2431	97F	Department of Emergency Management (Operations 7)
2432	980	Department of Emergency Management (Tactical 7)
2435	983	Department of Emergency Management (Red 7)
2607	A2F	Department of Emergency Management (Ops 4)
2608	A30	Department of Emergency Management (Tactical 4)
2611	A33	Department of Emergency Management (Red 4)
2613	A35	Department of Emergency Management (Operations 6)
2614	A36	Department of Emergency Management (Tactical 6)
2617	A39	Department of Emergency Management (Red 6)
3010	BC2	Department of Forestry (Operations 1)
3011	BC3	Department of Forestry (Fire 1A)
3012	BC4	Department of Forestry (Fire 1B)
3017	BC9	Department of Forestry (Red 1)
3019	BCB	Department of Forestry (Operations 2)
3020	BCC	Department of Forestry (Fire 2A)
3021	BCD	Department of Forestry (Fire 2B)
3026	BD2	Department of Forestry (Red 2)
3028	BD4	Department of Forestry (Operations 3)
3029	BD5	Department of Forestry (Fire 3A)
3030	BD6	Department of Forestry (Fire 3B)
3035	BDB	Department of Forestry (Red 3)
3037	BDD	Department of Forestry (Operations 4)
3038	BDE	Department of Forestry (Fire 4A)
3039	BDF	Department of Forestry (Fire 4B)
3044	BE4	Department of Forestry (Red 4)
3110	C26	Department of Forestry (Ops 5)
3111	C27	Department of Forestry (Fire 5A)
3112	C28	Department of Forestry (Fire 5B)
3117	C2D	Department of Forestry (Red 5)
3119	C2F	Department of Forestry (Ops 6)
3120	C30	Department of Forestry (Fire 6A)
3121	C31	Department of Forestry (Fire 6B)
3126	C36	Department of Forestry (Red 6)
3211	C8B	Department of Game and Inland Fisheries (Operations)
3212	C8C	Department of Game and Inland Fisheries (Dispatch)
3213	C8D	Department of Game and Inland Fisheries (Tactical)
3214	C8E	Department of Game and Inland Fisheries (Tactical)
3215	C8F	Department of Game and Inland Fisheries (Special)
3216	C90	Department of Game and Inland Fisheries ("Blue 1")
4524	11AC	Department of Military Affairs (Central Operations)
4525	11AD	Department of Military Affairs (Central Tactical)
4818	12D2	Department of Motor Vehicles Law Enforcement
4819	12D3	Department of Motor Vehicles Law Enforcement (Tactical)

In the Richmond area there is a Motorola Type II SmartZone system that carries public safety activity for Chesterfield and Henrico Counties as well as Richmond. The system uses the older Motorola control channel protocol (the so-called "3600-baud") and carries voice traffic in both analog and P-25 digital formats. The GRE PSR-500 and PSR-600 scanner models are able to scan these types of systems as well. The frequencies for each area of the system are as follows:

Henrico County: 854.9875, 855.2125, 855.2375, 855.4875, 855.9875, 856.9625, 856.9875,

857.9875, 858.9875, 859.4375, 859.9625, 859.9875, 860.4375, 860.9625, 860.9875, 866.2125, 866.7375, 866.8500, 867.1500, 867.3000, 867.8125 and 868.7250 MHz.

Chesterfield County: 856.2125, 856.2375, 856.7625, 856.9375, 857.2125, 857.2375, 857.7625, 857.9375, 858.2125, 858.2375, 858.7625, 858.9375, 859.2125, 859.2375, 859.7625, 859.9375, 860.2125, 860.2375, 860.7625 and 860.9375 MHz.

Richmond: 866.0375, 866.1375, 866.2375, 866.3875, 866.6625, 866.7875, 866.9125, 867.0875, 867.1875, 867.3375, 867.6125, 867.7250, 867.8625, 867.9625, 868.1250, 868.2375, 868.4125, 868.5125, 868.7000, 868.8250, 868.9500 and 868.9750 MHz.

As with STARS, the multi-county system has a very large number of talkgroups. The list below provides a sample of the agencies and departments using the system.

Decimal	Hex	Description
512	020	Henrico County Fire (Station Alerts)
16480	406	Henrico County Police (Administration)
16496	407	Henrico County Police (South Dispatch)
16512	408	Henrico County Police (Central Dispatch)
16528	409	Henrico County Police (North Dispatch)
16544	40A	Henrico County Police (West Dispatch)
16608	40E	Henrico County Police (Animal Protection)
16624	40F	Henrico County Police (East Street Crimes)
16640	410	Henrico County Police (West Street Crimes)
16704	414	Henrico County Police (East Tactical)
16720	415	Henrico County Police (West Tactical)
16736	416	Henrico County Police (South Tactical)
16752	417	Henrico County Police (North Tactical)
16944	423	Henrico County Police (Announcements)
17472	444	Henrico County Fire (Dispatch)
17488	445	Henrico County Fire (Talkaround)
17504	446	Henrico County Fire (Tactical 4)
17520	447	Henrico County Fire (Tactical 5)
17536	448	Henrico County Fire (Tactical 6)
17552	449	Henrico County Fire (Tactical 7)
17568	44A	Henrico County Fire (Tactical 8)
17584	44B	Henrico County Fire (Tactical 9)
17600	44C	Henrico County Fire (Tactical 10)
17776	457	Henrico County Fire (Fire Marshal)
17824	45A	Henrico County Fire (Training)
17888	45E	Henrico County Fire (All Call)
18240	474	Henrico County Emergency Medical Services
18256	475	Henrico County Emergency Medical Services
18272	476	Henrico County Emergency Medical Services
18288	477	Henrico Volunteer Rescue Squad (Dispatch)
18352	47B	Henrico County Emergency Medical Services (Dispatch)
32848	805	Richmond Police (1st Precinct Dispatch)
32864	806	Richmond Police (2nd Precinct Dispatch)
32880	807	Richmond Police (3rd Precinct Dispatch)
32896	808	Richmond Police (4th Precinct Dispatch)
32912	809	Richmond Police (5th Precinct Tactical)
32928	80A	Richmond Police (Citywide Alerts)
32944	80B	Richmond Police (1st Precinct Administration)
32960	80C	Richmond Police (1st Precinct Bicycle Patrols)
32976	80D	Richmond Police (1st Precinct Special Enforcement Unit)
32992	80E	Richmond Police (1st Precinct Tactical)
33024	810	Richmond Police (2nd Precinct Administration)
33040	811	Richmond Police (2nd Precinct Bicycle Patrols)
33056	812	Richmond Police (2nd Precinct Special Enforcement Unit)
33072	813	Richmond Police (2nd Precinct Tactical)
33120	816	Richmond Police (3rd Precinct Administration)
33136	817	Richmond Police (3rd Precinct Bicycle Patrols)
33152	818	Richmond Police (3rd Precinct Special Enforcement Unit)
33168	819	Richmond Police (3rd Precinct Tactical)
33216	81C	Richmond Police (4th Precinct Administration)
33232	81D	Richmond Police (4th Precinct Bicycle Patrols)
33248	81E	Richmond Police (4th Precinct Special Enforcement Unit
33424	829	Richmond Police (Canine)
33440	82A	Richmond Police (Special Operations Division)
33456	82B	Richmond Police (Special Operations Division)
34624	874	Richmond Fire (Dispatch)
34640	875	Richmond Fire (Tactical 2)
34656	876	Richmond Fire (Tactical 3)
34672	877	Richmond Fire (Tactical 4)
34688	878	Richmond Ambulance Authority (Dispatch)
34704	879	Richmond Ambulance Authority (Secondary)
34720	87A	Richmond Fire (Investigators)
34736	87B	Richmond Fire (Administration)
34752	87C	Richmond Fire (Training)
34816	880	Richmond Fire (Operations 1)
34832	881	Richmond Fire (Operations 2)
34848	882	Richmond Fire (Announcements)
34992	88B	Richmond Fire (Automated Dispatch)
37296	91B	Richmond Ambulance Authority (Tactical)
37312	91C	Richmond Ambulance Authority (Tactical)
37328	91D	Richmond Ambulance Authority (Tactical)

Virtual Scanner

If all of this seems like a lot of information to manage, you would be right. Instead of having to enter all of these frequencies and talkgroups by hand, recent scanners like the GRE PSR-500 and PSR-600 come from the factory with preprogrammed information to get you started. For these particular models, Virtual Scanner Folder #4 is dedicated to Virginia. Loading this will get you started without needing access to the Internet.

Erie County, Pennsylvania

Erie County, located in the northwest corner of Pennsylvania on the shores of Lake Erie, is home to about 280,000 people. There are only two cities in the county: Corry with about 7,000 residents and Erie with just over 100,000. Other communities are identified as boroughs and typically have relatively small populations, although historically they have been growing as the City of Erie shrinks.

Erie County has 18 police departments, as well as sheriff and university law enforcement agencies. Nine municipalities have their own police departments, while the Pennsylvania State Police covers the remainder of the county. The county has 34 fire departments handling more than 25,000 dispatched calls each year. All but one of those fire departments are staffed by volunteers.

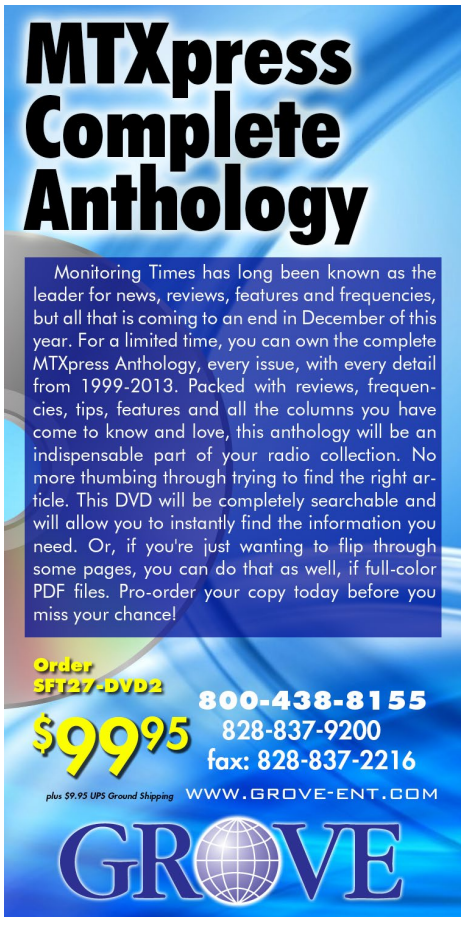
Like many counties across the country, Erie County does not have a single, centralized public

Erie County Emergency Management

safety radio system to serve all local emergency agencies and responders. Over the past few decades, individual cities and boroughs have purchased and operated small radio systems with just enough capability to serve their local area. These systems typically send conventional (non-trunked) analog transmissions from a single, central antenna tower and are not designed for widespread coverage.

In July, the county began to explore the possibility of hiring a consultant to help identify options for a cost-effective countywide radio network that would replace the numerous smaller, localized radio systems. The new system would use current technology on a set of common frequencies, allowing local agencies to interoperate much more easily. It would be compatible with the technology currently in use at the PSAP (Public Safety Answering Point) in Summit Township and make use of existing radio towers. Additional repeater sites might be necessary in order to provide service to all parts of the county and fill in existing gaps in coverage. The county is estimating the total cost for such a system to be somewhere between $12 million and $20 million and would have a build-out schedule that might take several years to complete.

The recommended consultant is MCM Consulting Group, Inc., who would be paid



$65,000 to put together plans and recommendations for Erie County's "next generation" network. Although such consultants are an additional expense, good ones can provide much-needed guidance to political bodies who otherwise would not be able to cut through the sales talk of equipment manufacturers.

❖ Dispatch Centers

Over time, individual municipalities in the county banded together and established combined dispatch centers to save money and streamline operations. Eventually, four major centers emerged.

The Erie County 911 Center dispatches for police departments in the western part of the county, including Albion, Girard, and Lake City. This center grew after the closure of the West County Communications Center at the end of 2012.

Police departments in the northeastern part of the county, including Lawrence Park, North East, and Wesleyville, are currently dispatched by the East County Communications Center but will eventually be transferred to the Erie County 911 Center. Millcreek Township dispatches the Millcreek Police Department.

Police Departments in the southern part of the county, including Edinboro, Union City, and Corry, currently do their own dispatching. As with western departments, eventually Erie County 911 Center will take over. Law enforcement calls in unincorporated areas are dispatched by the state police.

EmergyCare is a non-profit organization providing emergency medical care to 550,000 residents in northwestern Pennsylvania, including ambulances and LifeStar helicopter airlift. They dispatch emergency medical services across much of the county, although each municipality assigns Emergency Medical Services responsibilities to a particular EMS agency.

An interesting adjunct to normal crime-fighting outreach programs is the website **www.eriealert.com,** which is an Internet-based crime watch program operated by the Erie District Attorney's office. It provides residents with information about crimes in their neighborhood and allows them to report suspicious activity.

❖ Local Codes

Police and Fire Departments in the county use an abbreviated ten-code:

Code	Meaning
1	Accident
10-4	Acknowledgment
10-5	Operator leaving base
10-7	Out of service
10-8	In service at _____
10-9	Repeat
10-12	Stand by
10-13	Call tow truck
10-15	Send Hurst (extrication) tool
10-19	Return to quarters
10-20	What is your location
10-21	Call by telephone
10-22	Call Fire Marshall
10-23	Call Police
10-76	Enroute
10-81	Overdose
10-83	Suicide
10-85	Caution, trouble at scene
10-90	On the scene
10-96	Mental subject
10-99	False Alarm

Conventional analog frequencies carry nearly all of the public safety activity in the county.

Frequency	Description
33.98	County Fire (Dispatch)
33.96	County Fire (Channel 2)
33.88	County Fire (Channel 3)
33.94	County Fire (Channel 4)
33.82	County Fire (Channel 5)
33.46	County Fire (Channel 6)
33.82	County Fire (Channel 7)
33.48	Brookside Volunteer Fire Department
33.56	Brookside Volunteer Fire Police
33.16	Wattsburgh Fire Police
33.60	West Erie County Fire Chiefs
33.80	Elgin Beaverdam / Corry Fire
39.10	Corry Fire Department
151.100	City of Erie Streets Bureau
151.400	Presque Isle State Park Rangers (Dispatch)
151.445	Presque Isle State Park Rangers (Tactical)
151.820	Erie Civic Center and Warner Theater (Channel 1)
151.880	Erie Civic Center and Warner Theater (Channel 4)
151.940	Erie Civic Center and Warner Theater (Channel 3)
153.590	City of Erie Water Authority
153.830	Girard Fire Police
154.025	City of Erie Residential Waste Management
154.145	City of Erie Fire Department (Tactical)
154.235	City of Erie Fire Department (Patch to County Fire)
154.355	City of Erie Fire Department (Investigations)
154.430	City of Erie Fire Department (Dispatch)
154.515	City of Erie Area School District Buses
154.570	Erie Civic Center and Warner Theater (Channel 2)
154.600	Erie Civic Center and Warner Theater (Channel 5)
154.710	Union City Borough Police (Dispatch)
154.980	Erie International Airport Rescue Fire Station [P25]
154.995	Erie County Emergency Management Agency
155.130	Edinboro Borough Police (Channel 2)
155.130	Albion, Girard, Lake City Police (Tactical 2)
155.220	EmergyCare (Lifestar Helicopter) Tactical
155.430	Corry / Edinboro Borough Police (Dispatch)
155.715	Albion, Girard, Lake City Police (Tactical 3)
155.760	Albion, Girard, Lake City Police (Tactical 4)
158.730	Corry Police (Channel 2)
158.745	Albion, Girard, Lake City (Dispatch)
158.790	Sheriff (Dispatch)
159.345	Presque Isle State Park Lifeguards
159.420	Presque Isle State Park Lifeguards
452.1875	City of Erie Water Works Bayfront
453.1625	Erie County Prison
453.2250	Erie Metropolitan Transit Authority
453.3000	North East Borough Police (Dispatch)
453.4375	Erie County Prison (Tactical)
453.5250	Pennsylvania Emergency Management Agency
453.6250	City of Erie Wastewater Treatment Plant
458.7875	Erie County Prison (Operations)
453.8000	Erie Metropolitan Transit Authority (Maintenance)
453.9250	City of Erie Housing Authority
460.0500	City of Erie Police Department (Dispatch)
460.2000	City of Erie Police Department (Tactical)
460.2500	City of Erie Police Department (Traffic Control)
461.6250	City Of Erie Public Works
461.6500	City Of Erie Public Works
462.9500	EMS Med-9 Erie County MedCom (Dispatch)
462.9750	EmergyCare (Lifestar Helicopter) Dispatch (MED-10)
463.0000	EmergyCare EMS MED -1
463.0250	EmergyCare EMS MED -2
463.0500	EmergyCare EMS MED -3
463.0750	EmergyCare EMS MED -4
463.1000	EmergyCare EMS MED -5
463.1250	EmergyCare EMS MED -6
463.1500	EmergyCare EMS MED -7
463.1750	EmergyCare EMS MED-8
463.2000	Erie Yellow Cab Company
463.6500	City Of Erie Public Works

❖ Lost Radios

In June, the *Wall Street Journal* reported that the U.S. Marshals Service (USMS) lost track of at least 2,000 two-way radios capable of encrypted operation that are worth about $6 million. The problem goes back to 2011 when the Marshals Service deployed new radios and began replacing older models. The Service publicly blamed an outdated property management system and poor record keeping rather than assuming the radios were lost or stolen. Many of the radios were older models that had been deemed obsolete and were being removed from daily use.

The U.S. Marshals Service is the nation's oldest law enforcement agency and is tasked with protecting members of the federal court system as well as tracking fugitives and operating the witness protection program (called the Witness Security Program, or "WitSec"). Support for Marshal radios comes from their Office of Strategic Technology (OST) under the Wireless Communications Program, which "ensures the USMS has reliable secure LMR [Land Mobile Radio] communications capability."

The concern is not only about the cost of the radios but also the possibility that others could use them to monitor law enforcement activity. The Marshals Service has stated that they are "not aware of any instances where public safety was jeopardized" due to the missing radios and that they intend to have a new property management system in place soon.

❖ NYC EMS Delays

Record keeping is also a problem for New York City paramedics. In a move to modernize, Emergency Medical Services (EMS) technicians are now required to enter call and patient information on a tablet computer rather than filling out paper forms with a pen. The tablet is equipped with WiFi capability and links to a wireless router installed in the ambulance.

Since completing the electronic form is mandatory before returning to service, if the tablet cannot communicate with the network due to a lack of signal, the ambulance is delayed in responding to the next call. This leads to slower response times.

The tablets themselves weigh about five pounds and have no physical keyboard, so data entry must be done via a stylus, one letter at a time. They were introduced to EMS units in the five boroughs of the city over the past few months after an initial announcement in March.

EMS technicians are expected to complete the electronic forms in 20 to 25 minutes, although many say it can take up to twice that to make sure everything is updated and transmitted correctly.

Please continue to send your questions, comments, requests and reception reports to me at *danveeneman@monitoringtimes.com.* You can also check my website at **www.signalharbor.com** for more scanner-related information.

ASK BOB
GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *I have an active antenna for shortwave reception. It works fine with the telescoping whip extended, but when I substitute a similar-length fiberglass whip, reception is not as good. Why not?*

A. Is the whip spiral wound? Obviously the inductance would then play a part in frequency favoring. If it's simply uniformly plated, is the performance better at the low frequencies than the high? This could have something to do with skin effect. Finally, the whip could simply be defective in some manner, for instance, corrosion in contacts.

Q. *What types of HF antennas would have been installed on embassies before WW2? (J.J.O., NC)*

A. Most fixed-site antennas were horizontal wires of various configurations; Beverages, diamonds, longwires and more. Coaxial cable was invented in 1929, so it, as well as open-wire and single-wire feed, could also have been used. Considerable experimentation with gain and directivity on horizontal wires had been done by then and they were very effective for long distance communication.

Q. *Now that the Data Encryption Standard (DES) has been cracked, is it still authorized for use in public safety and other government communications?*

A. Yes, for routine local applications, but the Advanced Encryption Standard (AES) is mandated by the government to be used for interoperability among federal agencies.

Q. *I'd like to run an outside shortwave antenna wire for reception, but I'm not sure the best way to do it. (S.M., email)*

A. Most important is distance from interference generators like power lines, household wiring, and electronic appliances. It would be best to run the wire away from the house peak to a tree. Definitely bring the signal in through coaxial cable to prevent the intrusion of indoor electrical interference on the feedline.

A height of at least 15 feet above ground has always worked well for me, although higher would be better. Wire length of some 30-50 feet is certainly adequate; since you are going to be tuning your receiver over a 30:1 change in frequency range, there is no specifically-resonant antenna length.

An east/west wire alignment is fine since that means the wire's axis will be receiving north/south off its sides, favoring Europe and Asia as well as South America and, to a degree, Africa. Lesser heard will be off the ends of the wire.

Nothing beats an actual reception experiment. Simply run a temporary wire of any kind to your prospective distant end and listen to several stations on different high and low frequencies. Make a note of their relative signal strengths and the presence of electrical noise levels. Then do the same thing to an alternative location. It's important to do this test within a few minutes to avoid reception changes due to propagation.

An actual earth ground is probably unnecessary. You can try a ground rod to see if it helps reduce interference, but it won't increase signal strength.

The use of an inexpensive lightning arrestor such as the Grove LA1RF is recommended. Nothing can survive a direct lightning strike, but nearby strokes can induce high voltages on an antenna line that can damage a radio, and the arrestor short-circuits these harmlessly.

Q. *What is the proper and most effective use of the RF gain control on receivers? (Bob Redwine, Bloomfield, NM)*

A. The main reason is to reduce signal strengths of extremely strong signals that are causing interference to desired signals. This can be in the form of intermodulation ("intermod," the production of spurious signals on frequencies other than the actual transmitting frequency), or even adjacent channel interference ("signal splatter").

The RF gain control is reduced to the point at which the desired signal is unimpaired by the interference, or at least less impaired without adding debilitating receiver "hiss" to the desired, now weakened, signal.

A secondary use would be to reduce the level of an overpowering, desired signal to avoid distortion produced by exceeding the receiver's signal handling capabilities.

Q. *I have heard that in the 1950s and 60s the Voice of America used sub-audible frequencies in their broadcasts to send teletype messages to their foreign consulates and embassies. Is this true? (J.J. Owens, NC)*

A. I haven't heard this, although it is acknowledged that there were periods when messages were sent as part of a broadcast which anyone could hear. One example of the way the messages were "hidden in plain sight" was the playing of a particular song which would have a significance to the recipient.

Q. *As I was along a major road I spotted several yellow boxes at roughly 100 yard intervals with a rod driven into the ground alongside the road. I asked the flagger what these were and he explained that they were trying to locate pockets of natural gas under the roadway as they had previously done along I-70. Can you fill me in on this? (M.B., IN)*

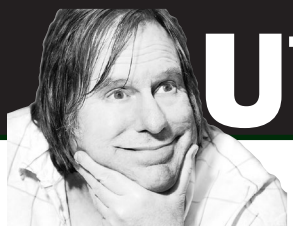
A. While I have no knowledge of yellow boxes without any dials or displays, there is a push on to get natural gas fuel stations positioned along major transportation corridors. I-70 is one of these. The devices may also be remote sensors to establish, from internal combustion fumes, the extent of natural gas automobiles currently travelling the highway. Colorado is a major player; you can see their study at:
www.epa.gov/region8/air/rmcdc/pdf/Swalnick_CONGVPlan_101111.pdf

---

Q. *I see a lot of audio and TV antenna cables being offered with "gold plated" connectors. How much better will such cables perform over nickel or any other plating? Is there enough gold on those connectors to justify the extra expense?*

A. The only benefit that gold plating provides is immunity to corrosion which would impede electrical conductivity between the connectors. Gold is actually a poorer conductor than copper, and even if it would be a better conductor, that thin film would do nothing to enhance the signal transfer because it still has to go through many feet of copper wire. The best conductor is actually silver, but silver plating would invite tarnishing in the weather. The simple answer is that no plating will do anything more than what's provided by clean contacts.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. Mail your questions along with a self-addressed stamped envelope in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.)



Hugh Stegman, NV6H
mtutilityworld@gmail.com
www.ominous-valve.com/uteworld.html
http://mt-utility.blogspot.com

U.S. Coast Guard Drops 2 MHz Services

On August 1, 2013, the United States Coast Guard (USCG) discontinued all medium frequency (MF) services. These were in the 2 megahertz (MHz) band.

An item in the July 15, 2013 Federal Register made it clear that the services affected included the distress watch on 2182 kilohertz (kHz), the Digital Selective Calling (DSC) watch on 2187.5 kHz, and all Marine Information Broadcasts from the various USCG sectors on 2670 kHz. These broadcasts were announced on 2182 and so, obviously, these announcements will go away as well.

The reasons given for this latest utility radio closure are the usual ones. The Coast Guard writes that, "The minimal use of these channels by mariners for distress and safety coupled with antenna site deterioration, costly upkeep, and extensive maintenance required to support the medium frequency (MF) system have led to a Coast Guard decision to terminate the MF services and direct the public mariner to use more modern safety and distress services which can be more reliably received by the Coast Guard." In plain English, this means that it's all about the money. It always is.

Indeed, the MF infrastructure has become ever more expensive and labor intensive to maintain. The more people say that terrestrial radio is dead, which it clearly isn't, the more budget and procurement decisions exclude it. The more it's excluded, the less profit there is in manufacturing, installation, and servicing of equipment. The lower profit means more expense and shortages, and it reinforces the idea that terrestrial radio is dead, even though it isn't.

U.S. Coast Guard (courtesy USCG).

Round and round it goes, and where it stops, everyone knows. Innovation ceases. Everything is old. Any engineer can tell stories about scrounging tubes and parts for obsolescent equipment, or hiring increasingly expensive riggers for those enormous MF antennas.

It's hard to dispute the idea that USCG MF gear had gotten pretty worn out. Stations that once hurled lightning around the planet became ever more feeble. Some of the 2670 kHz broadcasts were barely worth the effort of tuning in their daily transmissions.

At some point, all this becomes an unjustifiable expense if usage really and truly is down. USCG had been duly diligent in asking users if there would be a problem, and they claim to have received no answers that it would be.

The Coast Guard notes in its announcement that the impact on most users is that they will simply have to use higher frequencies. The Global Maritime Distress and Safety System (GMDSS) still requires high-frequency (HF) channels. USCG recommends that they be used farther than 20 miles from shore, where the Very High Frequency (VHF) service starts to drop off.

HF voice distress frequencies are provided on 4125, 6215, 8291, and 11190 kHz, all upper sideband (USB). The automated DSC shore side distress watch is still provided on 4207.5, 6312.0, 8414.5, 12577.0, and 16804 kHz, using frequency-shift keying. DSC is easily decoded by computer sound card programs, and it's getting a lot busier.

Especially in the vast Pacific Ocean, these higher channels usually get out better than two MHz anyway. Around here, it really had become something of a legacy service. Still, it's a bit sad that now both sets of Silent Periods on the radio room clock are meaningless here.

Old USCG Guam comm station logo.

Mainsail

"Mainsail" is a collective call sign used by the United States Air Force (USAF). It refers to any ground station in the High Frequency Global Communications System (HFGCS).

It's always been standard procedure that an aircraft (or other authorized user) could either call a specific ground station by name, or make an all-ground-stations call by transmitting the voice, "Mainsail, Mainsail, this is [aircraft call sign twice], over." The procedure is specified in Allied Communications Publication ACP-121, United States Supplement Two.

In the past, the ground station would answer with the name of the transmitter being used. For years, most of these worldwide stations have been "lights out" (fully automated). The control point is at Andrews Air Force Base in Maryland, with a backup at Offutt AFB in Nebraska.

And here's the issue: the SCOPE Command (System Capable Of Planned Expansion) radio upgrade has been in place for some time now. Its control setup is getting pretty sophisticated. It can pick the station with the best reception of the aircraft, and auto-configure accordingly.

As a result, the identity of the specific transmitter becomes less important. Apparently, this has now led to the use of Mainsail by ground stations as well.

This was noticed in July, when Emergency Action Message (EAM) broadcasts started to be identified by, "This is Mainsail, out." In the past the identifier had always been the specific station, usually Andrews or Offutt, with echoes to suggest that multiple transmitters were in use.

At press time, however, most routine EAMs are identified with "Mainsail," and stations are often using the call when working aircraft. Test counts still identify with the specific transmitter being tested.

Major HFGCS ground stations are as follows: Andrews, MD; Ascension, Ascension Island; Croughton, UK; Diego Garcia, Indian Ocean; Elmendorf, AK; Guam; Hickam, HI; Lajes, Azores; Offutt, NE; Puerto Rico, PR; Sigonella, Italy; McClellan, CA (formerly "West Coast"); and Yokota, Japan.

The primary frequencies are 4724, 6739, 8992, 11175, 13200, and 15016 kHz, all USB. Callups generally take place on these channels. EAM broadcasts will simulcast on most or all of them. A large number of secondary ("discrete") frequencies are provided for the purpose of moving traffic off the net.

There are also a number of Automatic Link Establishment (ALE) frequencies used mostly for sounding (real time propagation evaluation), or to establish data communications. One of these, 9025 kHz, also has been known to have auto-dialed phone patches.

Desert Eagle

The station identifying as Desert Eagle continues to be heard pretty much daily on 14484 kHz USB. This is a primary net frequency for the U.S. Military Auxiliary Radio System (MARS).

The call sign refers to the station's location, which is at the new Army MARS control point at Fort Huachuca in Arizona. It works stations with Army MARS call signs, and occasionally some more mysterious ones with identifiers such as Green Acres.

The signal strength of Desert Eagle seems to indicate the use of a rotatable directional antenna. It varies depending on who is being worked. Sometimes a contact will be taken off-net to another frequency, such as 10150 kHz.

Three to Go

As you are now aware, December of 2013

will be the last issue of *Monitoring Times*. The publishers, Bob and Judy Grove, are retiring.

While this column will become a Silent Key, its editor is not going anywhere. There is a perfectly good blog and web site, and soon there will be time to update them more frequently. Once the last Utility Logs closes in mid-September, contributors are welcome to keep sending what they hear, for publication on the blog.

No single web site or mailing list will ever have the wealth of information contained every month in this magazine, but there are still some very worthwhile ones. The first one worth mentioning is the Utility DXers Forum (UDXF). This is an informal, online radio club known mostly for its mailing list.

This list runs thousands of frequencies every year, and its members can probably answer any question about anything that transmits between 10 and 30000 kHz on this planet. The president, Ary Boender, has been at this for decades, and he runs a class act. Its web site is at **www.udxf.nl**. This includes a link for subscribing to the list. There will be more helpful transitional information in the next two columns.

ABBREVIATIONS USED IN THIS COLUMN

ALE..... Automatic Link Establishment
ARQ ..... Automatic Repeat reQuest teleprinting
AM ..... Amplitude Modulation
Camslant..... Communications Area Master Station, Atlantic
CW..... On-off keyed "Continuous Wave" Morse telegraphy
DGPS..... Differential Global Positioning System
DSC ..... Digital Selective Calling
E11a..... "Stritch" family numbers, in English
EAM ..... Emergency Action Message
FAA ..... U.S. Federal Aviation Administration
FAX..... Radiofacsimile
FEMA..... U.S. Federal Emergency Management Agency
G06..... Russian numbers in German, like other languages
G11..... "Stritch" family numbers, in German
FSK..... Frequency-Shift Keying
H3E ..... Single sideband with full carrier
HFDL..... High Frequency Data Link
HFGCS..... High Frequency Global Communications System
HM01 ..... Cuban AM "hybrid" mode, voice plus digital
ID ..... Station identification
LDOC..... Long-Distance Operational Control
LSB..... Lower Sideband
M21..... Russian CW time stamped tracking datagrams
MARS ..... U.S. Military Auxiliary Radio System
MFA..... Ministry of Foreign Affairs
MFSK..... Multiple Frequency-Shift Keying
MRHS..... Maritime Radio Historical Society
MSK..... Minimum-Shift Keying
MX..... Generic for Russian single-letter beacons/markers
NAWS ..... Group call: Notice to Allied War Ships
Pactor ..... Packet Teleprinting Over Radio, modes I-IV
PSK..... Phase-Shift Keying
RTTY..... Radio Teletype
S28..... Russian "buzzer"/ UVB-76/ MDZhB; strategic msgs
SECURE..... State Emergency Capability Using Radio Effectively
Selcal..... Selective Calling
SESEF..... Shipboard Electronics Systems Evaluation Facility
SHARES ..... Shared Resources, U.S. Federal frequency pool
Sitor..... Simplex Telex Over Radio, modes A & B
UK..... United Kingdom
Unid..... Unidentified
U.S. ..... United States
USAF ..... U.S. Air Force
USCG ..... U.S. Coast Guard
USS..... United States Ship
Volmet..... Scheduled, formatted, aviation weather broadcasts
XSL ..... Jangly PSK idlers and hissy data bursts from Japan

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

18.1 RDL-Russian military strategic broadcast, routine message of six 5-figure groups in FSK Morse, at 1311 (MPJ-UK).

316.0 710-Australian Maritime Safety Authority DGPS beacon, Corny Point, corrections in MSK, at 0430 (Eddy Waters-Australia).

1888.0 IPD-Civitavecchia Radio, Italy, marine information bulletins in Italian, at 2059 (MPJ-UK).

2000.0 New York-FAA Volmet on unpublished frequency, with aviation weather for Detroit, Cincinnati, Cleveland, and Indianapolis, at 0003 (Tony Agnelli-FL).

2070.4 BP21-German Federal Police boat *Bredstedt*, calling BPLEZS, control in Cuxhaven, ALE at 1901 (Ary Boender-Netherlands).

2656.0 IPA-Ancona Radio, Italy, weather and information bulletins in Italian, at 2052 (MPJ-UK).

2680.0 IDC-Cagliari Radio, Italy, weather and information bulletins in Italian and English, at 2050 (MPJ-UK).

3246.5 Unid-Russian Air Defense, CW null-data tracking strings padded with "?" (M21), also on 5221.5, at 1938 (MPJ-UK).

3531.0 REA4-Russian strategic air broadcast, CW message in 5-figure groups, at 2041 (MPJ-UK).

3815.0 262-Unknown agency, with "Stritch" numbers in German (G11), null-message callup "262/00," at 2000 (MPJ-UK).

4153.0 Unid-Japanese military "Slot Machine" (XSL), quadrature PSK idler making Las Vegas noises; also on 4231.5, 6250, 6417, 6435, 6445, 8313, 8588, and 8703.5; at 0951 (Boender-Hong Kong Remote).

4209.5 XVG-Haiphong Radio, Vietnam, Sitor-B navigation warnings for South China Sea in Vietnamese, at 2022 (MPJ-UK).

4553.5 ZLST-German Customs Control Post, Cuxhaven, ALE and data modem with ZEMD, Water Police boat *Emden* (DLVH), and ZHEL, Customs Cruiser *Helgoland* (DBQL), ALE at 2213 (MPJ-UK).

4603.0 FR3FEM-FEMA WGY903, MD, ALE chat and voice with FCSFEM2, FEMA WGY912, Mt. Weather, VA, at 1337 (Jack Metcalfe-KY).

4618.0 BP24-German Federal Police boats *Bad Bramstedt*, (DBGX), and *Bayreuth* (DBGY), both linking in ALE to BPLEZS, Cuxhaven, for modem conversations, similar on 8132, at 2230 (MPJ-UK).

4625.0 Unid-Russian military "buzzer" and strategic messages (S28), AM voice message "MDZhB 4925 VERKhOVShChIK," many others, starting at 0456 (Boender-Estonia Remote).

4780.0 Golden Pirate-U.S. National Guard, IN, net control calling stations, then went to "channel two" (unknown), LSB at 1306 (Metcalfe-KY).

5140.0 WPFY721-Oklahoma Emergency Management Agency, Operation SECURE net at the state emergency op center, at 1410 (Metcalfe-KY).

5150.0 VTK-Indian Navy, Tuticorin, CW weather at 1938 (MPJ-UK).

5646.0 Saudia Dispatch-Saudi Arabian Airlines company LDOC, Jeddah, selcal check with Saudia 1006, a B777, at 1934 (MDMonitor-Netherlands Remote).

5670.0 Colombo-South East Asian air route control, Sri Lanka, selcal check MR-FP with a South African Airways A340, at 1955 (MDMonitor-Netherlands).

5680.0 Kinloss Rescue-UK Aeronautical Rescue Coordination Centre, Scotland, making arrangements for rescued children with Rescue 122, a Royal Air Force Sea King helicopter, at 1843 (MDMonitor-Netherlands).

5687.0 DHM 91-German Air Force Transport Command, Münster, working GAF 264, a departing aircraft, at 1702 (MDMonitor-Netherlands).

5783.0 564-Russian "German Lady" (G06), machine voice in German repeating "564 22222" for 4 minutes, at 1800 (MPJ-UK).

5815.0 270-G11, null-message callup 270/00 in German, at 1755. G11, callup "278/?3" and unreadable message, also at 1755 (MPJ-UK).

5943.0 218-G06, callup "987 15" and message in 5-figure groups, at 1930 (MPJ-UK).

6383.0 NMC-USCG, Pt. Reyes, CA, special CW Night of Nights operation; also on 8574, at 0013 (Hugh Stegman-CA).

6477.5 KPH-MRHS, Pt. Reyes, CA, sending the annual Night of Nights CW message, then marker for "KPH / KFS / KSM;" simulkeying on 4247 (came up later), 8642, 12695.5, 12808.5, 16914, 17016.8, 17026, and 22477.5; at 0001 (Stegman-CA).

6676.0 Bangkok-South East Asian Volmet, Thailand, aviation weather at 2311 (MDMonitor-Netherlands).

6685.0 Klarnetist-Russian Air Force, Tver, working 76733, an IL-76MD transport reporting landing, at 1750. Korsar-Russian Air Force, Pskov; evening comm checks with Klarnetist (Tver), Davlenie (Taganrog), Polis (Orenburg), and Proselok (Bryansk); at 1800 (MDMonitor-Netherlands).

6693.0 Samara-Russian volmet, aviation weather in Russian, also on 8888, at 2316 (MDMonitor-Netherlands).

6765.0 KGG83A-Possible U.S. Federal Bureau of Investigation, VA, calling into SHARES Regional Net, at 1621 (Metcalfe-KY).

6800.0 Unid-SHARES Bulletin Board System, Pactor-IV at 1946 (Metcalfe-KY).

6846.0 AVLO-Russian military; CW duplex checks with 4UMY, 6GSA, LDQ2, and GSZ6; all sending on 5879, at 2124 (MPJ-UK).

6887.0 842-G06, callup "799 15" and message in 5-figure groups, at 1830 (MPJ-UK).

6968.5 Unid-Unknown SHARES station using Pactor-IV, at 1404 (Metcalfe-KY).

7345.0 Unid-U.S. communication intelligence training, broadcasting an audio book of Mark Twain's Huckleberry Finn a few sentences at a time, LSB at 1555 (Metcalfe-KY).

7348.0 WGY912-FEMA, Mt. Weather, VA, attempting a patch with WGY901 for WGY9021, at 1308 (Metcalfe-KY).

7475.0 KIT88-FAA, WV, ALE text messages and voice with KEM80 (FAA, Washington, D.C.), KLM80, (FAA, NJ), and KDM49 (FAA, GA); at 1704 (Metcalfe-KY).

7535.0 Saint George-U.S. Navy missile cruiser USS *Cape St. George* (CG 71), radio testing with Norfolk SESEF, VA, also on 10711, at 1355 (Metcalfe-KY).

7632.0 WGY9438, FEMA, FL, leaving a SHARES regional net, at 1617 (Metcalfe-KY).
7710.0 VFF-Canadian Coast Guard, Iqaluit, FAX Arctic Surface Analysis, at 1029 (Agnelli-FL).
7827.0 RGT77-Russian military, CW tactical broadcast in Cyrillic 5-letter groups, at 1557 (MPJ-UK).
7895.0 Unid-U.S. Navy, voice check probably with Mobile SESEF, AL; then ALE1, SHIP1, and SHIP2 in ALE, at 2000 (Metcalfe-KY).
7980.0 AQ101D-French Navy vessel FS *Aquitaine*, calling TLN400, Toulon, ALE at 1502 (Boender-Netherlands).
8105.0 SVJ4-Athens Meteo, Greece, FAX weather chart at 0910 (Boender-Netherlands).
8416.5 NMF-USCG, Boston, MA, Sitor-B weather synopsis at 1637 (Agnelli-FL).
8424.0 SVO-Olympia Radio, Greece, CW ID in Sitor-A marker, at 2318 (Agnelli-FL).
8431.0 TAH-Istanbul Radio, Turkey, CW ID in Sitor-A marker, at 2324 (Agnelli-FL).
8435.0 XSQ-Guangzhou Radio, China, CW ID in Sitor-A marker, also on 12613 and 16880, at 1325 (Waters-Australia).
8550.0 CTP-Portuguese Navy, Oeiras, RTTY "NAWS de CTP" loop, at 2326 (Agnelli-FL).
8677.0 CBV-Valparaiso/ Playa Ancha Radio, Chile, weak FAX satellite image, at 2331 (Agnelli-FL).
8886.0 MM62228-Italian Air Forces B767 flight IT0000, HFDL position for Krasnoyarsk, Russia, at 1940 (MPJ-UK).
8909.0 Ochitska-Unknown Russian military, formatted message in 3-figure groups for aircraft 79748, at 2245 (MDMonitor-Netherlands).
8939.0 Rostov-Russian volmet, aviation weather in Russian, at 1856 (MDMonitor-Netherlands).
8992.0 Unid-Portuguese Air Force, weather for unknown aircraft at 1519 (MDMonitor-Netherlands). Andrews-USAF HFGCS control station, MD, 89-character EAM for Noon 07 (unknown aircraft), at 1951 (Metcalfe-KY).
9031.0 Meredith-U.S. military, voice check and FSK exchange with Camel Rug, at 1319 (Metcalfe-KY).
9213.1 FAV22-French military, Favières, CW drill messages, spurious emission on 9215.2, at 1944 (MPJ-UK).
9268.0 239-G06, null-message callup in H3E, at 2000 (MPJ-UK).
9330.0 Unid-Cuban AM "hybrid" mode (HM01), alternating machine voice and data transmissions at 0707 (Robbie Spain-WY).
9914.0 KIT88-FAA, WV, calling unknown station in ALE and voice, at 1833 (Metcalfe-KY).
9996.0 RWM-Russian standard time station, Moscow, repeated CW ID and then time pips, at 0039 (Agnelli-FL).
10000.0 WWVH-U.S. National Institute of Standards and Technology, HI, female voice with time at minute plus 45 seconds, then male announcing WWV, CO, at 1051 (Agnelli-FL).
10075.0 VQ-BKW-Globus B737, flight GH0119, HFDL log-on with Al Muharraq, Bahrain, at 1830 (MPJ-UK).
10087.0 9V-SLM-SilkAir A320, flight MI0487, HFDL log-on with Krasnoyarsk, at 2113 (MPJ-UK).
10242.0 LNT-USCG Camslant Chesapeake, VA, ALE and voice with helicopter J14/ Juliet 14, at 1652 (Agnelli-FL).
10487.0 957-Unknown agency with "Stritch" numbers in English (E11a), callup and message in 5-figure groups, at 1710. E11a, callup "951/20" and message, also at 1710 (MPJ-UK).
10871.7 "D"-Russian Navy cluster beacon (MX), Odessa, Ukraine, CW ID at 2352 (Agnelli-FL).
11168.6 KAL71-Unknown U.S. State Department, calling KWV71, Ankara embassy, Turkey, ALE at 0652 (Boender-Netherlands).
11175.0 Andrews-USAF HFGCS, MD, radio check with Skull 20, a B-52H, at 1750 (Allan Stern-FL). Husker 16-U.S. Air National Guard, calling Chaos 13, then working Offutt HF-GCS, NE, at 1953 (Metcalfe-KY).
11193.0 Moscow Radio-LDOC, selcal check BG-JQ with an Aeroflot A320, reg VP-BWD, and voice in Russian, at 1050 (MDMonitor-Netherlands).
11220.0 Croughton-USAF HFGCS, UK, patching transport Reach 881 to Mildenhall for landing arrangements, at 1906 (MDMonitor-Netherlands).
11226.0 NW1-USAF E-4B "Nightwatch" National Airborne Operations Center, ALE sounding at 2012 (MDMonitor-MD).
11318.0 ZS-SXX-South African Airways A330, flight SA0052, HFDL position for Santa Cruz, Bolivia, at 2027 (MPJ-UK).
11354.0 Priboj-Russian Naval Air Transport Central Sector, Moscow, working (in Russian) aircraft 52891, who reported landing at Anapa, after which Priboj passed this info to Kraket (Western Sector, Kaliningrad), at 1050 (MDMonitor-Netherlands).
11360.0 Korsar-Russian Air Force transport regiment, Pskov; daily radio checks in Russian w/Proselok (Bryansk), Polis (Orenburg), Davlenie (Taganrog), and Klarnetist (Tver); at 1200 (MDMonitor-Netherlands).
11384.0 Tokyo Radio-Central/ East Pacific oceanic air control, calling Japanair 8854 (Japan Airlines International), at 0828 (Waters-Australia).
11424.0 239-G06, null-message callup "239/00000" in H3E, at 1900, and on 9268 at 2000 (MPJ-UK).
11900.0 TORMENTA38-Unknown, calling HURACAN, ALE at 1340 (Metcalfe-KY). *[Nice mystery. Mexican Army on old radios? -Hugh]*
12577.0 ZDJV2-UK flag vehicle carrier *Imola Express*, DSC ship-to-ship voice call request with 3EYX, Panama flag container ship *MSC Veronique*, at 1721 (MPJ-UK).
12581.5 XSV-Tianjin Radio, China, CW ID in Sitor-A marker, at 1330 (Waters-Australia).
12590.0 JNA-Tokyo Radio, Japan, Sitor-A message for ship on duplex frequency 12487.5, at 0820 (Waters-Australia).
12590.5 KLB-ShipCom, WA, CW ID in Sitor-A marker, at 0019 (Agnelli-FL).
12622.5 XSQ-Guangzhou Radio, China, Sitor-B messages in Chinese coded into 4-figure groups for the Sitor character set, at 1337 (Waters-Australia).
12629.0 TAH-Istanbul Radio, Turkey, CW ID in Sitor-A marker, at 0031 (Agnelli-FL).
12637.5 XSG-Shanghai Radio, China, CW ID in Sitor-A marker; also on 12649.5, 16892, and 16898.5; at 1342 (Waters-Australia).
12750.0 CWA-Cerrito Radio, Uruguay, fast CW weather in Spanish, at 0024 (Agnelli-FL).
12789.9 NMG-USCG, New Orleans, LA, very clear FAX tropical analysis, at 1211 (Agnelli-FL).
12843.0 HLO-Seoul Radio, South Korea, CW marker at 1044 (Agnelli-FL).
13017.0 KPH-Globe Wireless, Dixon, CA, still on-air after June 30 cutbacks, same GlobeFSK markers, at 0520 (Waters-Australia).
13110.0 WLO-ShipCom, Mobile, AL, female machine voice with maritime weather, also on 13152 and 17362, at 2314 (Agnelli-FL).
13158.0 BVA-Taipei Radio, Taiwan, voice phone patch to ship on duplex frequency 12311, at 1315 (Waters-Australia).
13182.0 XSQ-Guangzhou Radio, China, voice phone patch to ship on duplex frequency 12335, at 1255 (Waters-Australia).
13264.0 Shannon Volmet, Ireland, continuous aviation weather at 1112 (MDMonitor-Netherlands).
13270.0 5A-LAP-Libyan Airlines A320, flight LAA266, HFDL position for Hat Yai, Thailand, at 2033 (MPJ-UK).
13303.0 G-VBUG-Virgin Atlantic A340 "Lady Bird," flight VS0017, HFDL position for Canarias, Canary Islands, at 1957 (MPJ-UK).
13312.0 "16"-HFDL ground station, Guam, uplinks and squitters, also on 17919 and 21928, at 0545 (Waters-Australia).
13324.0 "02"-HFDL ground station, Molokai, HI, uplinks and squitters at 0408 (Waters-Australia).
13527.8 "P"-MX, Kaliningrad, Russia, also on 16331.8, CW ID at 0024 (Agnelli-FL).
13630.0 FAAMRB-FAA, WV, calling FAAASO; also tried 7475, 8125, 9914, 11637, 13630, 15851, and 20852; ALE at 1841 (Metcalfe-KY).
13722.0 985-E11a, callup "985/10" and message, at 1400. E11a, callup 981/10 and message, also at 1400, and again on 14518 at 1810 (MPJ-UK).
13927.0 AFA6BU-USAF MARS, AR, patch for Reach 188, an Air Mobility Command transport, at 1547 (Stern-FL).
13988.6 JMJ2-Japan Meteorological Agency, FAX weather chart at 0827 (Waters-Australia).
14434.0 Unid-SailMail Australia, New South Wales, Pactor-IV messages at 0435 (Waters-Australia).
14455.0 KHA920-U.S. National Aeronautics and Space Administration, CA, weekly net call-in, at 1633 (Metcalfe-KY).
14743.0 Unid-North Korean MFA, Pyongyang, encrypted ARQ messages in LSB, also on 16248 and 18525, at 0913 (Waters-Australia).
15867.0 LNT-USCG Camslant, calling 004 (USCG HC-130J #2004) ALE at 1649 (Boender-Netherlands).
16035.0 9VF 209-Kyodo News relay, Singapore or Penang, FAX Japanese newspaper at 60 lines per minute, at 0802 (Waters-Australia).
16283.6 KBF70-U.S. State Department, KBF95 (Emergency Net), ALE at 0601 (Boender-Netherlands).
16332.0 "C"-MX, Moscow, CW ID at 0023 and 1224 (Agnelli-FL).
16388.0 954-E11a, weak callup "954/31" and uncopyable message, at 1110 (MPJ-UK).
16809.0 WLO-ShipCom, AL, CW ID in Sitor-A marker, at 0435 (Waters-Australia).
16912.0 RDL-Russian military strategic broadcast, FSK Morse message in 5-figure groups, at 1400 (MPJ-UK).
16914.0 KSM-MRHS Night of Nights, weak but good quality CW signal at 0040 (Waters-Australia).
17016.8 KPH-Special event call sign for MRHS Night of Nights, weak and difficult CW copy at 0040 (Waters-Australia).
17026.0 KFS-MRHS Night of Nights, weak but clear CW at 0040 (Waters-Australia).
17901.0 HC-CJV-AeroGal A320, flight 2K0603, HFDL log-on with Albrook, Panama, at 2026 (MPJ-UK).
17904.0 San Francisco-Central/ West Pacific air route control, giving secondary frequency 11384 to United 150, at 0357 (Waters-Australia).
17912.0 "14"-HFDL ground station, Krasnoyarsk, squitters at 0748 (Waters-Australia).
17916.0 "05"-HFDL ground station, Auckland, New Zealand, uplinks and squitters at 0413 (Waters-Australia).
18980.0 7CB-Belawan/ Jakarta Radio, Indonesia, CW marine traffic in Indonesian language, at 0813 (Waters-Australia).
19241.8 MK6UT-Pakistani assets in Darfur, Sudan, short encrypted messages in Pactor-II, at 0646 (Waters-Australia).
19770.0 XSQ-Guangzhou Radio, China, voice telephone call to ship on 18795, at 0811 (Waters-Australia).
21949.0 "06"-HFDL ground station, Hat Yai, uplink to flight GAO616, at 0807 (Waters-Australia).
22447.0 KPH-MRHS CW Night of Nights, audible with flutter, at 0040 (Waters-Australia).
22542.0 JSC-Kyodo News, Japan, FAX Japanese newspaper, 60 lines per minute, at 0802 (Waters-Australia).
28216.0 K3FX/B-Amateur 10-meter CW propagation beacon, NJ, ID and position at 1214 (Boender-Netherlands).

Mike Chace
mikechace@monitoringtimes.com
www.chace-ortiz.org/umc

The Army MARS TSA HF Network

In 2006, the amateur radio operators that make up the U.S. MARS (Military Auxiliary Radio System) entered into an agreement to provide back-up communications for the TSA (Transportation Security Administration) with the possibility of expanding their role within other parts of the DHS (Department of Homeland Security) in the future.

Initially, the role of this new group was to help with communications in various "hurricane alleys" and the first stations were established at airports in the Florida cities of Miami, Fort Myers, Jacksonville and Pensacola. Soon after, units were formed to cover from Washington, D.C. to the U.S. Virgin Islands and Puerto Rico. Operators chosen for these stations were to live close to the key airports so that they had minimal travel time in case of emergencies.

While further parts of the agreement called for coverage of pipelines and mass transit, the TSA airport element appears to be the most active on HF. The agreement set out the following additional aims:

The Navy, Marine Corps and Air Force MARS organizations are included in the call for volunteers through their separate chains of command.

Army MARS State Directors will be responsible for formation of the joint teams.

All deployments will be by team, each with a combination of equipment and operator capabilities and members ready to work 12-hour shifts. Some locations may ultimately require more than one team.

Required equipment for each team will include HF and VHF radios with voice and digital capability, PacTOR/Airmail digital messaging, phone patching and emergency power. Some locations may have TSA radio gear and an emergency power supply to augment the ham's personal equipment.

These new units were also tasked with ensuring interoperability with existing RACES (Radio Amateur Civil Emergency Service) and SHARES (Shared Resources) networks and the DHS's NCS (National Communications System). The pact also calls for a reliable back-up solution "to ensure the continuity of TSA's command and control function during the first 72 hours following any incident interfering with normal communications channels and to provide local, regional and nationwide TSA communications during that time."

For its part, the TSA agreed to provide MARS volunteers with access to its facilities and space for radio equipment. It further agreed to integrate MARS capabilities into its emergency planning and exercises. The Army's commitment included providing, "volunteer MARS radio operators, equipment, and use of the MARS radio networks," as well as developing, "alert procedures and a communications support plan that identify specific frequencies, call signs, and radio operator level duties."

Over the past couple of months, I have been monitoring these stations intensively and now have a reasonably complete set of channels and stations that make up the network. Frequencies used are as follows (in kHz USB or LSB):

2360L, 3242U, 3278L, 5112U, 5393U, 6996L, 7314U, 7430U, 9210U, 10493U, 10535U, 12188U, 12187U, 14395U, 14484U, 14514U, 14938U and 18211U

As the text of the agreement suggests, the majority of traffic is carried by PacTOR-I, II or III modems and consist of lengthy sequences of stations calling neighbors in an attempt to determine connectivity, followed by short email status messages relayed between stations. Monthly tests appear to take place during the third week of the month but activity can be heard at any time.

With at least forty stations known to be active, and a network that extends beyond the contiguous 48 states, you are sure to hear at least a few in your location. A number of decoders such as MultiPSK, for example, will decode the selcalls between stations and the PacTOR-I messages. Hoka, WaveCom, Krypto500 and Sorcerer can decode the more advanced modes.

Here is the list of stations heard so far that comprise the Army MARS TSA Network:

AAN1BGR = Bangor International Airport, Bangor ME (FN54mm)
AAN1BOS = General Edward Lawrence Logan International Airport, Boston MA
AAN1BTV = Burlington International Airport, Burlington VT
AAN1MHT = Manchester–Boston Regional Airport, Manchester NH
AAN1PVD = T. F. Green Airport, Providence RI
AAN2JFK = John F. Kennedy International Airport, New York NY
AAN2EWR = Newark Liberty International Airport, Newark NJ
AAN3BWI = Baltimore-Washington International Airport, Baltimore MD
AAN3CRW = Yeager Airport, Charleston WV
AAN3DCA = Ronald Reagan Washington National Airport, Washington DC (FM18ko)
ABN3GUM = Agana Airport, Agana GU
AAN3MDT = Harrisburg International Airport, Harrisburg PA
AAN3MPT = Pentagon, Washington DC
AAN3ORF = Norfolk International Airport, Norfolk VA
AAN3PHL = Philadelphia International Airport, Philadelphia PA
AAN3PNT = Pentagon, Washington DC
AAN3TSA = Region 3 HQ Station
ACM3STT = Cyril E. King International Airport, US Virgin Islands
ACM3STX = Henry E Rohlsen Airport, Christiansted, US Virgin Islands (FK78mm)
AAN4BHM = Birmingham–Shuttlesworth International Airport, Birmingham AL (EM63mm)
AAN4BHV = Birmingham–Shuttlesworth International Airport, Birmingham AL (EM63mm)
AAN4BNA = Nashville International Airport, Nashville TN (EM65mm)
AAN4BQN = Rafael Hernández Airport, Aguadilla PR (FK68mm)
AAN4BTR = Baton Rouge Metropolitan Airport, Baton Rouge LA
AAN4CAE = Columbia Metropolitan Airport, Columbia SC (EM93mm)
AAN4CHS = Charleston International Airport, Charleston SC
AAN4CLT = Charlotte Douglas International Airport, Charlotte NC
AAN4ECP = Northwest Florida Beaches Airport, Panama City FL (EM70mm)
AAN4EKY = Bessemer Airport, Bessemer AL
AAN4FLL = Fort Lauderdale–Hollywood International Airport, Fort Lauderdale FL
AAN4HSV = Huntsville International Airport-Carl T Jones Field, Huntsville AL
AAN4JAX = Jacksonville International Airport, Jacksonville FL
AAN4MCO = Orlando International Airport, Orlando FL
AAN4MEM = Memphis International Airport, Memphis TN
AAN4MIA = Miami International Airport, Miami FL (EL95ok)
AAN4MOB = Mobile Regional Airport, Mobile AL
AAN4MYR = Myrtle Beach International Airport, Myrtle Beach SC
AAN4PNS = Pensacola Gulf Coast Regional Airport, Pensacola FL (EM60jm)
AAN4RDU = Raleigh-Durham International Airport, Morrisville NC
AAN4RIC = Richmond International Airport, Richmond VA
AAN4RSW = Southwest Florida International Airport, Fort Myers FL
AAN4RVA = Gainesville Regional Airport, Gainesville FL (EL89jm) (EL98ol)
AAN4SAV = Savannah Hilton Head International Airport, Savannah GA (EM91mm)
AAN4SDF = Louisville International Airport, Louisville KY
AAN4SJU = Luis Muñoz Marín International Airport, San Juan PR
AAN4SRQ = Sarasota Bradenton International Airport, Sarasota FL
AAN4TPA = Tampa International Airport, Tampa FL
AAN4TSA = Region 4 HQ Station, Pensacola FL (EM60jm) aka W4ZH
AAN4TSB = Pensacola, FL
AAN4TSE = Jackson, TN (EM55mm)
AAN4TVS = Tennessee Valley (unconfirmed)
AAN4TYS = McGhee Tyson Airport, Knoxville TN
AAN5CMH = Port Columbus International Airport, OH
AAN5CVG = Cincinnati/Northern Kentucky International Airport, Cincinnati KY
AAN5DAY = James M Cox International Airport, Dayton OH (EM79vv)
AAN5DTW = Detroit Metropolitan Wayne County Airport, Detroit MI
AAN5IND = Indianapolis International Airport, Indianapolis IN
AAN5MKE = General Mitchell International Airport, Milwaukee WI
AAN5MLI = Quad City International Airport, Moline IL
AAN5MSN = Dane County Regional Airport, Madison WI
AAN5MSP = Minneapolis–Saint Paul International Airport, Minneapolis MN
AAN5ORD = Chicago O'Hare International Airport, Chicago IL (EN60mm)
AAN5RST = Rochester International Airport, Rochester MN
AAN5TNC = Little Rock, AR
AAN5TSA = Region 5 HQ Station
AAN6AUS = Austin-Bergstrom International Airport, Austin TX
AAN6BTR = Baton Rouge Metropolitan Airport, Baton Rouge LA
AAN6CRP = Corpus Christi International Airport, Corpus Christi TX (EL18mm)
AAN6DAL = Dallas-Love Airport, Dallas TX
AAN6DFW = Dallas-Fort Worth Airport, Dallas TX (EM12mm)
AAN6ELP = El Paso International Airport, El Paso TX
AAN6HOU = William P. Hobby Airport, Houston TX
AAN6HRL = Valley International Airport, Harlingen TX
AAN6IAH = George Bush Intercontinental Airport. Houston TX
AAN6GPT = Gulfport–Biloxi International Airport, Gulfport MS (EM50mm)
AAN6LBB = Lubbock Preston Smith International Airport, Lubbock TX
AAN6LIT = Clinton National Airport/Adams Field, Little Rock AR (EM44mm)
AAN6MFE = McAllen-Miller International Airport, McAllen TX
AAN6MSY = Louis Armstrong New Orleans Airport, New Orleans LA (EL49mm)
AAN6OKC = Will Rogers World Airport, Oklahoma City OK
AAN6SAT = San Antonio International Airport, San Antonio TX (EM10mm)
AAN6TGC = Gibson County Airport, Trenton TN
AAN6XNA = Northwest Arkansas Regional Airport, Bentonville AR
AAN7DSM = Des Moines International Airport, Des Moines IA (EN32mm)
AAN7MCI = Kansas City International Airport, Kansas City MO
AAN7MCS = Unknown
AAN7STL = Lambert St Louis International Airport, St Louis MO (EM48mm)
AAN8BIS = Bismarck Municipal Airport, Bismarck ND
AAN8COS = Colorado Springs Municipal Airport, Colorado Springs CO
AAN8DEN = Denver International Airport, Denver CO
AAN8GJT = Grand Junction Regional Airport, Grand Junction CO
AAN8SLC = Salt Lake City International Airport, Salt Lake City UT
AAN8TSW = Scott Teerlinck (deceased)
AAN9HNL = Honolulu International Airport, Honolulu HI
AAN9LAS = McCarran International Airport, Las Vegas NV
AAN9LAX = Los Angeles International Airport, Los Angeles CA
AAN0LIH = Kauai Island Lihue, Lihue HI
AAN9OAK = Oakland International Airport, Oakland CA
AAN9PHX = Phoenix Sky Harbor International Airport, Phoenix AZ
AAN9OGG = Kahului Maui International, HI
AAN9RNO = Reno–Tahoe International Airport, Reno NV
AAN9RVA = Unknown
AAN9SAN = San Diego International Airport, San Diego CA
AAN9SFO = San Francisco International Airport, San Francisco CA
AAN9TSA = Region 9 HQ Station
AAN9TSW = Region 9 HQ Station
AAA9USA = Fort Huachuca, AZ (DM41un)
AAN0ANC = Ted Stevens Anchorage International Airport, Anchorage AK
AAN0BLI = Bellingham International Airport, Bellingham WA
AAN0BOI = Boise Airport, Boise ID
AAN0FAI = Fairbanks International Airport, Fairbanks AK
AAN0GEG = Spokane International Airport, Spokane WA
AAN0JNU = Juneau Airport, Juneau AK
AAN0MFR = Rogue Valley International-Medford Airport, Medford OR
AAN0PDX = Portland International Airport, Portland OR (CN95mm)
AAN0SEA = Seattle-Tacoma International Airport, Seattle WA (CN87ud)
AAN0TNW = Tin Creek Airport, Farewell Lake AK
UHCAACM = Unknown
UHCACCM = Lexington, NE (EN01ea)
UHEABCM = possibly AAN2JFK
UHHEADCM = near Hertford, NC (FM16pf)

Kirk A. Kleinschmidt, NT0Z
kirk@monitoringtimes.com

Adventure Beyond PSK31

The other day, a ham buddy and I were lamenting the generally sad state of affairs this season on 6-meters. Sure, there had been a few openings this summer, but nothing that could in any way rival the Magic Band action in 2010 and 2011, which produced lots of activity and generally awesome propagation during the VHF QSO Party and Field Day. This year, as usual, stations in the East and Southeast worked some double-hop and TEP DX, and a few of the Lucky Ones even worked stations in New Zealand, but in the North Central Plains, 6-meters was mostly dead air and tumbleweeds.

My friend, who went into the season worrying about the fact that he hadn't had time to climb his tower and fix up his 6-meter beam (which had suffered a bit from the previous winter), was now sort of relieved that he hadn't put forth the required effort!

In the midst of that funk we started daydreaming about ways we might put that 4-MHz chunk of spectral real estate to good use. After all, our rigs covered the whole band, but outside of 50.080 - 50.100 MHz for working CW (me only) and 50.125 - 50.250 MHz for SSB QSOs, the vast majority of the band might as well not exist. Blasphemy, I know! So, we wondered mischievously, what might we do to liven up an otherwise dead band?

The first thing that came to mind was Hellschreiber, quickly followed by Weather Fax and then RTTY, but at ridiculous baud rates and tone spacings (subject to FCC rules, of course!). The idea was to do something really off the wall, not only to broaden our own horizons, but to freak out other ops in the hope that they might feel the need to investigate and decode our crazy cross-town antics.

Being Computer Weenies, we knew that there were many interesting digital modes out there that we just hadn't gotten around to exploring. My buddy was a relative newcomer, but my sin was far greater: I had been on the air for decades and had only scratched the surface. In looking back over the years, I saw that almost all of my contacts had been via Morse code (at least 90%), with most of the rest via SSB.

I have worked stations in all 50 states and some 50 DXCC entities via RTTY (and even have a distant relative who helped "create" RTTY from the ground up), worked some DX via PSK31, and even made a few QSOs back in the day via HF Packet and AMTOR (remember the chirp-chirp-chirp?). But I've never messed with (RX yes, TX no) digital voice QSOs, or the plethora of multi-tone data modes such as Olivia, MFSK or JT-65 (let alone SSTV, WEFAX, WSPR, QRSS or Feld Hell), despite the fact that a cheap and dirty audio interface and a computer with a soundcard are all that's required to make it happen; and I own several PCs, soundcards and the aforementioned interfaces!

Old vs. New

I'm often amazed by the longevity of certain ham pursuits. Amateur radio defines experimentation and state-of-the-art and, over the decades, technologies, from packet radio to miniaturized satellites, to radio astronomy, to propagation and beyond, were pioneered by hams who, as a collection of individuals, still happily communicate by Morse code, which dates to the American Civil War! Who else does that?

Our hobby has lots of specialized nooks and crannies to explore, but many of us, I'm afraid, myself included, probably don't explore enough. We get comfortable with the skills and knowledge we've gained, but we don't necessarily break out of our comfort zones as much as we should.

So, the goal this month is to pull you out of your comfort zone and encourage you to do something new. Although you can feel free to pursue anything and everything that catches your ham radio attention, whether home-brewing or fox hunting, this month's column focuses more narrowly on exploring the wide variety of digital operating modes that require nothing more than a PC, a soundcard and a $3 interface (or a $300 interface if that's your thing).

My buddy and I are focusing on the wild, crazy and unusual purely for shock and novelty value, and you can certainly do the same. If you've dabbled with RTTY and PSK31 for years, consider something a bit more exotic. If you're a relative newcomer to digi-modes in general, PSK31 is a great place to start.

Get Connected

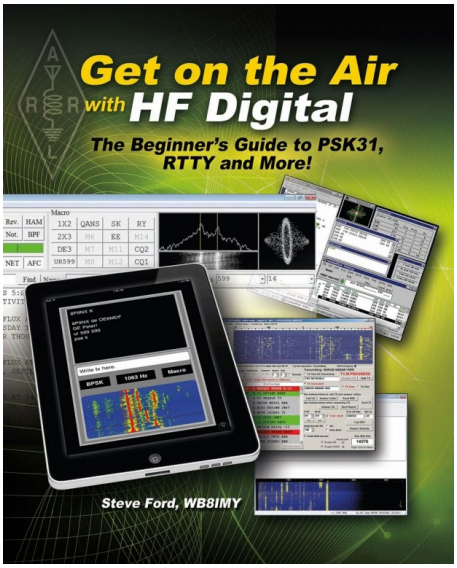
Aside from a working transceiver and a valid ham license, the rest of the hardware required to operate via just about every digital mode is a PC (with software, mostly free), a soundcard and an audio interface; none of which need to be recent models. But, it wasn't always that way. RTTY hardware improved and evolved in the 70s and 80s, and hams began working RTTY and receiving shortwave RTTY and FAX stations with everything from cheap, two-diode, PC serial interfaces to expensive HAL or Universal terminal units. SSTV, while possible, required an expensive scan-converter box (probably made by Robot Research). Before that transitional era, RTTY terminals were electromechanical monsters that were bigger than dorm fridges, made lots of noise and required frequent maintenance.

Starting in the 1980s, the use of multimode terminal units from Kantronics and AEA (often called multimode communications processors, MCPs), which were used with PCs or "dumb" terminals, began displacing even the more robust RTTY-only gear made by companies such as TONO and HAL.

Thanks to MCPs and other emerging digital technologies, RTTY saw increasing competition from the various error-correcting "handshaking" modes; AMTOR, packet, PACTOR, G-TOR, CLOVER, and so on. Even then, we wondered whether the RTTY era was coming to an end. It wasn't, and isn't, although modern RTTY is mostly used during contests.

Thanks to a sexy TONO EXL-5000 self-contained MCP (which had its own screen and keyboard), I went through an "AMTOR phase" in the early '90s. It had its moments, but AMTOR, which relentlessly chirps back and forth until all data is correctly transmitted and acknowledged, was hard on a rig's T/R relays (and an operator's ears)! Simply making a QSO required a transceiver with a sufficiently fast T/R turnaround time. Many rigs that were

The key to almost all digi-mode magic is the interface that connects your transceiver to your PC sound card (which uses its DSP prowess to encode and decode modulation streams of various types). You can spend a lot of money on deluxe commercial versions, or you can make a perfectly usable interface from junk box parts, as I did here for use with an Elecraft KX3. My existing interface lacked the cables and connectors required to match the little radio and I didn't want to "butcher" it to accommodate a new rig. I couldn't find my collection of scavenged audio transformers, so I "harvested" these beauties from a pair "never to be used again" PC telephone modems. Total cost was less than $3. The schematic, and tons of audio interface know-how, can be found at www.qsl.net/wm2u/interface.html.



Designed to show you how to work the world with just a few watts of digital RF, the ARRL's "Get on the Air with HF Digital," written by Steve Ford WB8IMY, is an easy-to-understand, step-by-step guide to RTTY, PSK31, MFSK, Olivia, JT65 and more. Topics include PCs, interfaces, software and operating tips and practices. It's an all-in-one guide to HF digi-mode operating. Priced at $23, "Get on the Air with HF Digital" is available from www.arrl.org.

only a few years old couldn't make the grade. Like RTTY on a non-contest weekend, I haven't heard AMTOR on the air in years. Hint, hint?

By the late 90s, the now-familiar "PC, soundcard, audio interface" setup reigned supreme, enabling digi-mode operation for the masses. The popularity of this combo was forever cemented by G3PLX's introduction of PSK31 in 1998. Hams needed a high-performance digital mode that could optionally incorporate error correction *without* requiring back-and-forth chirping. The breakthrough technology, which marked a turning point in amateur radio digital communication, was PSK31. Long live the sound card!

❖ Modes Aplenty!

What "soundcard modes" are available these days? So many that fragmentation is probably the biggest problem facing digi-mode ops today. Like other facets of modern society, there are simply too many choices. With that understood, let's look at just a few, with some historical perspective thrown in for good measure.

RTTY. Also known as Baudot, RTTY is short for Radioteletype, and it's the Elder Statesman of all digital modes, second only to Morse code, the "original digital." RTTY is an FSK (frequency-shift keying) mode that uses a five-tone digital code to represent letters, numbers, etc. There's *no error-correction*, making RTTY 100% "real radio" that depends on RF power and propagation for success. Although used mostly by contesters today, RTTY is good to go on any band at any time.

HF Packet Radio. HF packet radio is a 300-baud digital mode that uses AFSK (audio-frequency-shift keying) to squawk traffic and data over relatively long distances. HF packet is mostly a "has been" mode. It was interesting in its day, but its performance (generally poor) has long been eclipsed.

TOR. Ham ops, and commercial shortwave users, have plenty of TOR modes to choose from. TOR, short for Teleprinter Over Radio, is an error-correcting digital technology that uses FSK or AFSK to chirp-chirp data back and forth until it's been correctly received (unlike RTTY, which is a one-shot deal), or to transmit extra, redundant information with each transmission (a technique known as FEC, or Forward Error Correction).

AMTOR, the first TOR mode used by hams got the ball rolling, but isn't used much nowadays, although its commercial counterpart, SITOR-B, is still around. PACTOR is an FSK/AFSK mode that's sort of like a combination of packet and AMTOR. PACTOR uses data compression and can transfer 8-bit binary data, making it suitable for transferring binary data files.

PACTOR II and **PACTOR III** use more advanced PSK modulation (Phase Shift Keying) made possible by computers and DSP (Digital Signal Processing). PACTOR II is an improvement over the original PACTOR and is largely compatible with it, as they both share the same protocols. PACTOR III is somewhat restricted in the U.S. and the hardware required to use it is proprietary and prohibitively expensive.

CLOVER (including CLOVER-II and CLOVER-2000) is a proprietary mode developed by RTTY mainstay Hal Communications. It's an error-correcting PSK mode, well-suited to the vagaries of HF operation. CLOVER adapts its data rate and modulation modes to accommodate varying conditions. Like PACTOR, CLOVER hardware is proprietary and expensive (unless you can find some older HAL modems at a flea market!).

PSK31. This DSP-based "keyboard to keyboard" mode ushered in the digital revolution. PSK31 and its newer, faster cousin, PSK63, use microscopic amounts of spectrum space and are incredibly efficient (think excellent performance with low power). PSK31 is probably the most popular HF digital mode worldwide.

MT63. This "wideband" HF digital mode occupies 1 kHz of spectrum space and uses a complex set of 64 modulated tones to produce an aggressive, error-correcting, DSP-based mode that offers excellent performance in poor conditions (but probably shouldn't be used during crowded band conditions outside of 6 and 10 meters). This "hard to tune" multi-tone mode was developed by Pawel Jalocha SP9VRC. It's designed for keyboard-to-keyboard conversations and requires a relatively fast PC.

THROB. This interesting, and somewhat experimental, DSP-based digital mode, developed by Lionel Sear G3PPT, uses MFSK (Multiple Frequency Shift Keying) and nine audio tones to work its magic. It's a bit slower than PSK31, and uses a bit more bandwidth (144 Hz), but shares a handy waterfall visual display. An updated version, THROB 2000, was developed, but it's difficult to find on the air these days without making a sked.

Olivia. Designed to work with QRM and QRP, this multi-tone MFSK mode, developed by Pawel Jalocha SP9VRC in 2005, has a baud rate of 31.25 (like PSK31), but can decode signals that are 10-14 dB below the noise level (that means that the noise can be *two to three times louder* than the signal)! Emerging weak-signal modes such as JT65 and JT9 have slightly better decoder performance, but they can't really be used for keyboard to keyboard conversations like Olivia can (JT9 QSOs can take several minutes to several hours to complete and are semi-automated). With bandwidth and tone settings that range from 125 Hz to 2 kHz, and 4 to 32 tones, respectively, finding and tuning Olivia signals might be even more confusing if most activity didn't use one of two formats: 500/16 or 1000/32.

Contestia. Developed by Nick Fedoseev UT2UZ, and almost identical to Olivia, but with twice the speed (and somewhat reduced decoder performance), Contestia is often considered to be "Olivia Lite."

JT65 / JT9. Developed by Nobel Laureate Joe Taylor, K1JT, JT65 and JT9 are multi-tone modes that sprang from moon-bounce and weak-signal VHF/UHF work via tropo and meteor-scatter. They offer unparalleled decoder performance, but the user experience isn't always conversational or convenient (QSOs can take many minutes or even hours).

Hellschreiber. Think of Hellschreiber ("light writing" in German) as a sort of digital fax mode for HF. It uses a single audio tone that's keyed on and off in a particular fashion to "paint" characters on the screen at about 35 WPM. Taking up a reasonable 75 Hz of bandwidth, received characters are actually "painted" onto the screen instead of being decoded and displayed! As with other "fuzzy" modes such as Morse code, the "analog signal processor" between your ears can assist the DSP in your PC!

❖ Have Fun!

There are *many* other digital modes waiting for your discovery, including several for slow-scan TV, GPS, APRS, digital voice, propagation monitoring, beaconing, you name it. And, new modes are popping up all the time. Those highlighted here are mostly conversational, meaning that you can use them to chat keyboard to keyboard with other hams in real time. The only thing left to do is to get started. Then, like me and my buddy, if so moved, you can get goofy. If you tune across a strange signal on 6 meters, with weather fax on USB and a voice conversation on LSB, it's probably me, so say hello...via WEFAX, of course!

Resources

WB8NUT's digital mode info page—**http://wb8nut.com/digital**
WB8ROL's Olivia info page—**http://oliviamode.com**
ARRL's digital mode info page—**www.arrl.org/digital-modes**
Fldigi software—**www.w1hkj.com/Fldigi.html**
DM780 software—**www.hrdsoftwarellc.com**
MultiPSK software—**http://f6cte.free.fr/index_anglais.htm**
MixW software (not free)—**http://mixw.net**

GETTING STARTED
THE BEGINNER'S CORNER

Ken Reitz, KS4ZR
kenreitz@monitoringtimes.com

Repeater Silence, Missing WiFi Radio Stations, FTA-OTA-TV Reception and Rural Broadband

Mike Hawkins KJ4NQY, from Atlanta, Georgia, writes:

"Re: August, 2013, Beginner's Corner, 'Whatever Happened to 2-Meters?' I have been a ham for just 5 or 6 years. One of the first radios I purchased was a multi-band HT. I also installed a dual band VHF/UHF radio in my car. Both were programmed with the local repeaters; did I mention I live in the Atlanta metro area? That meant I had over 100 repeaters to choose from. Since that time I have found minor traffic on two, yes, two repeaters, and only during drive time in the mornings and afternoons.

"I have volunteered highway traffic information and weather updates on the repeater from time to time. I get a curt 'Thanks' for the information and they are back to their rag chew. As for traffic info and help when traveling, I've lately installed a CB radio in the car.

"I have driven from Atlanta to Tampa and never heard a peep from my VHF/UHF rig. I have even put out calls every so often to no reply. I can offer no explanation for this lack of interest. I don't care to listen to truck driver rag chews, but I can't rely on the ham rig for help on the road. I am not going to give up on it, I will keep trying to stir up some useful purpose for the excellent FM communications systems we have. I encourage all of my fellow hams to do the same!"

Taking the FTA-Satellite Plunge

John Strand W6IBL, Lake Isabella, California, writes:

"I have archived many of your articles on FTA satellite-TV reception, some of which date back to 2008, and it is obvious that the technology is rapidly changing. I really don't need to sweep the Clarke Belt and look at many birds. My interests are mainly uninterrupted music, some international news and maybe some NASA broadcasts.

"I was thinking of building a dedicated Ku-band system for looking at G-19. As for receivers, do you think I should consider the Motorola or the Manhattan receiver, or something else altogether?"

The Motorola is no longer made, but the Manhattan receiver is a really good buy. I've had one in constant use for several years without a problem. Here's the place to get it: **www.global-cm.net/PatriotEllipticalAntenna.html** (scroll down the page to see the entire system). Mike Kohl is the guy to talk to. Tell him you saw it in *MT*! This whole system is only $200. If you buy his 2-antenna system ($300 total) you'll get the Manhattan receiver and two complete dishes. You can aim one at G19 for all the international programming and the other at AMC-1 for WCPE-FM, a full-time classical music station. Changing dishes is done automatically through a switch which is included.

The most comprehensive list of FTA programming for CONUS, Pacific and Atlantic regions is found here: **www.global-cm.net/mpeg2central.html.** I don't think you'll see much in the Pacific rim region, even where you live in California, but in the CONUS (CONtinental U.S.), on Ku-band you'll see plenty of action, particularly if you move the dish around. On the satellite that carries WCPE-FM there are also NBC network time zone feeds as well as a surf camera mounted on the pier at Surf City, U.S.A. (Huntington Beach, California), a salve upon the wound many a long winter's night for those of us in the snow-belt!

Has the MPEGII format been replaced with an updated technology? Yes, more programmers are switching to MPEG4 feeds. The Manhattan receives MPEGII and MPEG4, so you can watch either format. Since programming is headed in the direction of MPEG4 (because it's HDTV), it's the best receiver for future viewing as well. Keep in mind that, while the Manhattan will be used for Ku-band reception in both of these satellite cases, in the event you should expand to a C-band dish, it will tune that as well.

Unfortunately, NASA is found only on C-band at AMC-18 105 degrees W. However, you could set up an inexpensive, stationary 6-foot C-band dish such as this one: **www.sadoun.com/Sat/Order/Dishes/C_Band_satellite_dish.htm.** It should work nicely for this purpose in the future. It will switch between your C-band and Ku-band satellite dishes, not nearly as hard as it sounds to set up.

Exede broadband over satellite ($50-130 per month plus equipment lease). (Courtesy: Exede)

OTA-TV Reception Tips

Herb Raemsch, from Montoursville, Pennsylvania writes:

I read your article on OTA-TV in the June issue of *Monitoring Times* with interest. I'd like to know if you had tried the digital-to-analog converters that I know Radio Shack had once sold. I'm interested in starting somewhere just to see in my area what I may receive Over-The-Air, if anything. I would be interested in any other names of converter boxes you may have seen or used. I don't want to go overboard in price, not knowing what I may or may not get. I know some years back I was able to pull in 6 or 7 UHF channels with good signals."

To find out what the TV reception possibilities were for Montoursville, Pennsylvania I went to **www.tvfool.com.** By putting in your rough location I found that there are stations to the southwest that you should get with little difficulty. Harder to receive will be the stations from Scranton/Wilkes Barre which seem to be some 54 miles in the other direction. But a decent amplified antenna on a rotator at 20 feet in the air should be able to receive seven stations on that list. Here's a UHF-only antenna that should do the job ($70): **www.channelmasterstore.com/Masterpiece_Digital_HDTV_Antenna_p/cm-3023.htm?CartID=1**

I recommend the CM-7777 antenna preamplifier ($70) to attach to the above antenna. **www.channelmasterstore.com/TV_Antenna_Preamplifier_p/cm-7777.htm**. Your location is hilly, which will make reception less reliable than flatter locations.

Currently, a good DTV-to-Analog converter (lets you use your older analog TV set to watch digital-TV) is the Channel Master CM-7001 ($116 on Amazon). While I haven't used this model, it has received good user reviews. More details may be found here: **www.amazon.com/Channel-Master-CM-7001-Antenna-Clear/dp/B0066O1DI2/ref=sr_1_1?s=electronics&ie=UTF8&qid=1371559590&sr=1-1&keywords=Channel+Master+CM-7001.** That may seem expensive, but the $40 big-box-store specials are, in my opinion, poor performers.

For an antenna rotator I use the Channel Master CM 9521A ($110 on Amazon). **www.amazon.com/Channel-Master-Complete-Infra-Red-Antennas/dp/B000BSGCY4/ref=sr_1_1?s=electronics&ie=UTF8&qid=1371559932&sr=1-1&keywords=Channel+Master+CM+9521A**

I'm not put off by the bad reviews for the rotator. I've used this rotator for years, and I give it a real workout through snow/ice, rain, heat and cold. It works well. To use it, put the DTV

converter in signal-strength mode and turn the antenna for maximum readings. In most cases, the majority of stations will be found in one direction, sometimes two. But, in more populated areas, you could discover TV stations in several directions. Also, be aware that OTA-TV signals are subject to band conditions. You may get some spectacular results during peak DX conditions that can't be regularly duplicated.

All together it will cost $366 to set up a system to receive 10 OTA TV channels in your location. Will it be worth it? Most people will pay more than twice that much for one year of cable or satellite-TV. By that standard, after a few months of watching OTA-TV, the system would be paid for and run for years for free.

❖ Are WiFi Radio Stations Available to Everyone?

George A. Santulli, Lovettsville, Virginia writes:

"As a long time DXer, I do enjoy your articles in *Monitoring Times* each month. As a kid in New Jersey, I was a member of the long defunct Newark News Radio Club (NNRC) and now I'm a member of the NRC and IRCA. In *MT* the April, 2013 issue, you talk about Wi-Fi radios which brought up a question about Wi-Fi radios that I do not understand.

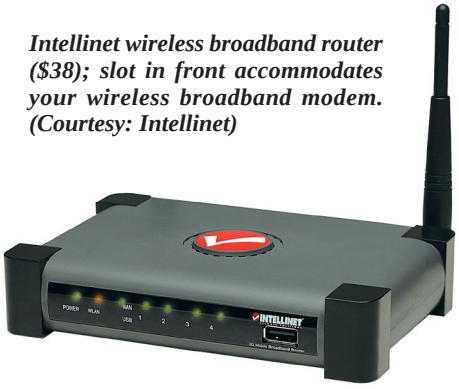
"I have a Logitech Squeezebox and, for the most part, I enjoy it as it does allow me to sit here in Virginia and listen to the morning news from ABC Sydney, which is quite cool indeed. But, what I don't understand is, why I can't listen to some stations on the Squeezebox that I can receive on my laptop.

"For example, KKGO FM105 in Los Angeles, which I can hear 'live' on my laptop, but the Squeezebox gives me an error message, saying it is 'forbidden.' This is not the only station that I have this issue with, there are others. My sense is that if I can hear it on my laptop, I should be able to hear it on my Squeezebox, but obviously this is not the case. Why? Is there a Wi-Fi radio out there that gets 'all' stations that stream live on my laptop?"

Radio stations control who can listen to their streams and at what bandwidth. I went to the KKGO-FM "Go Country 105" website and it clearly states, "Streaming is limited to listeners in California." I was intrigued by George's problem and tried to listen on both the Logitech Squeezebox and the Cambridge Soundworks Ambiance Touch and, since I also live in Virginia, I was not allowed to listen.

I found a listing on the Squeezebox for Go Cast (Go Country "from the Bay to LA"), it timed out. I even tried to listen on my desktop computer, still no dice. I was stumped. Then I had further exchanges with George that revealed that KKGO implemented its "California-only" listening rule since he had last used either his laptop or Squeezebox to tune in. The fact was that now he, too, couldn't hear the station on either device.

This points out the arbitrary nature of on-line WiFi radio listening. Signals are easily blocked by the station, as in the case of KKGO, for the benefit of local listeners only. This is also the case for flagship stations of major sports franchises, subject to blocking during live games in order to protect contractual agreements with other platforms such as Sirius/XM satellite radio.



Intellinet wireless broadband router ($38); slot in front accommodates your wireless broadband modem. (Courtesy: Intellinet)

One fact of on-line radio streaming life is, it doesn't pay. Broadcasters with whom I've talked agree, they don't know anyone who's making a profit streaming. It's an expense, which is why stations might want to restrict listening to local or at least state-wide listeners. They have to explain to advertisers why so many out of state listeners are tuning into to the program they're paying for. It's the opposite for public broadcasters. Since they're depending on listener support, they know long distance listeners will sometimes pay for the quality of programming they can't find locally.

❖ Broadband in the Hinterlands

One reader recently asked what to do about getting high-speed Internet at his location in Montana. Many urban and suburban readers, who have access to high-speed cable, don't understand what it's like to live in the wilds of rural America without the benefit of such a luxury. Those of us who do, are used to finding solutions ourselves.

There are at least two things you can do, one more expensive than other. The more expensive solution is broadband over satellite. Right now the best of these companies is **www.exede.com**. It's a satellite-delivered Internet connection that the FCC says delivers considerably more than advertised. Plans start at $50 per month for 10 GB per month, plus $10 per month equipment lease. You'll spend $130 per month for 25 GB per month, plus the lease fee. At 12 Mb/s download speeds, you'll run through 10 GB in no time, especially watching HD movies. All Exede plans require a two-year commitment.

The alternative is to sign up with a 3G mobile broadband plan which uses a modem such as the one I found at Best Buy from Verizon for $83. I use a similar modem at our house. **www.bestbuy.com/site/Verizon+Wireless+Prepaid+-+Verizon+Novatel+USB+Modem/9609316.p?id=1218131339743&skuId=9609316**

The Novatel prepaid modem uses Verizon's 3G wireless network to access the Internet. One advantage is that, plugged into a laptop, you can use it in the car as you travel (as long as you stay on Interstate highways where 3G signals are strongest).

Plans vary, but typically cost $40 per month for 10 GB per month, require no equipment lease (you buy the modem) and may not require a two-year commitment.

Verizon broadband modem ($83) delivers up to 1.5 Mb/s data. (Courtesy: Best Buy)

To use it in your house with other devices simultaneously, you'll need a router such as the Intellinet ($38) router that I use: **www.amazon.com/Intellinet-Wireless-Network-Router-524940/dp/B004OAOOUE**

Plug the router into the wall and the 3G mobile broadband modem into the USB port in the front. Attach an Ethernet cable from your computer or laptop to the back of the router. Log on and the modem and router will find the places on the Web that you need to register the products and you'll be set.

Though they look small, these modems really do the job. We stream Standard Definition Netflix films and can also be listening to WiFi radio, use an iPad to surf the Web or Skype on a laptop. We typically get over 1 Mbps, about one-tenth the speed of satellite Internet, but it's considerably cheaper and you don't have to lease equipment.

You can get similar devices for 4G networks, but the faster speed eats up your bandwidth allotment faster, which will end up costing considerably more each month than the 3G service.

ICOM
IC-R75A
✔FREE Joe Carr Loop Antenna HB
✔FREE Joe Carr Receive Antenna HB

The **Icom IC-R75A** may be the best value today in a communications receiver. Has dual PBT, coverage to 60 MHz, notch and 99 alpha memories. Now includes UT-106 DSP.

Universal also offers Icom amateur products. Please request our huge free catalog or visit: **www.universal-radio.com**

universal radio inc.

Universal Radio
6830 Americana Pkwy.
Reynoldsburg, OH 43068
◆ Orders: 800 431-3939
◆ Info: 614 866-4267
www.universal-radio.com

Fred Waterer
fredwaterer@monitoringtimes.com
www.doghousecharlie.com/radio

Two Stalwart SW Broadcasters Keep the Quality High

Welcome to October! Fall is definitely in the air. As the temperatures cool and the days start to get shorter it is the perfect time to check out what's happening on the shortwave bands. This month we shine the Programming Spotlight on a couple of the longest-running **Voice of America** programs, informative talk from **Radio Australia**, and an interesting magazine program from the **Voice of Russia**. Let's get right to it!

The **Voice of America** was born in the aftermath of the sudden impact of the Japanese attack on Pearl Harbor. In 1942 it began broadcasting to friend and foe alike. There was an obvious need for communication throughout the world, and the means to disseminate it. Edgar Whitcomb in his book, *Escape from Corregidor*, writes of the despair U.S. soldiers felt as they listened to KGEI on shortwave from San Francisco and realized that there really wasn't any relief coming soon.

By the end of the war, **VoA** was a powerful voice throughout the world, and continued this presence throughout Cold War and into the present. Like most shortwave stations, it isn't what it used to be, but it is still there, turning out lots of quality programming for the world.

Music Time in Africa is one of the longest running programs on the **Voice of America**, first airing in 1965. Leo Sarkisian, host of the program for 47 years, just retired in the fall of 2012. Sarkisian, like Willis Connover, the legendary **VoA** *Jazz Hour* presenter, is a household name in the target area of the broadcasts, but barely known in his own country. Sarkisian travelled the world, recording obscure, and well-known musical compositions, amassing a huge collection of audio tapes. The **Voice of America** named his archive of reel-to-reel recordings the *Leo Sarkisian Library of African Music*. This collection is currently being digitized by the University of Michigan.

Filling Leo's enormous shoes is Heather Maxwell, a music expert in her own right, and the transition has been seamless. Heather keeps listeners up to date on events in the African music scene with exclusive interviews and lots of great music. It is always an enjoyable listen. Since I first heard African rhythms via such stations as **Africa No. 1** in Gabon, I have been enamoured with this music. It features driving beats and joyous sounds. You can listen to *Music Time in Africa* on Saturdays and Sundays at 2000-2100 UTC on 15580 kHz. You can also hear it on demand via the **VoA** website. The fabulous legacy of Mr. Sarkisian provides some great listening!

Heather Maxwell (Courtesy www.voanews.com)

Staying with the **VoA Africa Service**, another long-running **VoA** program targeted to the region is *Daybreak Africa*, the flagship morning news program beamed to the region. It is a lively news and information show, heavy on news and information of interest to listeners in Africa. Hosted by James Butty, the program is of interest to people outside of Africa as well. This continent rarely makes headlines in this part of the world unless something really bad or important happens.

A typical program includes headline news, in-depth interviews, **VoA** correspondents reports, sports and listener's letters and comments. *Daybreak Africa* is then followed by *World News Now*, making for a fascinating hour of news and information. It gets your day off, or in our case in North America probably ends our day, in a very informative way. Give it a listen at 0300, 0400, 0500 and 0600 UTC. Try 4930 6080 9885 at 0300 UTC; 4930 4960 6080 9885 12025 at 0400 UTC; at 0500 UTC try 4930 6080 12025 15580; and at 0600 try 6080 12025 15580 kHz.

❖ Late Night Live

Late Night Live is a cerebral talk program from **Radio Australia**. It comes on a bit later than is practicable for extensive listening, but as the days become shorter, one should be able to hear a good chunk of the program. The host of the program, Phillip Adams, reminds me very much of Michael Enright, host of **CBC Radio's** *Sunday Morning* program. His style is very relaxed and informed. Topics are as varied as the rise of a new wave of racism and Holocaust denial, the election of Mugabe in Zimbabwe and North Korean refugees in Australia. But it's not all politics either. In mid-August, a program looked at the life and work of Jim Stewart and his wife, two of Australia's pre-eminent archaeologists. Each topic is presented in a fair and thoughtful way. Still, Adams is not afraid to have opinions of his own. Guests with expertise on the subject at hand join Adams in the studio for a very riveting discussion. The program is well worth hearing, much better than some of the opinionated fare heard on all the radio bands these days. Try 1400 UTC on 9580 kHz, or online at the **Radio Australia** website.

PS-Phillip Adams (Courtesy www.radioaustralia.net)

The **ABC** and **Radio Australia** are real treasures. In August, I listened to quite a bit of **Radio Australia** during the Australian election campaign. Australian politics is a rough and tumble affair at the best of times, but elections tend to put on quite a show. As this was written, Prime Minister Kevin Rudd, who overthrew Prime Minister Julia Gillard in an intra-party squabble, as she had done to him just a few years ago, is running a tight race with Opposition Leader Tony Abbott. Like the intriguing brand of football they play down there, Australian politics is a no holds barred affair and **Radio Australia** provides a fascinating window onto the show.

Newscasts and other news programs provide very detailed accounts of the campaigns. Australians take these affairs very seriously. In fact one can be fined for NOT voting in Australia (without a very good reason). One can learn more about Australian politics and government in one day of listening than one can learn about Canadian politics in a week via the **CBC**.

As a regular **Radio Australia** listener since 1978, I have to say, when I hear the fanfare at the top of the hour announcing the latest newscast, the word "authority" jumps to mind. **Radio Australia** news is one of the most informative news providers in the world.

Burning Point is another interesting program from the **Voice of Russia**. The program is hosted by Yekaterina Kudashkina and looks at conflict around the world. It offers an interesting insight into world affairs, from a Russian viewpoint.

Recent programs looked at the conflict between Israel and Hezbollah, the fishing dispute between Spain and Gibraltar, the email surveillance program in the U.S. and the apparent failure of Tunisian democratic reform. Not quite as heavy handed as some of the station's Soviet-era programming predecessors, but it is opinionated. If you want to hear about world problems with a Russian spin, this is the program for you. *Burning Point* can be heard on UTC Tuesdays through Saturdays at 0000 UTC and 0200 UTC on 9665 kHz.

These are just some of the great programs one can hear this month. And don't forget, with Halloween coming up, you can bet that Orson Welles cannot be far from a radio near you with his classic *War of the Worlds* broadcast from 1938. One of the most famous, if not infamous, broadcasts of all time. I will even play it on my online show *The Radio Time Capsule*, heard Sundays at 2300 UTC on **Radio Scooter International** (www.radioscooterinternational.net). **Radio Romania International** would be interesting to hear at this time of the year, being the birthplace of Vlad Dracul, the person on whom the whole Dracula legend is built. For me though, the scariest thing about Halloween is avoiding the candy!

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com
http://mt-shortwave.blogspot.com
Twitter @QSLRptMT

QSL Contact Updates

With improved listening conditions present, reception reports may be in your future. This month's listing of station contact updates include QSL managers, veri-signers, email, websites and postal addresses. Contacts can change daily, and staying up to date is foremost in the quest for QSLs.

ALBANIA
Radio Tirana, Mrs. Drita Cico, Director English Services & RTSH Head of Radio Tirana Monitoring *dcico@abcom.al* Rruga Ismail Qumali 11, Tirana, Albania **www.rtsh.al**

Radio Tirana

BAHRAIN
Mr. Abdulla Al-Baloushi, Director of Technical Affairs, P.O. Box 1075, Manama, Bahrain **www.radiobahrain.fm**

BANGLADESH
Bangladesh Betar, Abu Tabib Md., Zia Hasan, Senior Engineer, Research & Receiving Center Bangladesh Betar 121, Kazi Nazrul Islam Avenue, Shah Bagh Dakar 1000, Bangladesh **www.betar.org.bd**

BELARUS
Maria del Aquila, Servicio Espanol, 2220807 Minsk, Krasnata st, 4 (or) Cyronaja Street 4, 220807 Minsk, Belarus **www.radiobelarus.tv.by**

BELGIUM
Broadcast Belgium (Broker) (formerly TDP) Ludo Maes, Managing Director, P.O. Box 1, B-2310 Rijikevorsel, Belgium **www.broadcast.be** *info@broadcast.be*

BHUTAN
Radio Bhutan, Kaka Tshering, BBS General Manager, **www.bbs.com.bt** *katashering@bbs*

BOLIVIA
Radio Eco, Gonzalo Espinoza Cortez, Director Gerente **gonzalpeco@hotmail.com** Reyes, Pcia Balliván Radio Illimani, Marina Arrocha C., Responsible for Marketing *marketing@patrianueva.bo* Av. Illimani No. 1938, Miraflores, La Paz, Bolivia

BRAZIL
Radio 9 de Julho, Marcus Starling, Director Technico, Rua Manvel de Arzão 85, Villa Albertina, CEP-02730-030 São Paulo, SP, Brasil Radio Difusora Acereana, Francineida Dias *comercial@difusoraac.gov.br* Rua Benjamin Constant 1232, 69900-161 Rio Branco, AC, Brasil Radio Difusora/Macapá, Juliana Alves Coutinho,Gerente. Rua Cándido Mendes, 525-Centro, 68900-0100 Macapá, Amapá, Brasil
Radio Educação Rural De Tefé, Praça Santa Tereza 283 69470-000 Tefé, AM Brasil **www.radioruraltefe.com** *rert@osite.com.br*
Radio Itatiaia, Severino Carneiro, Gerente Tecnico, Rua Itatiaia 117, Bairro Bonfim, Belo Horizonte, MG, Brasil **www.itatiaia.com.br/**
Radio Nacional Amazonia, Luciana Couto, Coordinadora Radio Nacional Brasilia. Caixa Postal 258, 70359-970 Brasilia, DF Brasil **www.ebc.com.br**
Radio Roraima, Barbosa Junior and Iris Carvalho, Chefe de Gabinete. Av. Capitão Ene Garcez, 888, São Francisco, 69301-160 Boa Vista, RO, Brasil. **www.radiororaima.com.br** *direcao@radioraima.com.br*
Radio Trans Mundial, Caixa Postal 18113, CEP-04626-970 São Paulo, SP, Brasil

CANADA
CFRX, 2 St. Clair Ave W 2nd Flr., Toronto ON Canada M4V 1L6 *CFRX@ymail.com; mike.bandixen@newstalk1010.com; informationoffice@astral.com*
CHU, Bill Hower, Chief Engineer, *radio.chu.inms@nrc-cmrc.gc.ca.* Institute for National Measurement Standards, National Research Council of Canada (NRC-INMS), 1200 Montreal Road, Bldg. M-36, Ottawa, Ontario KIA 0R6 Canada **www.nrc-cnrc.gc.ca**

CLANDESTINE
Radio Free Sarawak, Zulkifli Ab Rahim, RTM Kanajng, Malaysia *zulrahim@rtm.gov.my info@radiofreesarawak.org*

COLOMBIA
Alcaravan Radio, Puerto Lleras, Apartado Postal 67751, Bogota, Colombia. *rafaelcodx@yahoo.com*

ECUADOR
Radio Oriental, Luis Enrique Espinoza. Casilla 260 (or) Av. Jumandy 536, Barrio 2 Rios, Tena, Napo, Ecuador

EGYPT
Radio Cairo, Amgad Bligh, Head of Spectrum & Monitoring Department, Propagation Department, P.O. Box 1186, Cairo 11511, Egypt

ETHIOPIA
Radio Oromiya, Habtamu Dargie Gudeta, Head of the Engineering Department, P.O. Box 2919, Adama, Ethiopia

FRANCE
Radio France International, TDF Radio Business Unit, Shortwave Department, 106 Avenue Marx Dormoy, FR-92541 Montrange Cedex, France **www.rfi.fr/**

GERMANY
Radio 700, *info@gemeinde-gottes-herford.de; christian.milling@funkhaus_euskirchen.de*
Radio Santec GmbH, Postfach 5643, DE-97006 Wurzburg, Germany **www.radio- santec.com** *info@radio-santec.com*

INDIA
All India Radio, External Services Division, P.O. Box 500, New Delhi-110001, India **www.allindiaradio.org** *gosesdair@yahoo.com* **www.newsonair.com**

INDONESIA
RRI Makassar, Jl Ribuane 3, Kotak Pos 102, Makassar 90111, Sulawesi Selatan, Indonesia. Contact for special broadcast Kang Guru, broadcasting weekly programs on RRI Indonesian stations. Ana Rahma Diana Sari, ELT Media & Communications Co-ordinator Kang Guru Indonesia, P.O. Box 3095, Denpasar 80030 Bali, Indonesia. *rsari@ialf.edu; kangguru@lalf.edu* **www.kangguru.org/**

KOREA, (D.P.R.)
Voice of Korea, Pyongyang, Democratic People's Republic of Korea.**www.vok.rep.kp** *VOK@star-co-net.kp*

MALAYSIA
Klasik Nasional, Zulkifli Ab Rahim, Technical Network Section, *zulrahim@rtm.gov.my* Radio TV Malaysia, Batu 13, Jalan Cheras, 43000 Kajang, Malaysia **www.rtm.gov.my**

NETHERLANDS
The Mighty KBC, Eric van Willegen, General Manager, Argonstraat 6, 6718 WT Ed, The Netherlands **www.kbcradio.eu** *themightyKBC@gmail.com*

NIGER
ORTN/La Voix de Sahel, Brah Amadou, Chef du Service Technique *brahamadou@yahoo.com* Maison de la Radio, Boite Postal 361, Niamey **www.ortn.ne** *ortny@ortn-niger.com*

NIGERIA
FRCN/Radio Nigeria, Yusuf, Director and Miss Yekinni Lassiggi Faousat, Secretary, French Service. Radio House, Herbert Macauley Way, Area 10, PMB 452, Garki, Abuja, Federal Capital Territory, Nigeria **www.radionigeriaonline.com**

PERU
Radio Logos, Ray Rising, Project Director *ray_rising@sil.org* **www.ethnicradio.org**
Radio Universo Cusco, Carlos Gamarra Moscoso, Avenida Garcilaso 411, Wanchaq, Cusco, Peru *adilidcusco@hotmail.com*

PHILIPPINES
Voice of America/IBB Transmitter Tinang, Station Manager, PSC 500 Box 28, DPO AP 96515-1000 USA **www.voanews.com** *askvoa@voanews.com*

POLAND
Polish Radio, Slawek Szefs. Polskie Radio SA, Redakcja Lacznosci ze Sluchaczami Al., Niepodleglosci 77/85, PL 00-977 Warsawa, Poland **www.polskieradio.pl**

ROMANIA
Radio Romania International, Victoria Sepciu, Spanish Service *victoria_sepciu@yahoo.es* P.O. Box 1-111, 014700 Bucuresti, Romania **www.rri.ro** *rri@rri.ro*

RUSSIA
Radio Rossii, Mikhail Timofeyev, QSL Manager/Engineer *timofeyev@sp.ru* SPbBC Technical Department, Ulitsa Akademica Pavlova 3, RU-197022 Saint Petersburg, Russia.
Radio Station Pacific Ocean, Radio Stantsiya Tikhy Okean, GTRK-Vladivostok, Primorskiy Kray, Russia **www.ptr-vlru/tv&radio** *ptr@ptrvlad.ru*
Radio Tatarstan Wave, Ildus Ibatullin, QSL Manager, P.O. Box 134, Kazan 420136, Russia

SOUTH AFRICA
Radio Sonder Grense/Radio South Africa Radio League, Miss Kathy Otto, *ottok@sentech.co.za* Private Bag X06, Honeydew 2040, South Africa **www.rsg.co.za www.amateurradio.org.za**

SYRIA
Radio Damascus, Mrs. Amelia Puga, Secretary-Spanish Service *radiodamasco@yahoo.com* P.O. Box 4702, Damascus, Syria **www.radio-damascus.net www.syriaonline.sy**

SWITZERLAND
Radio Reveil et Paroles de Vie, Les Chapons 4, CH-2022 Bevaix, Switzerland

THAILAND
Radio Thailand, Public Relations Department, Royal Thai Government, 236 Vibhavadi Rangsit Road, Ding Daeng, Bangkok 10400, Thailand. **www.hsk9.org** *manager-thailand@tha.ibb.gov*

TURKEY
Voice of Turkey, P.K. 333 Yenişehir 06443, P.K. 92 şankaya 06551, Ankara, Turkey **www.trt-world.com** Spanish service: *spanol@trt.net.tr*

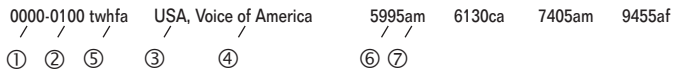
URUGUAY
Radio Sarandi, Gerente de Administracion y Finanzas, Enriqueta Compte y Rique 1250, Montevideo, Uruguay. Ct. Lic. Fernando Caetano Torres

UNITED STATES
Adventist World Radio, 12501 Old Columbia Pike, Silver Spring, MD 20904-6600. AWR Wavescan, Box 29235, Indianapolis, IN 46229 **www.awr.org** *wavescan@AWR.org*
Radio Marti, P.O. Box 521868, 2200 NW 72 Avenida, Miami, FL 33152-9998 USA **www.martinoticias.com** *info@martinoticias.com*
WWV, John B. Milton, Chief Engineer, U.S. Department of Commerce, National Bureau of Standards, 2000 East County Road 58, Ft. Collins, CO 80524.

UTILITY
Military Aeronautical Communications System (MACS), Cpl. Charles Raine, Wing Telecommunication & Information Services Squadron (WTISS), 8 Wing Trenton, National Defence, Carrying Place ON, Canada K0K 1L0 *Charles.Raines@forces.gc.ca*
WLO, Rene Stiegler, *info@shipcom.com*

VENEZUELA
Radio Nacional Venezuela Canal Internacional, Freddy R. Santos, Assistente de Producion Canal Internacional, *canalinternacionalrnv@gmail.com.* Final Calle Las Marias, entre Chapelin y Country Club, la Florida, Caracus, Distrito Federal, Venzuela, Zona Postal 1050.

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 Daylight Saving Time) 4, 5, 6 or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

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

Not all countries observe Daylight Saving Time, not all countries shift at the same time, and not all program scheduling is shifted. So if you do not hear your desired station or program, try searching the hour ahead or behind its listed start time.

FIND THE STATION YOU WANT TO HEAR

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

If a broadcast is not ***daily***, the days of broadcast⑤ will appear in the column following the time of broadcast, using the following codes:

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

CHOOSE PROMISING FREQUENCIES

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

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

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

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

Target Areas

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

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

MT MONITORING TEAM

Gayle Van Horn
Frequency Manager
gaylevanhorn@monitoringtimes.com

Larry Van Horn, MT Asst. Editor
larryvanhorn@monitoringtimes.com

Additional Contributors to This Month's Shortwave Guide:

Thank You to …

BCL News; Cumbre DX; DSW-CI/DX Window; Hard-Core DX; DX Mix News; WWDX Club/Top News. George Baxter/R Australia; Greece; Georgi Bancov/Balkan DX; Ivo Ivanov, Bulgaria; Sean Gilbert UK/WRTH; Wolfgang Bueschel, Stuttgart, Germany.

SHORTWAVE BROADCAST BANDS

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

Notes

Note 1	Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.
Note 2	Broadcasters can use this frequency range on a (NIB) non-interference basis only.
Note 3	WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007
Note 4	WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

"MISSING" LANGUAGES?

A **FREE** download to MTXpress subscribers, the online MTXtra Shortwave Guide is 115+ pages of combined language schedules, sorted by time. Print subscribers: add the MTXtra SW Guide to your subscription for only $11.95. Call **1-800-438-8155** or visit ***www.monitoringtimes.com*** to learn how.

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

0000	0030		Australia, ABC/R Australia	17750as		
0000	0030		Egypt, R Cairo	9965na		
0000	0030		USA, VO America	7430va	9790va	12015va
			17820va			
0000	0035		Vanuatu, R Vanuatu	3945do	7260do	
0000	0043		India, AIR/Natl Channel	9425do	9470do	
0000	0045		India, AIR/External Svc	9690as	9705as	
			11710as	13605as		
0000	0045	DRM	India, AIR/External Svc	11645as		
0000	0056		Romania, R Romania Intl	9700na	11955na	
0000	0100		Anguilla, Caribbean Beacon/Univ Net		6090ca	
0000	0100		Australia, ABC/R Australia	9660va	12080pa	
			15240va	15415va	17795pa	19000va
			21740va			
0000	0100		Australia, NT VL8A Alice Springs		4835do	
0000	0100		Australia, NT VL8K Katherine	5025do		
0000	0100		Australia, NT VL8T Tennant Creek		4910do	
0000	0100		Canada, CFRX Toronto ON	6070do		
0000	0100		Canada, CFVP Calgary AB	6030do		
0000	0100		Canada, CKZN St Johns NF	6160do		
0000	0100		Canada, CKZU Vancouver BC	6160do		
0000	0100		China, China R International	6020as	6075as	
			6180as	7350as	7415as	9570na
			11790as	11885as	13750as	15125as
0000	0100		China, Xizang PBS	4905do	4920do	6130do
			7385do			
0000	0100	1st fa	Finland, Scandinavian Weekend R		6170eu	
0000	0100		Germany, HCJB Germany	3995eu	7365eu	
0000	0100	Sun	Germany, Mighty KBC Radio	7375eu		
0000	0100		Germany, R 6150	6070eu		
0000	0100		Guatemala, R Verdad	4055do		
0000	0100		Guyana, Voice of Guyana	3290do		
0000	0100		Honduras, R Luz y Vida	3250do		
0000	0100		India, AIR/Imphal	4775do		
0000	0100		India, AIR/Kohima	4850do		
0000	0100		India, AIR/Mumbai	4840do		
0000	0100		India, AIR/Port Blair	4760do		
0000	0100		Malaysia, RTM/Kajang	5965do	6050do	
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100		Mexico, R Educacion	6185do		
0000	0100		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0000	0100		New Zealand, R New Zealand Intl		15720pa	
0000	0100	DRM	New Zealand, R New Zealand Intl		17675pa	
0000	0100		Papua New Guinea, Wantok R Light		7325do	
0000	0100		Russia, VO Russia	9665ca		
0000	0100		Solomon Islands, SIBC	9545do		
0000	0100		Spain, R Exterior de Espana	6055na		
0000	0100		Thailand, R Thailand World Svc	15275na		
0000	0100		UK, BBC World Service	5970as	6195as	
			9410as	9740as	11750as	12095as
			15335as	15755as	17685as	
0000	0100		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
0000	0100	smtwh	USA, Overcomer Ministry	7490na		
0000	0100		USA, Overcomer Ministry	3185na		
0000	0100		USA, WBCQ Monticello ME	7490na	9330na	
0000	0100	fas	USA, WBCQ Monticello ME	5110na		
0000	0100		USA, WEWN/Irondale AL	11520af		
0000	0100	twhfas	USA, WHRI Cypress Crk SC	5920va		
0000	0100		USA, WINB Red Lion PA	9265am		
0000	0100		USA, WRMI Miami FL	9955am		
0000	0100		USA, WTWW Lebanon TN	5085sa	5830na	
0000	0100		USA, WWCR Nashville TN	4840eu	5935af	
			6875eu	7520ca		
0000	0100	irreg	USA, WWRB Manchester TN	3185na	3215na	
0000	0100	Sun/irreg	USA, WWRB Manchester TN	5050na		
0015	0100		India, AIR/Chennai	4920do		
0020	0100		India, AIR/Hyderabad	4800do		
0020	0100		India, AIR/Thiruvananthapuram	5010do		
0025	0100		India, AIR/Aizawl	5050do		
0025	0100		India, AIR/Bhopal	4810do		
0025	0100		India, AIR/Jaipur	4910do		
0025	0100		India, AIR/Jeypore	5040do		
0030	0100		Australia, ABC/R Australia	17750va		
0030	0100		India, AIR/Srinagar	4950do		
0030	0100	twhfa	Serbia, International R Serbia	9685na		
0030	0100		USA, VO America	9325va	15290va	
0030	0100		USA, WHRI Cypress Crk SC	7315ca		

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

0100	0115	mtwha	Australia, HCJB Global Australia		15400as	
0100	0115	Sat/Sun	Canada, Bible VO Broadcasting		9490as	
0100	0130	Sun	Serbia, International R Serbia	9685na		
0100	0130		Vietnam, VO Vietnam/Overseas Svc		12005na	
0100	0200		Anguilla, Caribbean Beacon/Univ Net		6090ca	
0100	0200		Australia, ABC/R Australia	9660va	12080pa	
			15160pa	15240va	15415va	17750va
			17795pa	19000va		
0100	0200		Australia, NT VL8A Alice Springs		4835do	
0100	0200		Australia, NT VL8K Katherine	5025do		
0100	0200		Australia, NT VL8T Tennant Creek		4910do	
0100	0200		Canada, CFRX Toronto ON	6070do		
0100	0200		Canada, CFVP Calgary AB	6030do		
0100	0200		Canada, CKZN St Johns NF	6160do		
0100	0200		Canada, CKZU Vancouver BC	6160do		
0100	0200		China, China R International	6020as	6175eu	
			6180as	9410eu	9470eu	9535as
			9570na	9580na	9675eu	11870as
			15125as	15785as		
0100	0200		China, Xizang PBS	4905do	4920do	6130do
			7385do			
0100	0200		Cuba, R Havana Cuba	5040ca	6000na	
			6165na			
0100	0200	1st fa	Finland, Scandinavian Weekend R		6170eu	
0100	0200		Germany, HCJB Germany	3995eu	7365eu	
0100	0200	Sun	Germany, Mighty KBC Radio	7375eu		
0100	0200		Germany, R 6150	6070eu		
0100	0200		Guatemala, R Verdad	4055do		
0100	0200		Guyana, Voice of Guyana	3290do		
0100	0200		Honduras, R Luz y Vida	3250do		
0100	0200		India, AIR/Aizawl	5050do		
0100	0200		India, AIR/Bhopal	4810do		
0100	0200		India, AIR/Chennai	4920do		
0100	0200		India, AIR/Gangkok	4835do		
0100	0200		India, AIR/Hyderabad	4800do		
0100	0200		India, AIR/Imphal	4775do		
0100	0200		India, AIR/Jaipur	4910do		
0100	0200		India, AIR/Jeypore	5040do		
0100	0200		India, AIR/Kohima	4850do		
0100	0200		India, AIR/Mumbai	4840do		
0100	0200		India, AIR/Port Blair	4760do		
0100	0200		India, AIR/Srinagar	4950do		
0100	0200		India, AIR/Thiruvananthapuram	5010do		
0100	0200		Malaysia, RTM/Kajang	5965do	6050do	
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200		Mexico, R Educacion	6185do		
0100	0200		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0100	0200		New Zealand, R New Zealand Intl		15720pa	
0100	0200	DRM	New Zealand, R New Zealand Intl		17675pa	
0100	0200		Papua New Guinea, Wantok R Light		7325do	
0100	0200		Russia, VO Russia	9665ca		
0100	0200		Solomon Islands, SIBC	9545do		
0100	0200		Taiwan, R Taiwan Intl	11875as		
0100	0200		UK, BBC World Service	12095as	15310as	
0100	0200		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
0100	0200		USA, Overcomer Ministry	3185na		
0100	0200	smtwhf	USA, Overcomer Ministry	7490na		
0100	0200		USA, VO America	7430va	9780va	15205as
0100	0200		USA, WBCQ Monticello ME	7490na	9330na	
0100	0200	fas	USA, WBCQ Monticello ME	5110na		
0100	0200		USA, WEWN/Irondale AL	11520af		
0100	0200	twhfa	USA, WHRI Cypress Crk SC	5920va		
0100	0200		USA, WHRI Cypress Crk SC	9860na		
0100	0200		USA, WINB Red Lion PA	9265am		
0100	0200		USA, WRMI Miami FL	9955am		
0100	0200	irreg	USA, WRNO New Orleans LA	7506na		
0100	0200		USA, WTWW Lebanon TN	5085sa	5830na	
			9479na			
0100	0200		USA, WWCR Nashville TN	3215eu	4840na	
			5935af	7520ca		
0100	0200	irreg	USA, WWRB Manchester TN	3185na	3215na	
0100	0200	Sun/irreg	USA, WWRB Manchester TN	5050na		
0100	0200		Vanuatu, R Vanuatu	7260do		
0128	0200		India, AIR/Leh	4660do		
0130	0200	twhfas	Albania, R Tirana	9850va		
0130	0200		India, AIR/Chennai/FM Gold	7270do		
0130	0200	twhfa	USA, VO America	9820va		
0130	0200	mtwhf	USA, WRMI/R Slovakia Intl relay		9955am	
0140	0200		Vatican City State, Vatican R	11730as	15470as	

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

0200	0215		India, AIR/Bhopal	4810do		
0200	0215		India, AIR/Hyderabad	4800do		
0200	0215		India, AIR/Imphal	4775do		
0200	0215		India, AIR/Srinagar	4950do		
0200	0215		India, AIR/Thiruvananthapuram	5010do		
0200	0230		Thailand, R Thailand World Svc	15275na		
0200	0230		USA, WRMI/R Prague relay	9955am		
0200	0245		India, AIR/Chennai	4920do		
0200	0300		Anguilla, Caribbean Beacon/Univ Net		6090ca	
0200	0300	twhfa	Argentina, RAE	11710am		
0200	0300		Australia, ABC/R Australia	9660va	12080pa	
			15160pa	15240va	15415va	17750va
			17795pa	19000va		
0200	0300		Australia, NT VL8A Alice Springs		4835do	
0200	0300		Australia, NT VL8K Katherine	5025do		
0200	0300		Australia, NT VL8T Tennant Creek		4910do	
0200	0300		Canada, CFRX Toronto ON	6070do		
0200	0300		Canada, CFVP Calgary AB	6030do		
0200	0300		Canada, CKZN St Johns NF	6160do		
0200	0300		Canada, CKZU Vancouver BC	6160do		
0200	0300		China, China R International	11770as	13640as	
0200	0300		China, Xizang PBS	4905do	4920do	6130do
			7385do			

0200	0300		Cuba, R Havana Cuba	6000na	6165na
0200	0300		Egypt, R Cairo 9720na		
0200	0300	1st fa	Finland, Scandinavian Weekend R		6170eu
0200	0300		Germany, HCJB Germany	3995eu	7365eu
0200	0300		Germany, R 6150 6070eu		
0200	0300		Guatemala, R Verdad	4055do	
0200	0300		Guyana, Voice of Guyana	3290do	
0200	0300		Honduras, R Luz y Vida	3250do	
0200	0300		India, AIR/Aizawl 5050do		
0200	0300		India, AIR/Chennai/FM Gold	7270do	
0200	0300		India, AIR/Gangkok	4835do	
0200	0300		India, AIR/Jaipur 4910do		
0200	0300		India, AIR/Jeypore 5040do		
0200	0300		India, AIR/Kohima 4850do		
0200	0300		India, AIR/Leh 4660do		
0200	0300		India, AIR/Mumbai 4840do		
0200	0300		India, AIR/Port Blair	4760do	
0200	0300		Malaysia, RTM/Kajang	5965do	6050do
0200	0300		Malaysia, RTM/Traxx FM	7295do	
0200	0300		Mexico, R Educacion	6185do	
0200	0300		Micronesia, V6MP/Cross R/Pohnpei		4755 as
0200	0300		New Zealand, R New Zealand Intl		15720pa
0200	0300	DRM	New Zealand, R New Zealand Intl		17675pa
0200	0300		Papua New Guinea, Wantok R Light		7325do
0200	0300		Philippines, R Pilipinas Overseas Svc 15285me 17820me		11880me
0200	0300		Russia, VO Russia 9665ca		
0200	0300		Solomon Islands, SIBC	9545do	
0200	0300		South Korea, KBS World R	9580sa	9690as
0200	0300		UK, BBC World Service	15310as	17790as
0200	0300		USA, AFN/AFRTS 4319usb 13362usb	5765usb	12759usb
0200	0300		USA, Overcomer Ministry	3185na	
0200	0300	smtwhf	USA, Overcomer Ministry	7490na	
0200	0300		USA, WBCQ Monticello ME	7490na	9330na
0200	0300	fas	USA, WBCQ Monticello ME	5110na	
0200	0300		USA, WEWN/Irondale AL	11520af	
0200	0300		USA, WHRI Cypress Crk SC 9860na	5920va	7315ca
0200	0300		USA, WINB Red Lion PA	9265am	
0200	0300		USA, WRMI Miami FL	9955am	
0200	0300	irreg	USA, WRNO New Orleans LA	7506na	
0200	0300		USA, WTWW Lebanon TN	5085sa	5830na
0200	0300		USA, WWCR Nashville TN 5890ca 5935af	3215eu	4840na
0200	0300	irreg	USA, WWRB Manchester TN	3185na	3195na
0200	0300	Sun/irreg	USA, WWRB Manchester TN	5050na	
0200	0300		Vanuatu, R Vanuatu 7260do		
0215	0230		Nepal, R Nepal 5005do		
0215	0300		Myanmar, Myanma R	9731do	
0225	0300		India, AIR/Bhopal 7430do		
0225	0300		India, AIR/Hyderabad	7420do	
0225	0300		India, AIR/Imphal 7335do		
0225	0300		India, AIR/Srinagar 6110do		
0230	0300		India, AIR/Delhi 4870do		
0230	0300		India, AIR/Thiruvananthapuram	7290do	
0230	0300		Myanmar, Myanma R	5985do	
0230	0300		Vietnam, VO Vietnam/Overseas Svc		12005na
0245	0300		Zambia, Zambia Natl BC	5915do	6165do
0255	0300	Sun	Swaziland, TWR Africa	3200af	

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

0300	0310		India, AIR/Delhi 6030do		
0300	0320		Vatican City State, Vatican R	15460as	
0300	0325	Sun	Swaziland, TWR Africa	3200af	
0300	0330		Egypt, R Cairo 9720na		
0300	0330		India, AIR/Delhi 4870do		
0300	0330		Myanmar, Myanma R	5985do	
0300	0330		Philippines, R Pilipinas Overseas Svc 15285me 17820me		11880me
0300	0330		Vatican City State, Vatican R	7360af	9660af
0300	0355	mtwhf	South Africa, Channel Africa	3345af	5980af
0300	0356		Romania, R Romania Intl 17800as	7350na	9645na
0300	0356	DRM	Romania, R Romania Intl	15340as	
0300	0400		Anguilla, Caribbean Beacon/Univ Net		6090ca
0300	0400		Australia, ABC/R Australia 15415va 17750va	9660va	15160pa 21725va
0300	0400		Australia, NT VL8A Alice Springs		4835do
0300	0400		Australia, NT VL8K Katherine	5025do	
0300	0400		Australia, NT VL8T Tennant Creek		4910do
0300	0400		Canada, CFRX Toronto ON	6070do	
0300	0400		Canada, CFVP Calgary AB	6030do	
0300	0400		Canada, CKZN St Johns NF	6160do	
0300	0400		Canada, CKZU Vancouver BC	6160do	
0300	0400		China, China R International 11770as 13750as 15785as	9690am 15110as	9790na 15120as
0300	0400		China, Xizang PBS 4905do 7385do	4920do	6130do
0300	0400		Clandestine, R Miraya	11560af	
0300	0400		Cuba, R Havana Cuba	6000na	6165na
0300	0400	1st fa	Finland, Scandinavian Weekend R		6170eu
0300	0400		Germany, R 6150 6070eu		
0300	0400		Guatemala, R Verdad	4055do	
0300	0400		Guyana, Voice of Guyana	3290do	
0300	0400		Honduras, R Luz y Vida	3250do	
0300	0400		India, AIR/Aizawl 5050do		
0300	0400		India, AIR/Bhopal 7430do		
0300	0400		India, AIR/Chennai 7380do		
0300	0400		India, AIR/Chennai/FM Gold	7270do	
0300	0400		India, AIR/Gangkok	4835do	
0300	0400		India, AIR/Hyderabad	7420do	
0300	0400		India, AIR/Imphal 7335do		
0300	0400		India, AIR/Jaipur 4910do		
0300	0400		India, AIR/Kohima 4850do		
0300	0400		India, AIR/Leh 4660do		
0300	0400		India, AIR/Mumbai 4840do		
0300	0400		India, AIR/Srinagar 6110do		
0300	0400		India, AIR/Thiruvananthapuram	7290do	
0300	0400		Malaysia, RTM/Kajang	5965do	6050do
0300	0400		Malaysia, RTM/Traxx FM	7295do	
0300	0400		Mexico, R Educacion	6185do	
0300	0400		Micronesia, V6MP/Cross R/Pohnpei		4755 as
0300	0400		New Zealand, R New Zealand Intl		15720pa
0300	0400	DRM	New Zealand, R New Zealand Intl		17675pa
0300	0400		Oman, R Sultanate of Oman	13600af	
0300	0400		Papua New Guinea, Wantok R Light		7325do
0300	0400		Russia, VO Russia 9665ca		
0300	0400		Solomon Islands, SIBC	9545do	
0300	0400		Taiwan, R Taiwan Intl	15320as	
0300	0400		Turkey, VO Turkey 6165as	9515va	
0300	0400		UK, BBC World Service	12095as	15365as
0300	0400		USA, AFN/AFRTS 4319usb 13362usb	5765usb	12759usb
0300	0400		USA, Overcomer Ministry	3185na	
0300	0400	twhfa	USA, Overcomer Ministry	5890na	
0300	0400		USA, VO America 4930af	6080af	9885af
0300	0400		USA, WBCQ Monticello ME	7490na	9330na
0300	0400		USA, WEWN/Irondale AL	11520af	
0300	0400		USA, WHRI Cypress Crk SC	7385na	9825eu
0300	0400		USA, WRMI Miami FL	9955am	
0300	0400	irreg	USA, WRNO New Orleans LA	7506na	
0300	0400		USA, WTWW Lebanon TN	5085sa	5830na
0300	0400		USA, WWCR Nashville TN 5890ca 5935af	3215eu	4840na
0300	0400	irreg	USA, WWRB Manchester TN	3185na	3195na
0300	0400	Sun/irreg	USA, WWRB Manchester TN	5050na	
0300	0400		Vanuatu, R Vanuatu 7260do		
0300	0400		Zambia, Zambia Natl BC	5915do	6165do
0315	0400		India, AIR/Port Blair	4760do	
0315	0400	mtwhfa	India, AIR/Port Blair	7390do	
0315	0400	Sun	India, AIR/Port Blair	4760do	
0330	0400		Iran, VOIRI/VO Justice	13650eu	15470eu
0330	0400		Vietnam, VO Vietnam/Overseas Svc		6175na

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

0400	0401		India, AIR/Gangkok	4835do	
0400	0415		India, AIR/Kohima 4850do		
0400	0415	Sat	India, AIR/Port Blair	4760do	
0400	0427		Iran, VOIRI/VO Justice	13650eu	15470eu
0400	0430	mtwhfa	India, AIR/Chennai 7380do		
0400	0430		India, AIR/Chennai/FM Gold	7270do	
0400	0430		India, AIR/Jaipur 4910do		
0400	0430	Sun	India, AIR/Leh 4660do		
0400	0430		India, AIR/Thiruvananthapuram	7290do	
0400	0430		USA, WHRI Cypress Crk SC	7385na	
0400	0435	mtwhfa	India, AIR/Jeypore 5040do		
0400	0445	Sun	India, AIR/Jeypore 5040do		
0400	0447	mtwhfa	India, AIR/Bhopal 7430do		
0400	0455	mtwhf	South Africa, Channel Africa	3345af	
0400	0457		Germany, Deutsche Welle	9470af	12045af
0400	0457		North Korea, VO Korea 9730as 11735ca	7220as 13760sa	9445as 15180sa
0400	0458		New Zealand, R New Zealand Intl		15720pa
0400	0458	DRM	New Zealand, R New Zealand Intl		17675pa
0400	0500		Anguilla, Caribbean Beacon/Univ Net		6090ca
0400	0500		Australia, ABC/R Australia 15160pa 15240va 17800as 21725va	9660va 15415va	12080pa 17750as
0400	0500		Australia, NT VL8A Alice Springs		4835do
0400	0500		Australia, NT VL8K Katherine	5025do	
0400	0500		Australia, NT VL8T Tennant Creek		4910do
0400	0500		Canada, CFRX Toronto ON	6070do	
0400	0500		Canada, CKZN St Johns NF	6160do	
0400	0500		Canada, CKZU Vancouver BC	6160do	
0400	0500		China, China R International 15785as 17730va	13750as	15120as 17855va
0400	0500		China, Xizang PBS 4905do 7385do	4920do	6130do
0400	0500		Clandestine, R Miraya	11560af	
0400	0500		Cuba, R Havana Cuba	6000na	6165na
0400	0500	1st fa	Finland, Scandinavian Weekend R		6170eu
0400	0500		Germany, Deutsche Welle	9810af	
0400	0500		Germany, R 6150 6070eu		
0400	0500		Guatemala, R Verdad	4055do	

0400	0500		Guyana, Voice of Guyana	3290do		
0400	0500	Sun	India, AIR/Chennai	7380do		
0400	0500	Sun	India, AIR/Hyderabad	7420do		
0400	0500	Sun	India, AIR/Imphal	7335do		
0400	0500	Sun	India, AIR/Port Blair	7390do		
0400	0500		India, AIR/Srinagar	6110do		
0400	0500		Malaysia, RTM/Kajang	5965do	6050do	
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Mexico, R Educacion	6185do		
0400	0500		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0400	0500		Papua New Guinea, Wantok R Light		7325do	
0400	0500		Solomon Islands, SIBC	9545do		
0400	0500		UK, BBC World Service	11940af	12095as	
			15365as	15420af		
0400	0500	DRM	UK, BBC World Service	3955eu		
0400	0500		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
0400	0500		USA, Overcomer Ministry	3185na	5890na	
0400	0500		USA, VO America	4930af	4960af	6080af
			9885af	12025af		
0400	0500		USA, WBCQ Monticello ME	9330na		
0400	0500		USA, WEWN/Irondale AL	11520af		
0400	0500		USA, WHRI Cypress Crk SC	9825me		
0400	0500		USA, WRMI Miami FL	9955am		
0400	0500		USA, WTWW Lebanon TN	5830na		
0400	0500		USA, WWCR Nashville TN	3215eu	4840na	
			5890ca	5935af		
0400	0500	irreg	USA, WWRB Manchester TN	3185na		
0400	0500		Vanuatu, R Vanuatu	7260do		
0400	0500		Zambia, Zambia Natl BC	5915do	6165do	
0400	0500	irreg	Zimbabwe, VO Zimbabwe	4828af		
0430	0500		India, AIR/Kohima	6065do		
0430	0500	Sat/Sun	India, AIR/Thiruvananthapuram	7290do		
0430	0500	mtwhf	Swaziland, TWR Africa	3200af		
0430	0500		USA, VO America	4930af	4960af	6080af
			12025af			
0455	0500	irreg	Nigeria, VO Nigeria	15120eu		
0459	0500		New Zealand, R New Zealand Intl			11725pa
0459	0500	DRM	New Zealand, R New Zealand Intl			11675pa

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

0500	0501		India, AIR/Srinagar	6110do		
0500	0505	Sat	India, AIR/Hyderabad	7420do		
0500	0510		India, AIR/Kohima	6065do		
0500	0527		Germany, Deutsche Welle	5905af	9470af	
0500	0530		Australia, ABC/R Australia	17750as	17800as	
0500	0530	Sun	India, AIR/Bhopal	7430do		
0500	0530	Sun	India, AIR/Jaipur	4910do		
0500	0530		Japan, R Japan/NHK World	5975as	11970af	
0500	0530		Vatican City State, Vatican R	11625af	13765af	
0500	0557		North Korea, VO Korea	13650as	15105as	
0500	0600		Anguilla, Caribbean Beacon/Univ Net		6090ca	
0500	0600		Australia, ABC/R Australia	9660va	12080pa	
			13630pa	15415va	21725va	
0500	0600		Australia, NT VL8A Alice Springs		4835do	
0500	0600		Australia, NT VL8K Katherine	5025do		
0500	0600		Australia, NT VL8T Tennant Creek		4910do	
0500	0600		Bhutan, Bhutan BC Svc	6035do		
0500	0600		Canada, CFRX Toronto ON	6070do		
0500	0600		Canada, CKZN St Johns NF	6160do		
0500	0600		Canada, CKZU Vancouver BC	6160do		
0500	0600		China, China R International	11710af	11895as	
			15465as	15350as	17505va	17730va
			17855va			
0500	0600		China, Xizang PBS	4905do	4920do	6130do
			7385do			
0500	0600		Clandestine, R Miraya	11560af		
0500	0600		Cuba, R Havana Cuba	6010na	6060na	
			6125am	6165na		
0500	0600	1st Sat	Finland, Scandinavian Weekend R		5980eu	
0500	0600		Germany, Deutsche Welle	9800af	15275af	
0500	0600		Germany, R 6150	6070eu		
0500	0600		Guatemala, R Verdad	4055do		
0500	0600		Guyana, Voice of Guyana	3290do		
0500	0600	Sat/Sun	India, AIR/Thiruvananthapuram	7290do		
0500	0600		Malaysia, RTM/Kajang	5965do	6050do	
0500	0600		Malaysia, RTM/Traxx FM	7295do		
0500	0600		Mexico, R Educacion	6185do		
0500	0600		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0500	0600	DRM	New Zealand, R New Zealand Intl		11675pa	
0500	0600	irreg	Nigeria, VO Nigeria	15120af		
0500	0600		Papua New Guinea, Wantok R Light		7325do	
0500	0600		Solomon Islands, SIBC	9545do		
0500	0600	mtwhf	South Africa, Channel Africa	7230af		
0500	0600	mtwhf	Swaziland, TWR Africa	4775af		
0500	0600	Sat/Sun	Swaziland, TWR Africa	3200af	4775af	
0500	0600		Swaziland, TWR Africa	9500af		
0500	0600		UK, BBC World Service	3255af	5875af	
			6005af	6190af	7355af	11945af
			15420af			
0500	0600	DRM	UK, BBC World Service	3955eu		
0500	0600		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
0500	0600		USA, Overcomer Ministry	3185na	5890na	
0500	0600		USA, VO America	4930af	6080af	12025af
			15580af			
0500	0600		USA, WBCQ Monticello ME	9330na		
0500	0600		USA, WEWN/Irondale AL	11520af		
0500	0600		USA, WHRI Cypress Crk SC	9825me		
0500	0600		USA, WRMI Miami FL	9955am		
0500	0600		USA, WTWW Lebanon TN	5830na		
0500	0600		USA, WWCR Nashville TN	3215eu	4840na	
			5890ca	5935af		
0500	0600	irreg	USA, WWRB Manchester TN	3185na		
0500	0600		Vanuatu, R Vanuatu	7260do		
0500	0600		Zambia, Zambia Natl BC	5915do	6165do	
0500	0600	irreg	Zimbabwe, VO Zimbabwe	4828af		
0515	0530		Rwanda, R Rep Rwandaise	6055do		
0525	0600		Vanuatu, R Vanuatu	3945do		
0530	0556		Romania, R Romania Intl	9700eu	17760pa	
			21500pa			
0530	0556	DRM	Romania, R Romania Intl	11875eu		
0530	0557		Germany, Deutsche Welle	9800af		
0530	0600		Australia, ABC/R Australia	17750va		
0530	0600	irreg	Congo Dem Rep, R Kahuzi	6210do		
0530	0600		Germany, Deutsche Welle	15275af		
0530	0600	Sun	India, AIR/Hyderabad	7420do		
0530	0600		India, AIR/Mumbai	7240do		
0530	0600		Nigeria, FRCN Abuja	7275do		
0530	0600		Thailand, R Thailand World Svc	17770eu		
0535	0547		New Zealand, R New Zealand Intl		15720pa	
0548	0600		New Zealand, R New Zealand Intl		11725pa	
0555	0600		Mali, ORTM/R Mali	5995do		

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

0600	0627		Germany, Deutsche Welle	15275af		
0600	0630		China, Xizang PBS	6025do	6130do	9580do
0600	0630		Germany, Deutsche Welle	15440af	17800af	
0600	0630	Sat/Sun	India, AIR/Thiruvananthapuram	7290do		
0600	0655	mtwhf	South Africa, Channel Africa	7230af	15255af	
0600	0657		North Korea, VO Korea	7220as	9445as	
			9730as			
0600	0700		Anguilla, Caribbean Beacon/Univ Net		6090ca	
0600	0700		Australia, ABC/R Australia	9660va	11945va	
			13630pa	15240va	15415va	17750va
			21725va			
0600	0700		Australia, NT VL8A Alice Springs		4835do	
0600	0700		Australia, NT VL8K Katherine	5025do		
0600	0700		Australia, NT VL8T Tennant Creek		4910do	
0600	0700		Bangladesh, Bangla Betar/Home Svc		4750as	
0600	0700		Canada, CFRX Toronto ON	6070do		
0600	0700		Canada, CFVP Calgary AB	6030do		
0600	0700		Canada, CKZN St Johns NF	6160do		
0600	0700		Canada, CKZU Vancouver BC	6160do		
0600	0700		China, China R International	11710af	11870me	
			15140me	15350as	17505va	17710as
0600	0700		China, VO the South China Sea	13660as		
0600	0700		China, Xizang PBS	4905do	4920do	6130do
			7385do			
0600	0700	irreg	Congo Dem Rep, R Kahuzi	6210do		
0600	0700		Cuba, R Havana Cuba	6010na	6060na	
			6125am	6165na		
0600	0700	1st Sat	Finland, Scandinavian Weekend R		5980eu	
0600	0700	wa/irreg	Germany, Hamburger Lokalradio		7265eu	
0600	0700		Germany, R 6150	6070eu		
0600	0700		Guyana, Voice of Guyana	3290do		
0600	0700		India, AIR/Chennai	7380do		
0600	0700		India, AIR/Hyderabad	7420do		
0600	0700		India, AIR/Imphal	7335do		
0600	0700		India, AIR/Mumbai	7240do		
0600	0700		Malaysia, RTM/Kajang	5965do	6050do	
0600	0700		Malaysia, RTM/Traxx FM	7295do		
0600	0700		Mali, ORTM/R Mali	5995do		
0600	0700		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0600	0700	DRM	New Zealand, R New Zealand Intl		9890pa	
0600	0700		New Zealand, R New Zealand Intl		11725pa	
0600	0700		Nigeria, FRCN Abuja	7275do		
0600	0700	irreg	Nigeria, VO Nigeria	15120af		
0600	0700		Papua New Guinea, R Central	3290do		
0600	0700		Papua New Guinea, R East New Britain		3385do	
0600	0700		Papua New Guinea, R Vanimo	3205do		
0600	0700		Papua New Guinea, R Western	3305do		
0600	0700		Papua New Guinea, Wantok R Light		7325do	
0600	0700		Russia, VO Russia	21800pa	21820pa	
0600	0700	DRM	Russia, VO Russia	11830eu		
0600	0700		Solomon Islands, SIBC	9545do		
0600	0700		Swaziland, TWR Africa	4775af	6120af	
0600	0700		UK, BBC World Service	6005af	6190af	
			7355af	9860af	12095af	15105af
			15420af	17640af		
0600	0700	DRM	UK, BBC World Service	5875eu	7325eu	
0600	0700		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
0600	0700		USA, Overcomer Ministry	3185na	5890na	
0600	0700		USA, VO America	6080af	12025af	15580af
0600	0700		USA, WBCQ Monticello ME	9330na		

0600	0700		USA, WEWN/Irondale AL	11520af	
0600	0700		USA, WHRI Cypress Crk SC	9825me	
0600	0700		USA, WRMI Miami FL	9955am	
0600	0700		USA, WTWW Lebanon TN	5830na	
0600	0700		USA, WWCR Nashville TN	3215eu	4840na
			5890ca	5935af	
0600	0700	irreg	USA, WWRB Manchester TN	3185na	
0600	0700		Vanuatu, R Vanuatu	3945do	7260do
0600	0700		Zambia, Zambia Natl BC	5915do	6165do
0600	0700	irreg	Zimbabwe, VO Zimbabwe	4828af	
0615	0700	Sat	USA, WHRI Cypress Crk SC	9825me	
0630	0645	mtwhfa	Vatican City State, Vatican R	15595me	
0630	0700		Germany, Deutsche Welle	15440af	17800af
0630	0700		India, AIR/Bhopal	7430do	
0630	0700	mtwhfa	India, AIR/Imphal	7335do	
0630	0700		India, AIR/Jaipur	7325do	
0630	0700	Sun	India, AIR/Leh	6000do	
0630	0700		India, AIR/Srinagar	6110do	
0630	0700		India, AIR/Thiruvananthapuram	7290do	
0630	0700		Vatican City State, Vatican R	13765af	15570af
0657	0700		Germany, TWR Europe	6105eu	

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

0700	0730		Myanmar, Myanma R	5985do	
0700	0735		Vanuatu, R Vanuatu	7260do	
0700	0745	Sat/Sun	Canada, Bible VO Broadcasting		5945eu
0700	0750		Austria, TWR Europe	7400eu	
0700	0750		Germany, TWR Europe	6105eu	
0700	0758		New Zealand, R New Zealand Intl		11725pa
0700	0758	DRM	New Zealand, R New Zealand Intl		9890pa
0700	0800		Anguilla, Caribbean Beacon/Univ Net		6090ca
0700	0800		Australia, ABC/R Australia	7410va	9475as
			9660va	9710va	11945va 12080pa
			13630pa	15240va	
0700	0800		Australia, NT VL8A Alice Springs		4835do
0700	0800		Australia, NT VL8K Katherine	5025do	
0700	0800		Australia, NT VL8T Tennant Creek		4910do
0700	0800		Bangladesh, Bangla Betar/Home Svc		4750as
0700	0800	irreg	Cameroon, CRTV/R Buea	6005do	
0700	0800		Canada, CFRX Toronto ON	6070do	
0700	0800		Canada, CFVP Calgary AB	6030do	
0700	0800		Canada, CKZN St Johns NF	6160do	
0700	0800		Canada, CKZU Vancouver BC	6160do	
0700	0800		China, China R International	11895as	13660as
			13710eu	15350as	15465as 17480va
			17490eu	17540as	17710as
0700	0800		China, Xizang PBS	4905do	4920do 6130do
			7385do		
0700	0800	irreg	Congo Dem Rep, R Kahuzi	6210do	
0700	0800	1st Sat	Finland, Scandinavian Weekend R		5980eu
0700	0800	wa/irreg	Germany, Hamburger Lokalradio		7265eu
0700	0800		Germany, R 6150	6070eu	
0700	0800		Guyana, Voice of Guyana	3290do	
0700	0800		India, AIR/Aizawl	7295do	
0700	0800		India, AIR/Bhopal	7430do	
0700	0800		India, AIR/Chennai	7380do	
0700	0800		India, AIR/Hyderabad	7420do	
0700	0800		India, AIR/Imphal	7335do	
0700	0800		India, AIR/Jaipur	7325do	
0700	0800		India, AIR/Jeypore	6040do	
0700	0800		India, AIR/Kohima	6065do	
0700	0800		India, AIR/Leh	6000do	
0700	0800		India, AIR/Mumbai	7240do	
0700	0800		India, AIR/Port Blair	7390do	
0700	0800		India, AIR/Srinagar	6110do	
0700	0800		India, AIR/Thiruvananthapuram	7290do	
0700	0800		Malaysia, RTM/Kajang	5965do	6050do
0700	0800		Malaysia, RTM/Traxx FM	7295do	
0700	0800		Mali, ORTM/R Mali	5995do	
0700	0800		Micronesia, V6MP/Cross R/Pohnpei		4755 as
0700	0800		Nigeria, FRCN Abuja	7275do	
0700	0800		Papua New Guinea, R Central	3290do	
0700	0800		Papua New Guinea, R East New Britain		3385do
0700	0800		Papua New Guinea, R Northern	3345do	
0700	0800		Papua New Guinea, R Vanimo	3205do	
0700	0800		Papua New Guinea, R Western	3305do	
0700	0800		Papua New Guinea, Wantok R Light		7325do
0700	0800		Russia, VO Russia	13785as	17500as 21800pa
			21820pa		
0700	0800	DRM	Russia, VO Russia	11830eu	
0700	0800		Solomon Islands, SIBC	5020do	9545do
0700	0800	mtwhf	South Africa, Channel Africa	9625af	
0700	0800		Swaziland, TWR Africa	4775af	6120af
			9500af		
0700	0800		UK, BBC World Service	6190af	11770af
			12095af	13660af	15400af 15420af
			17640af	17830af	
0700	0800	DRM	UK, BBC World Service	5875eu	7325eu
0700	0800		USA, AFN/AFRTS	4319usb	5765usb 12759usb
			13362usb		
0700	0800		USA, Overcomer Ministry	3185na	
0700	0800	sm	USA, Overcomer Ministry	5890na	
0700	0800		USA, WBCQ Monticello ME	9330na	
0700	0800		USA, WEWN/Irondale AL	11520af	
0700	0800		USA, WRMI Miami FL	9955am	
0700	0800		USA, WTWW Lebanon TN	5830na	
0700	0800		USA, WWCR Nashville TN	3215eu	4840na
			5890ca	5935af	
0700	0800	irreg	USA, WWRB Manchester TN	3185na	
0700	0800		Vanuatu, R Vanuatu	3945do	
0700	0800		Zambia, Zambia Natl BC	5915do	6165do
0730	0800		Australia, HCJB Global Australia		15490as
0730	0800		Sudan, VO Africa/Sudan R	9505af	
0759	0800		New Zealand, R New Zealand Intl		9700pa
0759	0800	DRM	New Zealand, R New Zealand Intl		9890pa

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

0800	0830		Australia, HCJB Global Australia		15490as
0800	0830		Australia, NT VL8A Alice Springs		4835do
0800	0830		Australia, NT VL8K Katherine	5025do	
0800	0830		Australia, NT VL8T Tennant Creek		4910do
0800	0830		Sudan, VO Africa/Sudan R	9505af	
0800	0900		Anguilla, Caribbean Beacon/Univ Net		6090ca
0800	0900		Australia, ABC/R Australia	5995as	7410va
			9475as	9580pa	9710va 11945va
			12080pa	15240va	
0800	0900		Bangladesh, Bangla Betar/Home Svc		4750as
0800	0900		Bhutan, Bhutan BC Svc	6035do	
0800	0900	irreg	Cameroon, CRTV/R Buea	6005do	
0800	0900		Canada, CFRX Toronto ON	6070do	
0800	0900		Canada, CFVP Calgary AB	6030do	
0800	0900		Canada, CKZN St Johns NF	6160do	
0800	0900		Canada, CKZU Vancouver BC	6160do	
0800	0900		China, China R International	11620as	11895as
			13710as	15350as	15465as 17480va
			17490eu	17540as	
0800	0900		China, Xizang PBS	4905do	4920do 6130do
			7385do		
0800	0900	irreg	Congo Dem Rep, R Kahuzi	6210do	
0800	0900	1st Sat	Finland, Scandinavian Weekend R		6170eu
0800	0900	Sat/Sun	Germany, Mighty KBC Radio	6095eu	
0800	0900		Germany, R 6150	6070eu	
0800	0900		Guyana, Voice of Guyana	3290do	
0800	0900		India, AIR/Aizawl	7295do	
0800	0900		India, AIR/Bhopal	7430do	
0800	0900		India, AIR/Chennai	7380do	
0800	0900		India, AIR/Imphal	7335do	
0800	0900		India, AIR/Jaipur	7325do	
0800	0900		India, AIR/Jeypore	6040do	
0800	0900		India, AIR/Kohima	6065do	
0800	0900		India, AIR/Leh	6000do	
0800	0900		India, AIR/Mumbai	7240do	
0800	0900		India, AIR/Port Blair	7390do	
0800	0900		India, AIR/Srinagar	6110do	
0800	0900		India, AIR/Thiruvananthapuram	7290do	
0800	0900	Sat	Italy, IRRS Shortwave	9510va	
0800	0900		Malaysia, RTM/Kajang	5965do	6050do
0800	0900		Malaysia, RTM/Traxx FM	7295do	
0800	0900		Mali, ORTM/R Mali	9635do	
0800	0900		Micronesia, V6MP/Cross R/Pohnpei		4755 as
0800	0900		New Zealand, R New Zealand Intl		9700pa
0800	0900	DRM	New Zealand, R New Zealand Intl		9890pa
0800	0900		Nigeria, FRCN Abuja	7275do	
0800	0900	irreg	Nigeria, VO Nigeria	15120af	
0800	0900	mtwhfs	Palau, T8WH/World Harvest R	9930as	
0800	0900		Papua New Guinea, R Central	3290do	
0800	0900		Papua New Guinea, R East New Britain		3385do
0800	0900		Papua New Guinea, R Northern	3345do	
0800	0900		Papua New Guinea, R Vanimo	3205do	
0800	0900		Papua New Guinea, R Western	3305do	
0800	0900		Papua New Guinea, Wantok R Light		7325do
0800	0900		Russia, VO Russia	13785as	17500as 21800va
			21820pa		
0800	0900	DRM	Russia, VO Russia	9850eu	11830eu
0800	0900		Solomon Islands, SIBC	5020do	9545do
0800	0900	mtwhf	South Africa, Channel Africa	9625af	
0800	0900	Sun	South Africa, SA Radio League	7205af	17660af
0800	0900		South Korea, KBS World R	9570as	
0800	0900		USA, AFN/AFRTS	4319usb	5765usb 12759usb
			13362usb		
0800	0900		USA, Overcomer Ministry	3185na	5890na
0800	0900		USA, WBCQ Monticello ME	9330na	
0800	0900		USA, WEWN/Irondale AL	11520af	
0800	0900	mtwhfs	USA, WHRI Cypress Crk SC	11565pa	
0800	0900		USA, WRMI Miami FL	9955am	
0800	0900		USA, WTWW Lebanon TN	5830na	
0800	0900		USA, WWCR Nashville TN	3215eu	4840na
			5890ca	5935af	
0800	0900	irreg	USA, WWRB Manchester TN	3185na	
0800	0900		Vanuatu, R Vanuatu	3945do	
0800	0900		Zambia, Zambia Natl BC	5915do	6165do
0815	0830		Nepal, R Nepal	5005do	
0830	0900		Australia, NT VL8A Alice Springs		2310do
0830	0900		Australia, NT VL8K Katherine	2485do	
0830	0900		Australia, NT VL8T Tennant Creek		2325do
0830	0900		India, AIR/External Svc	7250as	7340as
			9595as	11620as	
0850	0900	smtwhf	Singapore, TWR Asia	15200as	

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

0900	0920		India, AIR/Chennai	7380do		
0900	0930		India, AIR/Leh	6000do		
0900	0930		Mongolia, VO Mongolia	12085as		
0900	0930	smtwhf	Singapore, TWR Asia	15200as		
0900	0931		India, AIR/Bhopal	7430do		
0900	0931		India, AIR/Jaipur	7325do		
0900	0931		India, AIR/Port Blair	7390do		
0900	0945		India, AIR/Jeypore	6040do		
0900	1000		Anguilla, Caribbean Beacon/Univ Net			6090ca
0900	1000		Australia, ABC/R Australia	9580pa		11945va
0900	1000		Australia, NT VL8A Alice Springs			2310do
0900	1000		Australia, NT VL8K Katherine	2485do		
0900	1000		Australia, NT VL8T Tennant Creek			2325do
0900	1000		Bangladesh, Bangla Betar/Home Svc			4750as
0900	1000	irreg	Cameroon, CRTV/R Buea	6005do		
0900	1000		Canada, CFRX Toronto ON	6070do		
0900	1000		Canada, CFVP Calgary AB	6030do		
0900	1000		Canada, CKZN St Johns NF	6160do		
0900	1000		Canada, CKZU Vancouver BC	6160do		
0900	1000		China, China R International	11620as		13790as
			15270eu	15350as	17490eu	17570eu
			17650pa	17750as		
0900	1000		China, Xizang PBS	4905do	4920do	6130do
			7385do			
0900	1000	irreg	Congo Dem Rep, R Kahuzi	6210do		
0900	1000	1st Sat	Finland, Scandinavian Weekend R			6170eu
0900	1000	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
0900	1000		Germany, R 6150	6070eu		
0900	1000		India, AIR/Aizawl	7295do		
0900	1000		India, AIR/External Svc	7250as		7340as
			9595as	11620as		
0900	1000		India, AIR/Imphal	7335do		
0900	1000		India, AIR/Mumbai	7240do		
0900	1000		India, AIR/Port Blair	7390do		
0900	1000		India, AIR/Srinagar	6110do		
0900	1000		India, AIR/Thiruvananthapuram	7290do		
0900	1000		Malaysia, RTM/Kajang	5965do		6050do
0900	1000		Malaysia, RTM/Traxx FM	7295do		
0900	1000		Mali, ORTM/R Mali	9635do		
0900	1000		Micronesia, V6MP/Cross R/Pohnpei			4755 as
0900	1000	3rd Sun	Netherlands, XVRB/Music Museum			6045eu
0900	1000	DRM	New Zealand, R New Zealand Intl			9890pa
0900	1000		New Zealand, R New Zealand Intl			9700pa
0900	1000		Nigeria, FRCN Abuja	7275do		
0900	1000	irreg	Nigeria, VO Nigeria	9690af		
0900	1000		Palau, T8WH/World Harvest R	9930as		
0900	1000		Papua New Guinea, R Central	3290do		
0900	1000		Papua New Guinea, R East New Britain			3385do
0900	1000		Papua New Guinea, R Northern	3345do		
0900	1000		Papua New Guinea, R Vanimo	3205do		
0900	1000		Papua New Guinea, R Western	3305do		
0900	1000		Papua New Guinea, Wantok R Light			7325do
0900	1000		Russia, VO Russia	21800va	21820va	
0900	1000	DRM	Russia, VO Russia	9850eu	11830eu	
0900	1000		Solomon Islands, SIBC	5020do		9545do
0900	1000	mtwhf	South Africa, Channel Africa	9625af		
0900	1000		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
0900	1000		USA, Overcomer Ministry	3185na		5890na
0900	1000		USA, WBCQ Monticello ME	9330na		
0900	1000		USA, WEWN/Irondale AL	11520af		
0900	1000	Sun	USA, WHRI Cypress Crk SC	11565pa		
0900	1000		USA, WRMI Miami FL	9955am		
0900	1000		USA, WTWW Lebanon TN	5830na		
0900	1000		USA, WWCR Nashville TN	4840na		5890ca
			5935af	15825eu		
0900	1000	irreg	USA, WWRB Manchester TN	3185na		
0900	1000		Vanuatu, R Vanuatu	3945do		
0900	1000		Zambia, Zambia Natl BC	5915do		6165do
0930	1000	fs	China, VO the Strait	6115do		
0930	1000	Sun	Italy, IRRS Shortwave	9510va		
0930	1000		Saudi Arabia, BSKSA/External Svc			15250af

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

1000	1000		USA, KNLS Anchor Point AK	9655as		
1000	1020	mtwhf	Singapore, TWR Asia	11840pa		
1000	1030	Sun	India, AIR/Thiruvananthapuram	7290do		
1000	1030		Japan, R Japan/NHK World	9625as		9695as
1000	1030	Sat	Singapore, TWR Asia	11840pa		
1000	1030		Vietnam, VO Vietnam/Overseas Svc			9840as
			12020as			
1000	1031	Sun	India, AIR/Bhopal	7430do		
1000	1035		India, AIR/Mumbai	7240do		
1000	1057		North Korea, VO Korea	11710ca		11735as
			13650as	15180sa		
1000	1058		New Zealand, R New Zealand Intl			9700pa
1000	1058	DRM	New Zealand, R New Zealand Intl			9890pa
1000	1100		Anguilla, Caribbean Beacon/Univ Net			11775ca
1000	1100		Australia, ABC/R Australia	9580pa		12065pa
1000	1100	Sat/Sun	Australia, ABC/R Australia	5995as		6080as
			6150as	9475va	9710va	12080pa
1000	1100		Australia, NT VL8A Alice Springs			2310do
1000	1100		Australia, NT VL8K Katherine	2485do		
1000	1100		Australia, NT VL8T Tennant Creek			2325do
1000	1100		Bangladesh, Bangla Betar/Home Svc			4750as
1000	1100	irreg	Cameroon, CRTV/R Buea	6005do		
1000	1100		Canada, CFRX Toronto ON	6070do		
1000	1100		Canada, CFVP Calgary AB	6030do		
1000	1100		Canada, CKZN St Johns NF	6160do		
1000	1100		Canada, CKZU Vancouver BC	6160do		
1000	1100		China, China R International	11610as		11620as
			11635as	13590as	13620as	13720as
			13790pa	15190as	15210pa	15350as
			17490eu			
1000	1100		China, Xizang PBS	4905do	4920do	6130do
			7385do			
1000	1100	irreg	Congo Dem Rep, R Kahuzi	6210do		
1000	1100	1st Sat	Finland, Scandinavian Weekend R			6170eu
1000	1100	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1000	1100		Germany, R 6150	6070eu		
1000	1100		India, AIR/External Svc	7270as		13605as
			13695pa	15030as	15410as	17510pa
			17895pa			
1000	1100		India, AIR/External Svc	7250as		7340as
			9595as	11620as		
1000	1100		India, AIR/Kohima	4850do		
1000	1100		India, AIR/Srinagar	6110do		
1000	1100	irreg	Indonesia, VO Indonesia	9526pa		
1000	1100	Sun	Italy, IRRS Shortwave	9510va		
1000	1100		Malaysia, RTM/Kajang	5965do		6050do
1000	1100		Malaysia, RTM/Traxx FM	7295do		
1000	1100		Mali, ORTM/R Mali	9635do		
1000	1100		Micronesia, V6MP/Cross R/Pohnpei			4755as
1000	1100		Nigeria, FRCN Abuja	7275do		
1000	1100	irreg	Nigeria, VO Nigeria	9690af		
1000	1100		Papua New Guinea, R Central	3290do		
1000	1100		Papua New Guinea, R East New Britain			3385do
1000	1100		Papua New Guinea, R Northern	3345do		
1000	1100		Papua New Guinea, R Vanimo	3205do		
1000	1100		Papua New Guinea, R Western	3305do		
1000	1100		Papua New Guinea, Wantok R Light			7325do
1000	1100		Russia, VO Russia	11530as	12030as	
1000	1100	DRM	Russia, VO Russia	9850eu		
1000	1100		Saudi Arabia, BSKSA/External Svc			15250af
1000	1100		Solomon Islands, SIBC	5020do		9545do
1000	1100	mtwhf	South Africa, Channel Africa	9625af		
1000	1100		UK, BBC World Service	6195as		9740as
			15285as	17660as	21660as	
1000	1100	Sat/t	UK, BBC World Service	17760as		
1000	1100	mf	UK, BBC World Service	17705as		
1000	1100	wa	UK, BBC World Service	17840as		
1000	1100		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1000	1100		USA, Overcomer Ministry	3185na		5890na
1000	1100		USA, WBCQ Monticello ME	9330na		
1000	1100		USA, WEWN/Irondale AL	11520af		
1000	1100	Sun	USA, WHRI Cypress Crk SC	11565pa		
1000	1100	Sun	USA, WINB Red Lion PA	9265am		
1000	1100		USA, WRMI Miami FL	9955am		
1000	1100		USA, WTWW Lebanon TN	5830na		
1000	1100		USA, WWCR Nashville TN	4840na		5890ca
			5935af	15825eu		
1000	1100	irreg	USA, WWRB Manchester TN	3185na		
1000	1100		Vanuatu, R Vanuatu	3945do		
1000	1100		Zambia, Zambia Natl BC	5915do		6165do
1030	1100		India, AIR/Gangkok	4835do		
1030	1100		India, AIR/Imphal	4775do		
1030	1100		India, AIR/Port Blair	4760do		
1030	1100		Iran, VOIRI	21505va	21640va	
1059	1100		New Zealand, R New Zealand Intl			9700pa
1059	1100	DRM	New Zealand, R New Zealand Intl			9890pa

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

1100	1115	mwh	Australia, HCJB Global Australia			15490as
1100	1127		Iran, VOIRI	21505va	21640va	
1100	1130	Sun	Canada, Bible VO Broadcasting			21480as
1100	1130		India, AIR/External Svc	7250as		7340as
			9595as	11620as		
1100	1130	f/DRM	Japan, R Japan/NHK World	9760eu		
1100	1130	Sat/DRM	South Korea, KBS World R	9760eu		
1100	1130		Vietnam, VO Vietnam/Overseas Svc			7285as
1100	1156		Romania, R Romania Intl		15210eu	15430eu
			17510eu	17670af		
1100	1200		Anguilla, Caribbean Beacon/Univ Net			11775ca
1100	1200		Australia, ABC/R Australia	5995as		6080as
			6140as	6150va	9475as	9580pa
			11945va	12065pa		
1100	1200	DRM	Australia, ABC/R Australia	12080pa		
1100	1200		Australia, NT VL8A Alice Springs			2310do
1100	1200		Australia, NT VL8K Katherine	2485do		
1100	1200		Australia, NT VL8T Tennant Creek			2325do
1100	1200		Bangladesh, Bangla Betar/Home Svc			4750as
1100	1200	irreg	Cameroon, CRTV/R Buea	6005do		
1100	1200	Sat	Canada, Bible VO Broadcasting			21480as

SHORTWAVE GUIDE

1100	1200		Canada, CFRX Toronto ON	6070do		
1100	1200		Canada, CFVP Calgary AB	6030do		
1100	1200		Canada, CKZN St Johns NF	6160do		
1100	1200		Canada, CKZU Vancouver BC	6160do		
1100	1200		China, China R International	5955as	11660as	
			11795as	13650as	17490eu	
1100	1200		China, Xizang PBS	4905do	4920do	6130do
			7385do			
1100	1200	irreg	Congo Dem Rep, R Kahuzi	6210do		
1100	1200	1st Sat	Finland, Scandinavian Weekend R			6170eu
1100	1200	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1100	1200		Germany, R 6150	6070eu		
1100	1200		India, AIR/Gangkok	4835do		
1100	1200		India, AIR/Imphal	4775do		
1100	1200		India, AIR/Jeypore	5040do		
1100	1200		India, AIR/Kohima	4850do		
1100	1200		India, AIR/Port Blair	4760do		
1100	1200		India, AIR/Srinagar	6110do		
1100	1200		India, AIR/Thiruvananthapuram	5010do		
1100	1200	Sun	Italy, IRRS Shortwave	9510va		
1100	1200		Malaysia, RTM/Kajang	5965do	6050do	
1100	1200		Malaysia, RTM/Traxx FM	7295do		
1100	1200		Mali, ORTM/R Mali	9635do		
1100	1200		Micronesia, V6MP/Cross R/Pohnpei		4755as	
1100	1200		New Zealand, R New Zealand Intl		9700pa	
1100	1200	DRM	New Zealand, R New Zealand Intl		9890pa	
1100	1200		Nigeria, FRCN Abuja	7275do		
1100	1200	irreg	Nigeria, VO Nigeria	9690af		
1100	1200		Papua New Guinea, R Central	3290do		
1100	1200		Papua New Guinea, R East New Britain		3385do	
1100	1200		Papua New Guinea, R Northern	3345do		
1100	1200		Papua New Guinea, R Vanimo	3205do		
1100	1200		Papua New Guinea, R Western	3305do		
1100	1200		Papua New Guinea, Wantok R Light		7325do	
1100	1200		Russia, VO Russia	11530as	12030as	15670as
1100	1200	DRM	Russia, VO Russia	9850eu		
1100	1200		Saudi Arabia, BSKSA/External Svc		15250af	
1100	1200		Solomon Islands, SIBC	5020do	9545do	
1100	1200	mtwhf	South Africa, Channel Africa	9625af		
1100	1200		Taiwan, R Taiwan Intl	7445as	9465as	
1100	1200		UK, BBC World Service	6195as	9740as	
			15285as	17660as		
1100	1200	mf	UK, BBC World Service	17705as		
1100	1200	wa	UK, BBC World Service	17840as		
1100	1200	Sat/t	UK, BBC World Service	17760as		
1100	1200		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1100	1200		USA, Overcomer Ministry	3185na		
1100	1200	twhfa	USA, Overcomer Ministry	5890na		
1100	1200		USA, WBCQ Monticello ME	9330na		
1100	1200		USA, WEWN/Irondale AL	11520af		
1100	1200	Sun	USA, WHRI Cypress Crk SC	7315ca		
1100	1200	Sun	USA, WINB Red Lion PA	9265am		
1100	1200		USA, WRMI Miami FL	9955am		
1100	1200		USA, WTWW Lebanon TN	5830na		
1100	1200		USA, WWCR Nashville TN	4840na	5890ca	
			5935af	15825eu		
1100	1200	irreg	USA, WWRB Manchester TN	3185na		
1100	1200		Vanuatu, R Vanuatu	3945do		
1100	1200		Zambia, Zambia Natl BC	5915do	6165do	
1115	1145	f	Canada, Bible VO Broadcasting		21480as	
1120	1200		India, AIR/Srinagar	4950do		
1130	1145	smtha	Australia, HCJB Global Australia		15490as	
1130	1145	f	USA, Eternal Good News	15525as		
1130	1200		Guatemala, R Verdad	4055do		
1130	1200		India, AIR/Aizawl	5050do		
1130	1200		India, AIR/Bhopal	4810do		
1130	1200		India, AIR/Jaipur	4910do		
1130	1200		India, AIR/Leh	4660do		
1130	1200	f	Vatican City State, Vatican R	17590me	21560me	
1130	1200		Vietnam, VO Vietnam/Overseas Svc		9840as	
			12020as			
1150	1200		USA, Overcomer Ministry	9930sa		

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

1200	1215		India, AIR/Srinagar	6110do		
1200	1227		Saudi Arabia, BSKSA/External Svc		15250af	
1200	1230		Japan, R Japan/NHK World	9695af	11740as	
1200	1230		Vanuatu, R Vanuatu	3945do		
1200	1259		New Zealand, R New Zealand Intl		9700pa	
1200	1300		Anguilla, Caribbean Beacon/Univ Net		11775ca	
1200	1300		Australia, ABC/R Australia	6080as	6140as	
			6150va	9475as	9580pa	11945va
1200	1300	DRM	Australia, ABC/R Australia	5995as		
1200	1300		Australia, NT VL8A Alice Springs		2310do	
1200	1300		Australia, NT VL8K Katherine	2485do		
1200	1300		Australia, NT VL8T Tennant Creek		2325do	
1200	1300		Bangladesh, Bangla Betar/Home Svc		4750as	
1200	1300	irreg	Cameroon, CRTV/R Buea	6005do		
1200	1300		Canada, CFRX Toronto ON	6070do		
1200	1300		Canada, CFVP Calgary AB	6030do		
1200	1300		Canada, CKZN St Johns NF	6160do		
1200	1300		Canada, CKZU Vancouver BC	6160do		
1200	1300		China, China R International	6010as	9460as	
			9600as	9645as	9730as	11650as
			11660as	11690va	11980as	13645as
			13650eu	17490eu	17630eu	
1200	1300		China, Xizang PBS	4905do	4920do	6130do
			7385do			
1200	1300	irreg	Congo Dem Rep, R Kahuzi	6210do		
1200	1300		Ethiopia, R Ethiopia/Natl Svc	9705do		
1200	1300	1st Sat	Finland, Scandinavian Weekend R			6170eu
1200	1300	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1200	1300		Germany, R 6150	6070eu		
1200	1300		Guatemala, R Verdad	4055do		
1200	1300		India, AIR/Aizawl	7295do		
1200	1300		India, AIR/Bhopal	4810do		
1200	1300		India, AIR/Chennai	4920do		
1200	1300		India, AIR/Gangkok	4835do		
1200	1300		India, AIR/Imphal	4775do		
1200	1300		India, AIR/Jaipur	4910do		
1200	1300		India, AIR/Jeypore	5040do		
1200	1300		India, AIR/Kohima	4850do		
1200	1300		India, AIR/Leh	4660do		
1200	1300		India, AIR/Port Blair	4760do		
1200	1300		India, AIR/Srinagar	4950do		
1200	1300		India, AIR/Thiruvananthapuram	5010do		
1200	1300		Malaysia, RTM/Kajang	5965do	6050do	
1200	1300		Malaysia, RTM/Traxx FM	7295do		
1200	1300		Mali, ORTM/R Mali	9635do		
1200	1300		Nigeria, FRCN Abuja	7275do		
1200	1300	irreg	Nigeria, VO Nigeria	9690af		
1200	1300	Sat/Sun	Palau, T8WH/World Harvest R	9930as		
1200	1300		Papua New Guinea, R Central	3290do		
1200	1300		Papua New Guinea, R East New Britain		3385do	
1200	1300		Papua New Guinea, R Fly	3915do	5960do	
1200	1300		Papua New Guinea, R Northern	3345do		
1200	1300		Papua New Guinea, R Vanimo	3205do		
1200	1300		Papua New Guinea, R Western	3305do		
1200	1300		Papua New Guinea, Wantok R Light		7325do	
1200	1300		Russia, VO Russia	11530as	15670as	
1200	1300		Solomon Islands, SIBC	5020do	9545do	
1200	1300		UK, BBC World Service	5875as	6195as	
			9740as	11750as		
1200	1300		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1200	1300		USA, KNLS Anchor Point AK	7355as		
1200	1300	mtwhf	USA, Overcomer Ministry	9980na		
1200	1300		USA, Overcomer Ministry	3185na	9930sa	
			9980na	17750me		
1200	1300		USA, VO America	7575va	9510va	12075va
			12150va			
1200	1300		USA, WBCQ Monticello ME	9330na		
1200	1300		USA, WEWN/Irondale AL	15610eu		
1200	1300		USA, WHRI Cypress Crk SC	9795am		
1200	1300		USA, WRMI Miami FL	9955am		
1200	1300		USA, WTWW Lebanon TN	9930sa		
1200	1300		USA, WTWW Lebanon TN	5830na		
1200	1300		USA, WWCR Nashville TN	7490af	9980ca	
			13845na	15825eu		
1200	1300	irreg	USA, WWRB Manchester TN	3185na		
1200	1300		Zambia, Zambia Natl BC	5915do	6165do	
1215	1300		Egypt, R Cairo	17870as		
1230	1245	smtwhf	Australia, HCJB Global Australia		15340pa	
1230	1300		Bangladesh, Bangla Betar	15105as		
1230	1300		India, AIR/Mumbai	4840do		
1230	1300		South Korea, KBS World R	6095as		
1230	1300		Thailand, R Thailand World Svc	9390as		
1230	1300		Turkey, VO Turkey	15450va		
1230	1300		Vietnam, VO Vietnam/Overseas Svc		9840as	
			12020as			

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

1300	1330		Egypt, R Cairo	17870as		
1300	1330		Japan, R Japan/NHK World	15735as		
1300	1330		Turkey, VO Turkey	15450eu		
1300	1357		North Korea, VO Korea	9435na	11710na	
			13760eu	15245eu		
1300	1400		Anguilla, Caribbean Beacon/Univ Net		11775ca	
1300	1400		Australia, ABC/R Australia	5940as	6150va	
			9475as	9580pa	9965as	12065pa
			12085as			
1300	1400	DRM	Australia, ABC/R Australia	5995as		
1300	1400		Australia, NT VL8A Alice Springs		2310do	
1300	1400		Australia, NT VL8K Katherine	2485do		
1300	1400		Bangladesh, Bangla Betar/Home Svc		4750as	
1300	1400	irreg	Cameroon, CRTV/R Buea	6005do		
1300	1400		Canada, CFRX Toronto ON	6070do		
1300	1400		Canada, CFVP Calgary AB	6030do		
1300	1400		Canada, CKZN St Johns NF	6160do		
1300	1400		Canada, CKZU Vancouver BC	6160do		
1300	1400		China, China R International	5955as	9570na	
			9730as	9760pa	9765va	9870as
			11660as	11760pa	11980as	13610eu
			13755as	17630eu		
1300	1400		China, Xizang PBS	4905do	4920do	6130do
			7385do			

1300	1400	irreg	Congo Dem Rep, R Kahuzi	6210do		
1300	1400	1st Sat	Finland, Scandinavian Weekend R			6170eu
1300	1400	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1300	1400		Germany, R 6150	6070eu		
1300	1400		Guatemala, R Verdad	4055do		
1300	1400		India, AIR/Aizawl	7295do		
1300	1400		India, AIR/Bhopal	4810do		
1300	1400		India, AIR/Chennai	4920do		
1300	1400		India, AIR/Gangkok	4835do		
1300	1400		India, AIR/Imphal	4775do		
1300	1400		India, AIR/Jaipur	4910do		
1300	1400		India, AIR/Jeypore	5040do		
1300	1400		India, AIR/Kohima	4850do		
1300	1400		India, AIR/Leh	4660do		
1300	1400		India, AIR/Mumbai	4840do		
1300	1400		India, AIR/Port Blair	4760do		
1300	1400		India, AIR/Srinagar	4950do		
1300	1400		India, AIR/Thiruvananthapuram	5010do		
1300	1400	irreg	Indonesia, VO Indonesia	9526as		
1300	1400		Malaysia, RTM/Kajang	5965do	6050do	
1300	1400		Malaysia, RTM/Traxx FM	7295do		
1300	1400		Mali, ORTM/R Mali	9635do		
1300	1400		New Zealand, R New Zealand Intl			6170pa
1300	1400		Nigeria, FRCN Abuja	7275do		
1300	1400	irreg	Nigeria, VO Nigeria	9690af		
1300	1400		Papua New Guinea, R Central	3290do		
1300	1400		Papua New Guinea, R East New Britain			3385do
1300	1400		Papua New Guinea, R Fly	3915do	5960do	
1300	1400		Papua New Guinea, R Northern	3345do		
1300	1400		Papua New Guinea, R Vanimo	3205do		
1300	1400		Papua New Guinea, R Western	3305do		
1300	1400		Papua New Guinea, Wantok R Light			7325do
1300	1400		Russia, VO Russia	12030as	15670as	
1300	1400	DRM	Russia, VO Russia	9850eu		
1300	1400		Solomon Islands, SIBC	5020do	9545do	
1300	1400		South Korea, KBS World R	9570as	15575na	
1300	1400		Tajikistan, VO Tajik	7245va		
1300	1400		UK, BBC World Service	5875as	6195as	
			9740as	15310as	17790as	
1300	1400		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1300	1400		USA, KJES Vado NM	11715na		
1300	1400		USA, Overcomer Ministry	9370na	9930sa	
			15205eu	17750me		
1300	1400	Sat/Sun	USA, VO America	7575va	9510va	12075va
			12150va			
1300	1400		USA, WBCQ Monticello ME	9330na		
1300	1400		USA, WEWN/Irondale AL	15610eu		
1300	1400	Sat/Sun	USA, WHRI Cypress Crk SC	9795am	9840na	
1300	1400		USA, WRMI Miami FL	9955am		
1300	1400		USA, WTWW Lebanon TN	9930sa		
1300	1400		USA, WTWW Lebanon TN	9479na		
1300	1400		USA, WWCR Nashville TN	7490af	9980ca	
			13845na	15825eu		
1300	1400	irreg	USA, WWRB Manchester TN	9370na		
1300	1400		Zambia, Zambia Natl BC	5915do	6165do	
1320	1400		India, AIR/Natl Channel	9425do	9470do	
1330	1400	f	Clandestine, JSR Shiokaze	6020as		
1330	1400		India, AIR/External Svc	9690as	11620as	
			13710as			
1330	1400		Vietnam, VO Vietnam/Overseas Svc			9840as
			12020as			

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

1400	1425	mtf	Singapore, TWR Asia	15190as		
1400	1430		Australia, ABC/R Australia	9475as	9965as	
			12085as			
1400	1430	f	Clandestine, JSR Shiokaze	6020as		
1400	1430		Japan, R Japan/NHK World	11705af	15735as	
1400	1430		Laos, Lao National R	6130as		
1400	1430	h	Singapore, TWR Asia	15190as		
1400	1430		Thailand, R Thailand World Svc	9950as		
1400	1435	sw	Singapore, TWR Asia	15190as		
1400	1445	Sun	USA, Pan Am Broadcasting	15205as		
1400	1500		Anguilla, Caribbean Beacon/Univ Net			11775ca
1400	1500		Australia, ABC/R Australia	5940as	5995va	
			9580pa	12065pa		
1400	1500		Australia, NT VL8A Alice Springs			2310do
1400	1500		Australia, NT VL8K Katherine	2485do		
1400	1500		Australia, NT VL8T Tennant Creek			2325do
1400	1500		Bangladesh, Bangla Betar/Home Svc			4750as
1400	1500	irreg	Cameroon, CRTV/R Buea	6005do		
1400	1500	Sun	Canada, Bible VO Broadcasting			17495as
1400	1500		Canada, CFRX Toronto ON	6070do		
1400	1500		Canada, CFVP Calgary AB	6030do		
1400	1500		Canada, CKZN St Johns NF	6160do		
1400	1500		Canada, CKZU Vancouver BC	6160do		
1400	1500		China, China Natl R/CNR11	4905do	4920do	
			6130do			
1400	1500		China, China R International	5955as	9765va	
			9870as	11665me	11675as	11765as
			13710eu	13740na	17630eu	
1400	1500		China, Xizang PBS	4905do	4920do	6130do
			7385do			
1400	1500	irreg	Congo Dem Rep, R Kahuzi	6210do		
1400	1500	1st Sat	Finland, Scandinavian Weekend R			5980eu
1400	1500	wa/irreg	Germany, Hamburger Lokalradio			7265eu
1400	1500	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1400	1500		Germany, R 6150	6070eu		
1400	1500		Guatemala, R Verdad	4055do		
1400	1500		India, AIR/Aizawl	7295do		
1400	1500		India, AIR/Bhopal	4810do		
1400	1500		India, AIR/Chennai	4920do		
1400	1500		India, AIR/External Svc	9690as	11620as	
			13710as			
1400	1500		India, AIR/Gangkok	4835do		
1400	1500		India, AIR/Imphal	4775do		
1400	1500		India, AIR/Jaipur	4910do		
1400	1500		India, AIR/Jeypore	5040do		
1400	1500		India, AIR/Kohima	4850do		
1400	1500		India, AIR/Leh	4660do		
1400	1500		India, AIR/Mumbai	4840do		
1400	1500		India, AIR/Natl Channel	9425do	9470do	
1400	1500		India, AIR/Port Blair	4760do		
1400	1500		India, AIR/Srinagar	4950do		
1400	1500		India, AIR/Thiruvananthapuram	5010do		
1400	1500		Malaysia, RTM/Kajang	5965do	6050do	
1400	1500		Malaysia, RTM/Traxx FM	7295do		
1400	1500		Mali, ORTM/R Mali	9635do		
1400	1500		Mexico, R Educacion	6185do		
1400	1500		New Zealand, R New Zealand Intl			6170pa
1400	1500		Nigeria, FRCN Abuja	7275do		
1400	1500	irreg	Nigeria, VO Nigeria	9690af		
1400	1500		Oman, R Sultanate of Oman	15140eu		
1400	1500		Papua New Guinea, R Central	3290do		
1400	1500		Papua New Guinea, R East New Britain			3385do
1400	1500		Papua New Guinea, R Northern	3345do		
1400	1500		Papua New Guinea, R Vanimo	3205do		
1400	1500		Papua New Guinea, R Western	3305do		
1400	1500		Papua New Guinea, Wantok R Light			7325do
1400	1500		Russia, VO Russia	4960va	9900me	11530as
			12030as	15670as		
1400	1500		Solomon Islands, SIBC	5020do	9545do	
1400	1500		South Korea, KBS World R	9640as		
1400	1500		UK, BBC World Service	11890as	15310as	
1400	1500	DRM	UK, BBC World Service	5845as		
1400	1500		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, Overcomer Ministry	9370na	9655eu	
			9930sa	9980na	13810me	
1400	1500	Sat	USA, Overcomer Ministry	15420na		
1400	1500	mtwhf	USA, VO America	7575va	12150as	15490as
1400	1500		USA, VO America	4930af	6080af	15580af
1400	1500		USA, WBCQ Monticello ME	9330na		
1400	1500	Sat	USA, WBCQ Monticello ME	15420na		
1400	1500		USA, WEWN/Irondale AL	15610eu		
1400	1500	Sun	USA, WHRI Cypress Crk SC	9795am	9840na	
			21600af			
1400	1500		USA, WINB Red Lion PA	13570am		
1400	1500		USA, WJHR Intl Milton FL	15550usb		
1400	1500	Sat/Sun	USA, WRMI Miami FL	9955am		
1400	1500		USA, WTWW Lebanon TN	9930sa		
1400	1500		USA, WTWW Lebanon TN	9479na		
1400	1500		USA, WWCR Nashville TN	7490af	9980ca	
			13845na	15825eu		
1400	1500	irreg	USA, WWRB Manchester TN	9370na		
1400	1500		Zambia, Zambia Natl BC	5915do	6165do	
1415	1430		Nepal, R Nepal	5005do		
1415	1430	mtwhfa	USA, Pan Am Broadcasting	15205as		
1415	1500		India, AIR/External Svc	9910as	11670as	
1420	1455		Swaziland, TWR Africa	6025af		
1430	1500		Australia, ABC/R Australia	9475va	11835as	
1430	1500	Sat	Canada, Bible VO Broadcasting			17495as
1430	1500		India, AIR/Delhi	4870do		
1430	1500	Sun	Palau, T8WH/World Harvest R	15550as		

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

1500	1530		Australia, ABC/R Australia	11835as	12065pa	
1500	1530		Australia, HCJB Global Australia			15340pa
1500	1530		India, AIR/Delhi	4870do		
1500	1530		India, AIR/External Svc	9910as	11670as	
1500	1530	Sun	Italy, IRRS Shortwave	15190va		
1500	1530		Vietnam, VO Vietnam/Overseas Svc			7285as
			9840as	12020as		
1500	1550		New Zealand, R New Zealand Intl			6170pa
1500	1557		North Korea, VO Korea	9435na	11710na	
			13760eu	15245eu		
1500	1600		Anguilla, Caribbean Beacon/Univ Net			11775ca
1500	1600		Australia, ABC/R Australia	5940as	5995va	
			7240pa	9475va		
1500	1600		Australia, NT VL8A Alice Springs			2310do
1500	1600		Australia, NT VL8K Katherine	2485do		
1500	1600		Bangladesh, Bangla Betar/Home Svc			4750as
1500	1600		Bhutan, Bhutan BC Svc	6035do		
1500	1600	irreg	Cameroon, CRTV/R Buea	6005do		
1500	1600		Canada, CFRX Toronto ON	6070do		

1500	1600		Canada, CFVP Calgary AB	6030do		
1500	1600		Canada, CKZN St Johns NF	6160do		
1500	1600		Canada, CKZU Vancouver BC	6160do		
1500	1600		China, China R International	5955as	6095me	
			7325as	7395as	9720me	9800as
			9870as	13640eu	13740na	15245eu
1500	1600		China, Xizang PBS	4905do	4920do	6130do
			7385do			
1500	1600	irreg	Congo Dem Rep, R Kahuzi	6210do		
1500	1600	1st Sat	Finland, Scandinavian Weekend R			5980eu
1500	1600		Germany, R 6150	6070eu		
1500	1600		Guatemala, R Verdad	4055do		
1500	1600		India, AIR/Aizawl	7295do		
1500	1600		India, AIR/Bhopal	4810do		
1500	1600		India, AIR/Chennai	4920do		
1500	1600		India, AIR/Gangkok	4835do		
1500	1600		India, AIR/Imphal	4775do		
1500	1600		India, AIR/Jaipur	4910do		
1500	1600		India, AIR/Jeypore	5040do		
1500	1600		India, AIR/Kohima	4850do		
1500	1600		India, AIR/Leh	4660do		
1500	1600		India, AIR/Mumbai	4840do		
1500	1600		India, AIR/Natl Channel	9425do	9470do	
1500	1600		India, AIR/Port Blair	4760do		
1500	1600		India, AIR/Srinagar	4950do		
1500	1600		India, AIR/Thiruvananthapuram	5010do		
1500	1600		Malaysia, RTM/Traxx FM	7295do		
1500	1600		Mali, ORTM/R Mali	9635do		
1500	1600		Mexico, R Educacion	6185do		
1500	1600		Nigeria, FRCN Abuja	7275do		
1500	1600	irreg	Nigeria, VO Nigeria	15120af		
1500	1600		Papua New Guinea, R Northern	3345do		
1500	1600		Papua New Guinea, R Vanimo	3205do		
1500	1600		Papua New Guinea, R Western	3305do		
1500	1600		Papua New Guinea, Wantok R Light			7325do
1500	1600		Russia, VO Russia	4960va	6185as	9900me
1500	1600		Solomon Islands, SIBC	5020do	9545do	
1500	1600	mtwhf	South Africa, Channel Africa	9625af		
1500	1600		UK, BBC World Service	7565as	9410as	
			11675as	11890as	12095as	15420af
1500	1600	DRM	UK, BBC World Service	5845as		
1500	1600		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1500	1600		USA, KNLS Anchor Point AK	9920as		
1500	1600		USA, Overcomer Ministry	9370na	9655eu	
			9955ca	9980na	13810me	
1500	1600		USA, VO America	4930af	6080af	7540va
			7575va	12150va	15490as	15580va
			17895va			
1500	1600		USA, VO America	6140as	9400as	9760as
1500	1600		USA, WBCQ Monticello ME	9330na		
1500	1600	Sat	USA, WBCQ Monticello ME	15420na		
1500	1600		USA, WEWN/Irondale AL	15610eu		
1500	1600		USA, WHRI Cypress Crk SC	17510eu		
1500	1600		USA, WINB Red Lion PA	13570am		
1500	1600		USA, WJHR Intl Milton FL	15550usb		
1500	1600	Sat/Sun	USA, WRMI Miami FL	9955am		
1500	1600		USA, WTWW Lebanon TN	9930sa		
1500	1600		USA, WTWW Lebanon TN	9479na		
1500	1600		USA, WWCR Nashville TN	9980ca	12160af	
			13845na	15825eu		
1500	1600	irreg	USA, WWRB Manchester TN	9370na		
1500	1600		Zambia, Zambia Natl BC	5915do	6165do	
1525	1555	Sat/Sun	Swaziland, TWR Africa	6025af		
1530	1545		India, AIR/External Svc	9910as		
1530	1550	smtwhf	Vatican City State, Vatican R	11850af	15110as	
1530	1550	smtwhf/DRM	Vatican City State, Vatican R	17550as		
1530	1600		Australia, ABC/R Australia	11660as	11880va	
1530	1600	DRM	Belgium, The Disco Palace	15775as		
1530	1600	Sat	Canada, Bible VO Broadcasting			17600as
1530	1600	smtwa	Germany, AWR Europe	15335as		
1530	1600		Iran, VOIRI	13780va	15515va	
1530	1600		Mongolia, VO Mongolia	12015as		
1530	1600		Myanmar, Myanma R	5985do		
1530	1600	Sat	Vatican City State, Vatican R	11850as	15110as	
			17550as			
1551	1600		New Zealand, R New Zealand Intl			7330pa
1551	1600	DRM	New Zealand, R New Zealand Intl			6135pa

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

1600	1627		Iran, VOIRI	13780va	15515va	
1600	1630		Australia, ABC/R Australia	9540as		
1600	1630	DRM	Belgium, The Disco Palace	15775as		
1600	1630		India, AIR/Aizawl	7295do		
1600	1630		Indonesia, AWR Asia/Pacific	15360as		
1600	1630		Myanmar, Myanma R	5985do		
1600	1630	Sun	Palau, T8WH/World Harvest R	15505as		
1600	1630		Vietnam, VO Vietnam/Overseas Svc			7220me
			7280eu	9550me	9730eu	
1600	1650	DRM	New Zealand, R New Zealand Intl			6135pa
1600	1650		New Zealand, R New Zealand Intl			7330pa
1600	1657		North Korea, VO Korea	9890va	11645va	
1600	1700		Anguilla, Caribbean Beacon/Univ Net			11775ca
1600	1700		Australia, ABC/R Australia	5940as	5995va	
			7240pa	9475va	11660as	11880va
1600	1700		Australia, NT VL8A Alice Springs			2310do
1600	1700		Australia, NT VL8K Katherine	2485do		
1600	1700		Bangladesh, Bangla Betar/Home Svc			4750as
1600	1700		Bhutan, Bhutan BC Svc	6035do		
1600	1700	irreg	Cameroon, CRTV/R Buea	6005do		
1600	1700		Canada, CFRX Toronto ON	6070do		
1600	1700		Canada, CFVP Calgary AB	6030do		
1600	1700		Canada, CKZN St Johns NF	6160do		
1600	1700		Canada, CKZU Vancouver BC	6160do		
1600	1700		China, China R International	6060as	7235as	
			9570af	11900af	11940eu	11965eu
			13760eu	15250va		
1600	1700		China, Xizang PBS	4905do	4920do	6130do
			7385do			
1600	1700		Clandestine, R Dialogue	12105af		
1600	1700	irreg	Congo Dem Rep, R Kahuzi	6210do		
1600	1700		Egypt, R Cairo	15345af		
1600	1700	irreg	Ethiopia, R Ethiopia/Intl Svc	7235va	9560va	
1600	1700	1st Sat	Finland, Scandinavian Weekend R			5980eu
1600	1700		Germany, R 6150	6070eu		
1600	1700		Guatemala, R Verdad	4055do		
1600	1700		India, AIR/Bhopal	4810do		
1600	1700		India, AIR/Chennai	4920do		
1600	1700		India, AIR/Imphal	4775do		
1600	1700		India, AIR/Jaipur	4910do		
1600	1700		India, AIR/Jeypore	5040do		
1600	1700		India, AIR/Kohima	4850do		
1600	1700		India, AIR/Leh	4660do		
1600	1700		India, AIR/Mumbai	4840do		
1600	1700		India, AIR/Natl Channel	9425do	9470do	
1600	1700		India, AIR/Port Blair	4760do		
1600	1700		India, AIR/Srinagar	4950do		
1600	1700		India, AIR/Thiruvananthapuram	5010do		
1600	1700		Malaysia, RTM/Kajang	5965do	6050do	
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		Mali, ORTM/R Mali	9635do		
1600	1700		Nigeria, FRCN Abuja	7275do		
1600	1700		Papua New Guinea, Wantok R Light			7325do
1600	1700		Russia, VO Russia	4960va	6035as	6185as
			9490as			
1600	1700		Solomon Islands, SIBC	5020do	9545do	
1600	1700		South Korea, KBS World R	9515eu	9640as	
1600	1700		Taiwan, R Taiwan Intl	6180as	15485as	
1600	1700		UK, BBC World Service	3255af	6190as	
			7565as	9410as	11675as	11890as
			12095as	15420af	17640af	17830af
1600	1700	DRM	UK, BBC World Service	5845as		
1600	1700		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1600	1700		USA, Overcomer Ministry	9370na	9955ca	
			9980na			
1600	1700	Sat	USA, Overcomer Ministry	15420na		
1600	1700		USA, VO America	4930af	6080af	15580af
1600	1700		USA, VO America	11915va	13570af	15470va
			17895va			
1600	1700		USA, WBCQ Monticello ME	9330na		
1600	1700	Sat	USA, WBCQ Monticello ME	15420na		
1600	1700		USA, WEWN/Irondale AL	15610eu		
1600	1700		USA, WHRI Cypress Crk SC	21630af		
1600	1700		USA, WINB Red Lion PA	13570am		
1600	1700		USA, WJHR Intl Milton FL	15550usb		
1600	1700	Sat/Sun	USA, WRMI Miami FL	9955am		
1600	1700		USA, WTWW Lebanon TN	9930sa		
1600	1700		USA, WTWW Lebanon TN	9479na		
1600	1700		USA, WWCR Nashville TN	9980ca	12160af	
			13845na	15825eu		
1600	1700	irreg	USA, WWRB Manchester TN	9370na		
1600	1700		Zambia, Zambia Natl BC	5915do	6165do	
1600	1700	irreg	Zimbabwe, VO Zimbabwe	4828af		
1615	1630		Vatican City State, Vatican R	15595me		
1630	1700		China, Xizang PBS	4905do	6200do	
1630	1700	mwf	Indonesia, AWR Asia/Pacific	15360as		
1630	1700	m	South Africa, SA Radio League	3230af		
1630	1700		Turkey, VO Turkey	15520as		
1630	1700	mtwhf	USA, VO America	11905af		
1630	1700	mtwhf	USA, VO America/S Sudan in Focus			9490af
			11655af	13870af		
1651	1700		New Zealand, R New Zealand Intl			730pa
1651	1700	DRM	New Zealand, R New Zealand Intl			6135pa

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

1700	1710	irreg	Congo Dem Rep, R Kahuzi	6210do		
1700	1710		Pakistan, R Pakistan	11570eu	15265eu	
1700	1715		Bangladesh, Bangla Betar/Home Svc			4750as
1700	1715	tf	Canada, Bible VO Broadcasting			15215me
1700	1730		Australia, ABC/R Australia	11660as		
1700	1730	h	Canada, Bible VO Broadcasting			15215me
1700	1730		India, AIR/Mumbai	4840do		
1700	1730	m	South Africa, SA Radio League	3230af		
1700	1730		Turkey, VO Turkey	15520as		
1700	1730		Vietnam, VO Vietnam/Overseas Svc			9625eu

1700	1739		India, AIR/Chennai	4920do		
1700	1739		India, AIR/Srinagar	4950do		
1700	1740		India, AIR/Jeypore	5040do		
1700	1741		India, AIR/Jaipur	4910do		
1700	1742		India, AIR/Bhopal	4810do		
1700	1745	DRM	New Zealand, R New Zealand Intl			6135pa
1700	1745		New Zealand, R New Zealand Intl			7330pa
1700	1755	mtwhf	South Africa, Channel Africa	15235af		
1700	1756	DRM	Romania, R Romania Intl	9535eu		
1700	1756		Romania, R Romania Intl	11740eu		
1700	1800		Anguilla, Caribbean Beacon/Univ Net			11775ca
1700	1800		Australia, ABC/R Australia	5995va		9475as
			9500va	9580pa	11880va	
1700	1800		Australia, NT VL8A Alice Springs			2310do
1700	1800		Australia, NT VL8K Katherine	2485do		
1700	1800	Sat/Sun	Canada, Bible VO Broadcasting			15215me
1700	1800		Canada, CFRX Toronto ON	6070do		
1700	1800		Canada, CFVP Calgary AB	6030do		
1700	1800		Canada, CKZN St Johns NF	6160do		
1700	1800		Canada, CKZU Vancouver BC	6160do		
1700	1800		China, China R International	6090as		6140as
			6165me	7235as	7265af	7410as
			7420as	9570as	9695eu	11900af
			13570eu	13760eu		
1700	1800		China, Xizang PBS	4905do	4920do	6130do
			7385do			
1700	1800		Clandestine, SW R Africa	4880af		
1700	1800		Egypt, R Cairo	15345af		
1700	1800	1st Sat	Finland, Scandinavian Weekend R			5980eu
1700	1800		Germany, R 6150	6070eu		
1700	1800		Guatemala, R Verdad	4055do		
1700	1800		India, AIR/Natl Channel	9425do		9470do
1700	1800		Malaysia, RTM/Kajang	5965do		6050do
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		Mali, ORTM/R Mali	9635do		
1700	1800		Mexico, R Educacion	6185do		
1700	1800		Nigeria, FRCN Abuja	7275do		
1700	1800		Papua New Guinea, Wantok R Light			7325do
1700	1800		Russia, VO Russia	4960va	6035as	6185as
			9420as			
1700	1800	DRM	Russia, VO Russia	9820as		
1700	1800		Solomon Islands, SIBC	5020do		9545do
1700	1800	Sat/Sun	Swaziland, TWR Africa	3200af		
1700	1800		Taiwan, R Taiwan Intl	15690af		
1700	1800		UK, BBC World Service	3255af		
			6190 f	6195as	9410as	12095af
			15400af	15420af	17795af	
			17830af			
1700	1800	DRM	UK, BBC World Service	5845as		
1700	1800		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1700	1800		USA, Overcomer Ministry	9370na		9955ca
1700	1800	Sat/Sun	USA, Overcomer Ministry	9980na		
1700	1800		USA, VO America	6080af	11795af	15580af
			17895af			
1700	1800		USA, WBCQ Monticello ME	9330na		15420na
1700	1800		USA, WEWN/Irondale AL	15610eu		
1700	1800		USA, WHRI Cypress Crk SC	21630af		
1700	1800		USA, WINB Red Lion PA	13570am		
1700	1800		USA, WJHR Intl Milton FL	15550usb		
1700	1800	Sat/Sun	USA, WRMI Miami FL	9955am		
1700	1800		USA, WTWW Lebanon TN	9479na		9930sa
1700	1800		USA, WWCR Nashville TN	9980ca		12160af
			13845na	15825eu		
1700	1800	irreg	USA, WWRB Manchester TN	9370na		
1700	1800		Zambia, Zambia Natl BC	5915do		6165do
1700	1800	irreg	Zimbabwe, VO Zimbabwe	4828af		
1720	1740	Sat/Sun	USA, VOA/Studio 7	4930af		5940af
			15455af			
1730	1800		Australia, ABC/R Australia	6080as		
1730	1800		Philippines, R Pilipinas Overseas Svc			9915me
			11720me	15190me		
1730	1800		Sudan, VO Africa/Sudan R	9505af		
1730	1800	mtwh	USA, VOA/Studio 7	4930af		5940af
			15455af			
1730	1800		Vatican City State, Vatican R	11625af		13765af
			15570af			
1745	1800		Bangladesh, Bangla Betar	7250eu		
1745	1800		India, AIR/External Svc	7550eu		9445va
			9950eu	11580af	11670eu	11935af
			13695af	17670af		
1745	1800	mtwhf	Swaziland, TWR Africa	3200af		
1746	1800		New Zealand, R New Zealand Intl			9615pa
1746	1800	DRM	New Zealand, R New Zealand Intl			7330as

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

1800	1805		China, Xizang PBS	4905do	4920do	6130do
			7385do			
1800	1815	Sat	Canada, Bible VO Broadcasting			9430me
			11855as			
1800	1830		Japan, R Japan/NHK World	9590af	11885af	
1800	1830		Sudan, VO Africa/Sudan R	9505af		
1800	1830		USA, VO America	6080af	15580af	17895af
1800	1830	Sat/Sun	USA, VO America	4930af		
1800	1830	f	USA, VOA/Studio 7	4930af		5940af
1800	1836		New Zealand, R New Zealand Intl			9615pa
1800	1836	DRM	New Zealand, R New Zealand Intl			7330pa
1800	1857		North Korea, VO Korea	13760eu		15245eu
1800	1900		Anguilla, Caribbean Beacon/Univ Net			11775ca
1800	1900	mtwhf	Argentina, RAE	15345eu		
1800	1900		Australia, ABC/R Australia	6080as		9475as
			9500va	9580pa	9710va	11880va
1800	1900		Australia, NT VL8A Alice Springs			4835do
1800	1900		Australia, NT VL8K Katherine	2485do		
1800	1900		Bangladesh, Bangla Betar	7250eu		
1800	1900	Sat/Sun	Canada, Bible VO Broadcasting			15215me
1800	1900	Sun	Canada, Bible VO Broadcasting			6130eu
1800	1900		Canada, CFRX Toronto ON	6070do		
1800	1900		Canada, CFVP Calgary AB	6030do		
1800	1900		Canada, CKZN St Johns NF	6160do		
1800	1900		Canada, CKZU Vancouver BC	6160do		
1800	1900		China, China R International	6175eu		9600eu
			13760eu			
1800	1900		Clandestine, SW R Africa	4880af		
1800	1900	1st Sat	Finland, Scandinavian Weekend R			6170eu
1800	1900		Germany, R 6150	6070eu		
1800	1900		Guatemala, R Verdad	4055do		
1800	1900		India, AIR/External Svc	7550eu		9445va
			9950eu	11580af	11670eu	11935af
			13695af	17670af		
1800	1900		India, AIR/Natl Channel	9425do		9470do
1800	1900	fas	Italy, IRRS Shortwave	7290va		
1800	1900		Kuwait, R Kuwait	15540va		
1800	1900		Malaysia, RTM/Kajang	5965do		6050do
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Mali, ORTM/R Mali	5995do		
1800	1900		Mexico, R Educacion	6185do		
1800	1900		Nigeria, FRCN Abuja	7275do		
1800	1900	irreg	Nigeria, VO Nigeria	7255af		
1800	1900		Papua New Guinea, Wantok R Light			7325do
1800	1900		Philippines, R Pilipinas Overseas Svc			9915me
			11720me	15190me		
1800	1900		Russia, VO Russia	4960va	9900va	
1800	1900		South Korea, KBS World R	7275eu		
1800	1900	Sat/Sun	Swaziland, TWR Africa	3200af		
1800	1900		Swaziland, TWR Africa	9500af		
1800	1900		Taiwan, R Taiwan Intl	6155eu		
1800	1900		UK, BBC World Service	3255af	6190af	
			7375as	11810af	12095af	15400af
			15420af	17795af		
1800	1900		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1800	1900	mtwhf	USA, Overcomer Ministry	9980na		
1800	1900	Sat	USA, Overcomer Ministry	9955ca		
1800	1900	Sun	USA, Overcomer Ministry	9370na		9955ca
1800	1900		USA, Overcomer Ministry	9700eu		
1800	1900		USA, WBCQ Monticello ME	9330na		15420na
1800	1900		USA, WEWN/Irondale AL	15610eu		
1800	1900		USA, WHRI Cypress Crk SC	9840na		21630af
1800	1900		USA, WINB Red Lion PA	13570am		
1800	1900		USA, WJHR Intl Milton FL	15550usb		
1800	1900	Sat/Sun	USA, WRMI Miami FL	9955am		
1800	1900		USA, WTWW Lebanon TN	9479na		9930sa
1800	1900		USA, WWCR Nashville TN	9980ca		12160af
			13845na	15825eu		
1800	1900	irreg	USA, WWRB Manchester TN	9370na		
1800	1900		Zambia, Zambia Natl BC	5915do		6165do
1800	1900	irreg	Zimbabwe, VO Zimbabwe	4828af		
1815	1845	Sun	Canada, Bible VO Broadcasting			9430me
1825	1900		Vanuatu, R Vanuatu	3945do		
1830	1845	Sat	Canada, Bible VO Broadcasting			6130eu
1830	1845		Rwanda, R Rep Rwandaise	6055do		
1830	1900	Sun	Canada, Bible VO Broadcasting			9635as
1830	1900	irreg/DRM	Nigeria, VO Nigeria	15120af		
1830	1900		Serbia, International R Serbia	6100eu		
1830	1900		South Africa, AWR Africa	11840af		
1830	1900		Turkey, VO Turkey	9785eu		
1830	1900		USA, VO America	4930af	15580af	
1830	1900	mtwhf	USA, VOA/Studio 7	5940af		15455af
1837	1900		New Zealand, R New Zealand Intl			9615pa
1837	1900	DRM	New Zealand, R New Zealand Intl			9630pa
1845	1900	irreg	Guinea, RTV Guinee	7125do		

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

1900	1915	Sun	Canada, Bible VO Broadcasting			9635as
1900	1930		Germany, Deutsche Welle	11800af		11865af
			15275af			
1900	1930		Philippines, R Pilipinas Overseas Svc			9915me
			11720me	15190me		
1900	1930		Turkey, VO Turkey	9785eu		
1900	1930		USA, VO America	4930af	9850af	15580va
1900	1930		Vietnam, VO Vietnam/Overseas Svc			7280eu
			9730eu			
1900	1945		India, AIR/External Svc	7550eu		9445eu
			9950eu	11580af	11670eu	11935af
			13695af	17670af		

SHORTWAVE GUIDE

1900	1950		New Zealand, R New Zealand Intl			9615pa
1900	1950	DRM	New Zealand, R New Zealand Intl			9630pa
1900	1957		North Korea, VO Korea	7210af		9875va
			11635va	11910af		
1900	2000		Anguilla, Caribbean Beacon/Univ Net			11775ca
1900	2000		Australia, ABC/R Australia	6080as		9500va
			9710va	11660va		
1900	2000		Australia, NT VL8A Alice Springs			4835do
1900	2000		Australia, NT VL8K Katherine	2485do		
1900	2000		Canada, CFRX Toronto ON	6070do		
1900	2000		Canada, CFVP Calgary AB	6030do		
1900	2000		Canada, CKZN St Johns NF	6160do		
1900	2000		Canada, CKZU Vancouver BC	6160do		
1900	2000		China, China R International	7295va		9435af
			9440af			
1900	2000		Egypt, R Cairo	15290af		
1900	2000	1st Sat	Finland, Scandinavian Weekend R			6170eu
1900	2000		Germany, Deutsche Welle	7340af		11865af
1900	2000		Germany, R 6150 6070eu			
1900	2000		Guatemala, R Verdad	4055do		
1900	2000		India, AIR/Natl Channel	9425do		9470do
1900	2000	irreg	Indonesia, VO Indonesia	9526eu		
1900	2000		Kuwait, R Kuwait 15540eu			
1900	2000		Malaysia, RTM/Kajang	5965do		6050do
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Mali, ORTM/R Mali	5995do		
1900	2000		Micronesia, V6MP/Cross R/Pohnpei			4755as
1900	2000		Nigeria, FRCN Abuja	7275do		
1900	2000	irreg	Nigeria, VO Nigeria	7255af		
1900	2000		Papua New Guinea, R Central	3290do		
1900	2000		Papua New Guinea, R East New Britain			3385do
1900	2000		Papua New Guinea, R Northern	3345do		
1900	2000		Papua New Guinea, R Vanimo	3205do		
1900	2000		Papua New Guinea, R Western	3305do		
1900	2000		Papua New Guinea, Wantok R Light			7325do
1900	2000		Solomon Islands, SIBC	5020do		9545do
1900	2000	mtwhf	Spain, R Exterior de Espana	9665eu		11615af
1900	2000		Swaziland, TWR Africa	3200af		
1900	2000		Thailand, R Thailand World Svc	9390eu		
1900	2000		UK, BBC World Service	3255af		6190af
			11810af	12095af	15400af	15420af
			17795af			
1900	2000		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
1900	2000	mtwhfa	USA, Overcomer Ministry	9955ca		
1900	2000		USA, Overcomer Ministry	9370na		9700eu
			9980na	11850af		
1900	2000		USA, VO America 7485va			
1900	2000		USA, WBCQ Monticello ME	15420na		
1900	2000	at	USA, WBCQ Monticello ME	7490na		
1900	2000		USA, WEWN/Irondale AL	15610eu		
1900	2000		USA, WHRI Cypress Crk SC	9840na		21630af
1900	2000		USA, WINB Red Lion PA	13570am		
1900	2000		USA, WJHR Intl Milton FL	15550usb		
1900	2000	Sat/Sun	USA, WRMI Miami FL	9955am		
1900	2000		USA, WTWW Lebanon TN	9479na		9930sa
1900	2000		USA, WWCR Nashville TN	9980ca		12160af
			13845na	15825eu		
1900	2000	irreg	USA, WWRB Manchester TN	9370na		
1900	2000		Vanuatu, R Vanuatu 3945do			
1900	2000		Zambia, Zambia Natl BC	5915do		6165do
1900	2000	irreg	Zimbabwe, VO Zimbabwe	4828af		
1905	1920	Sat	Mali, ORTM/R Mali	9635do		
1930	2000		Iran, VOIRI	9400eu	9715eu	11750af
			11885af			
1930	2000		South Africa, RTE R Worldwide	5820af		
1930	2000	Sun	USA, Pan Am Broadcasting	9515af		
1930	2000		USA, VO America 4930af	15580as		
1951	2000	DRM	New Zealand, R New Zealand Intl			11675pa

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

2000	2020	tf	Belarus, R Belarus	7255eu	11730eu	
2000	2027		Iran, VOIRI	9400eu	9715eu	11750af
			11885af			
2000	2030	mtwhfa	Albania, R Tirana 7465va			
2000	2030		Australia, ABC/R Australia	6080as		9500va
2000	2030		Egypt, R Cairo	15290af		
2000	2030	Sat/Sun	Swaziland, TWR Africa	3200af		
2000	2030		USA, VO America 4930af	15580af		
2000	2030		Vatican City State, Vatican R	11625af		13765af
2000	2057		Germany, Deutsche Welle	11865af		
2000	2100		Anguilla, Caribbean Beacon/Univ Net			11775ca
2000	2100		Australia, ABC/R Australia	9580pa		11650va
			11660va	12080pa	15515va	
2000	2100		Australia, NT VL8A Alice Springs			4835do
2000	2100		Australia, NT VL8K Katherine	2485do		
2000	2100		Australia, NT VL8T Tennant Creek			2325do
2000	2100		Canada, CFRX Toronto ON	6070do		
2000	2100		Canada, CFVP Calgary AB	6030do		
2000	2100		Canada, CKZN St Johns NF	6160do		
2000	2100		Canada, CKZU Vancouver BC	6160do		
2000	2100		China, China R International	5960eu		5985af
			7285eu	7295va	9440af	
2000	2100		China, Xizang PBS	4905do	4920do	6130do
			7385do			
2000	2100	f	Clandestine, JSR Shiokaze	6075as		
2000	2100		Cuba, R Havana Cuba	11760am		
2000	2100	1st Sat	Finland, Scandinavian Weekend R			6170eu
2000	2100		Germany, R 6150 6070eu			
2000	2100		Guatemala, R Verdad	4055do		
2000	2100		India, AIR/Natl Channel	9425do		9470do
2000	2100		Kuwait, R Kuwait 15540eu			
2000	2100		Malaysia, RTM/Kajang	5965do		6050do
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		Mali, ORTM/R Mali	5995do		
2000	2100		Mexico, R Educacion	6185do		
2000	2100		Micronesia, V6MP/Cross R/Pohnpei			4755as
2000	2100		New Zealand, R New Zealand Intl			11725pa
2000	2100		Nigeria, FRCN Abuja	7275do		
2000	2100		Papua New Guinea, R Central	3290do		
2000	2100		Papua New Guinea, R East New Britain			3385do
2000	2100		Papua New Guinea, R Northern	3345do		
2000	2100		Papua New Guinea, R Vanimo	3205do		
2000	2100		Papua New Guinea, R Western	3305do		
2000	2100		Papua New Guinea, Wantok R Light			7325do
2000	2100		Solomon Islands, SIBC	5020do		9545do
2000	2100		UK, BBC World Service	11810af		12095af
			15400af			
2000	2100		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
2000	2100		USA, Overcomer Ministry	9370na		9700eu
			11775af	11850af		
2000	2100	mtwhfa	USA, Overcomer Ministry	9955ca		
2000	2100	Sat/Sun	USA, Overcomer Ministry	9980na		
2000	2100		USA, WBCQ Monticello ME	15420na		
2000	2100	mtwhf	USA, WBCQ Monticello ME	7490na		
2000	2100		USA, WEWN/Irondale AL	15610eu		
2000	2100	Sun	USA, WHRI Cypress Crk SC	17510va		
2000	2100		USA, WINB Red Lion PA	13570am		
2000	2100		USA, WJHR Intl Milton FL	15550usb		
2000	2100	Sat/Sun	USA, WRMI Miami FL	9955am		
2000	2100		USA, WTWW Lebanon TN	9479na		9930sa
2000	2100		USA, WWCR Nashville TN	9980ca		12160af
			13845na	15825eu		
2000	2100	irreg	USA, WWRB Manchester TN	9370na		
2000	2100		Vanuatu, R Vanuatu 3945do	7260do		
2000	2100		Zambia, Zambia Natl BC	5915do		6165do
2000	2100	irreg	Zimbabwe, VO Zimbabwe	4828af		
2020	2100		Belarus, R Belarus 7255eu	11730eu		
2030	2045		Thailand, R Thailand World Svc	9390eu		
2030	2056	DRM	Romania, R Romania Intl	9800eu		
2030	2056		Romania, R Romania Intl	11745na		11975eu
			13800na			
2030	2100		Australia, ABC/R Australia	9500va		11695va
2030	2100		Turkey, VO Turkey 7205va			
2030	2100		USA, VO America 4930af	6080af		15580af
2030	2100	Sat/Sun	USA, VO America 4940af			
2030	2100		Vietnam, VO Vietnam/Overseas Svc			7220me
			7280eu	9550eu	9730eu	
2045	2100		India, AIR/External Svc	7550eu		9445eu
			9910pa	11620pa	11670eu	11740pa
2045	2100	DRM	India, AIR/External Svc	9950eu		
2051	2100	DRM	New Zealand, R New Zealand Intl			17675pa

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

2100	2130		Australia, NT VL8A Alice Springs			4835do
2100	2130		Australia, NT VL8K Katherine	2485do		
2100	2130		Australia, NT VL8T Tennant Creek			2325do
2100	2130		Austria, AWR Europe	11955af		
2100	2130		Serbia, International R Serbia	6100eu		
2100	2130		South Korea, KBS World R	3955eu		
2100	2130		Turkey, VO Turkey 7205va			
2100	2150		New Zealand, R New Zealand Intl			11725pa
2100	2150	DRM	New Zealand, R New Zealand Intl			17675pa
2100	2157		North Korea, VO Korea	13760eu		15245eu
2100	2200	irreg	Angola, Angolan Natl R	7217af		
2100	2200		Anguilla, Caribbean Beacon/Univ Net			11775ca
2100	2200		Australia, ABC/R Australia	9500va		9660va
			11650va	11695va	13630pa	15515va
2100	2200		Belarus, R Belarus	7255eu	11730eu	
2100	2200		Canada, CFRX Toronto ON	6070do		
2100	2200		Canada, CFVP Calgary AB	6030do		
2100	2200		Canada, CKZN St Johns NF	6160do		
2100	2200		Canada, CKZU Vancouver BC	6160do		
2100	2200		China, China R International	5960eu		7205af
			7285eu	7325af	7415eu	9600eu
2100	2200		China, Xizang PBS	4905do	4920do	6130do
			7385do			
2100	2200		Egypt, R Cairo	11890eu		
2100	2200	1st fa	Finland, Scandinavian Weekend R			6170eu
2100	2200		Germany, Deutsche Welle	11800af		11865af
			12070af			
2100	2200		Germany, R 6150 6070eu			
2100	2200		Guatemala, R Verdad	4055do		
2100	2200		India, AIR/External Svc	7550eu		9445eu
			9910pa	11620pa	11670eu	11740pa
2100	2200	DRM	India, AIR/External Svc	9950eu		

2100	2200		India, AIR/Natl Channel	9425do	9470do	
2100	2200		Malaysia, RTM/Kajang	5965do	6050do	
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		Mali, ORTM/R Mali	5995do		
2100	2200		Mexico, R Educacion	6185do		
2100	2200		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
2100	2200		Nigeria, FRCN Abuja	7275do		
2100	2200		Papua New Guinea, R Central	3290do		
2100	2200		Papua New Guinea, R East New Britain		3385do	
2100	2200		Papua New Guinea, R Northern	3345do		
2100	2200		Papua New Guinea, R Vanimo	3205do		
2100	2200		Papua New Guinea, R Western	3305do		
2100	2200		Papua New Guinea, Wantok R Light		7325do	
2100	2200		Solomon Islands, SIBC	5020do	9545do	
2100	2200	Sat/Sun	Spain, R Exterior de Espana	9570af	9660eu	
2100	2200	mtwhf	UK, BBC World Service	9915af	11810af	
			12095af			
2100	2200		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
2100	2200		USA, Overcomer Ministry	9370na	9700eu	
			9955ca	9980na	11775af	15390sa
			15620na			
2100	2200		USA, VO America	6080af	15580af	
2100	2200	Sun	USA, WBCQ Monticello ME	7490na		
2100	2200		USA, WEWN/Irondale AL	15610eu		
2100	2200	Sun	USA, WHRI Cypress Crk SC	17510va		
2100	2200	m	USA, WINB Red Lion PA	9265am		
2100	2200		USA, WJHR Intl Milton FL	15550usb		
2100	2200	Sat/Sun	USA, WRMI Miami FL	9955am		
2100	2200		USA, WTWW Lebanon TN	9479na	9930sa	
2100	2200		USA, WWCR Nashville TN	6875eu	9350af	
			9980ca	13845na		
2100	2200	irreg	USA, WWRB Manchester TN	3215na	9370na	
2100	2200		Vanuatu, R Vanuatu	3945do		
2100	2200		Zambia, Zambia Natl BC	5915do	6165do	
2100	2200	irreg	Zimbabwe, VO Zimbabwe	4828af		
2125	2200		Vanuatu, R Vanuatu	3945do	7260do	
2130	2200		Australia, NT VL8A Alice Springs		4835do	
2130	2200		Australia, NT VL8K Katherine	5025do		
2130	2200		Australia, NT VL8T Tennant Creek		4910do	
2151	2200		New Zealand, R New Zealand Intl		15720pa	
2151	2200	DRM	New Zealand, R New Zealand Intl		17675pa	

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

2200	2230		India, AIR/External Svc	9910pa	11620pa	
			11670eu	11740pa		
2200	2230	DRM	India, AIR/External Svc	9950eu		
2200	2245		Zambia, Zambia Natl BC	5915do	6165do	
2200	2256		Romania, R Romania Intl	7430eu	9540eu	
			9790as	11940as		
2200	2300		Anguilla, Caribbean Beacon/Univ Net		6090ca	
2200	2300		Australia, ABC/R Australia	9610as	9660as	
			11695as	12080pa	13630pa	15240va
			15415va	15515va		
2200	2300		Australia, NT VL8A Alice Springs		4835do	
2200	2300		Australia, NT VL8K Katherine	5025do		
2200	2300		Australia, NT VL8T Tennant Creek		4910do	
2200	2300		Canada, CFRX Toronto ON	6070do		
2200	2300		Canada, CFVP Calgary AB	6030do		
2200	2300		Canada, CKZN St Johns NF	6160do		
2200	2300		Canada, CKZU Vancouver BC	6160do		
2200	2300		China, China R International	9590as		
2200	2300		China, Xizang PBS	4905do	4920do	6130do
			7385do			
2200	2300		Egypt, R Cairo	9965eu		
2200	2300	1st fa	Finland, Scandinavian Weekend R		6170eu	
2200	2300		Germany, R 6150	6070eu		
2200	2300		Guatemala, R Verdad	4055do		
2200	2300		Guyana, Voice of Guyana	3290do		
2200	2300		India, AIR/Natl Channel	9425do	9470do	
2200	2300		Malaysia, RTM/Kajang	5965do	6050do	
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300		Mali, ORTM/R Mali	5995do		
2200	2300		Mexico, R Educacion	6185do		
2200	2300		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
2200	2300		New Zealand, R New Zealand Intl		15720pa	
2200	2300	DRM	New Zealand, R New Zealand Intl		17675pa	
2200	2300		Nigeria, FRCN Abuja	7275do		
2200	2300		Papua New Guinea, R Central	3290do		
2200	2300		Papua New Guinea, R East New Britain		3385do	
2200	2300		Papua New Guinea, R Northern	3345do		
2200	2300		Papua New Guinea, R Vanimo	3205do		
2200	2300		Papua New Guinea, R Western	3305do		
2200	2300		Papua New Guinea, Wantok R Light		7325do	
2200	2300		Russia, VO Russia	9465ca		
2200	2300		Solomon Islands, SIBC	5020do	9545do	
2200	2300		South Korea, KBS World R	11810eu		
2200	2300		Turkey, VO Turkey	9830va		
2200	2300		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
2200	2300	mtwhf	USA, Overcomer Ministry	9955ca	9980na	
2200	2300		USA, Overcomer Ministry	9370na	15390sa	
			15620na			
2200	2300	smtwh	USA, VO America	5915va	7480va	7575va
			12150va			
2200	2300		USA, WBCQ Monticello ME	7490na		
2200	2300		USA, WEWN/Irondale AL	15610eu		
2200	2300	Sat/Sun	USA, WHRI Cypress Crk SC	11775eu		
2200	2300	Sat/Sun	USA, WRMI Miami FL	9955am		
2200	2300		USA, WTWW Lebanon TN	9479na	9930sa	
2200	2300		USA, WWCR Nashville TN	6875eu	9350af	
			9980ca	13845na		
2200	2300	irreg	USA, WWRB Manchester TN	3215na	9370na	
2200	2300		Vanuatu, R Vanuatu	3945do	7260do	
2220	2300		India, AIR/Srinagar	4950do		
2230	2300		China, Xizang PBS	4905do		
2230	2300		Indonesia, AWR Asia/Pacific	15320as		
2230	2300		USA, VO America	5820va	7460va	9570va
2245	2300		India, AIR/External Svc	9690as	9705as	
			11710as	13605as		
2245	2300	DRM	India, AIR/External Svc	11645as		

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

2300	0000		Anguilla, Caribbean Beacon/Univ Net		6090ca	
2300	0000		Australia, ABC/R Australia	9660va	9855as	
			12080pa	15240va	15415va	17795pa
			19000va	21740va		
2300	0000		Australia, NT VL8A Alice Springs		4835do	
2300	0000		Australia, NT VL8K Katherine	5025do		
2300	0000		Australia, NT VL8T Tennant Creek		4910do	
2300	0000		Canada, CFRX Toronto ON	6070do		
2300	0000		Canada, CFVP Calgary AB	6030do		
2300	0000		Canada, CKZN St Johns NF	6160do		
2300	0000		Canada, CKZU Vancouver BC	6160do		
2300	0000		China, China R International	5915as	5990ca	
			7350eu	7410as	11690as	11790as
			11955as			
2300	0000		China, Xizang PBS	4905do	4920do	6130do
			7385do			
2300	0000		Cuba, R Havana Cuba	11880af		
2300	0000		Egypt, R Cairo	9965na		
2300	0000	1st fa	Finland, Scandinavian Weekend R		6170eu	
2300	0000		Germany, R 6150	6070eu		
2300	0000		Guatemala, R Verdad	4055do		
2300	0000		Guyana, Voice of Guyana	3290do		
2300	0000		India, AIR/External Svc	6055as	9690as	
			9705as	11710as	13605as	
2300	0000	DRM	India, AIR/External Svc	11645as		
2300	0000		India, AIR/Natl Channel	9425do	9470do	
2300	0000		Malaysia, RTM/Kajang	5965do	6050do	
2300	0000		Malaysia, RTM/Traxx FM	7295do		
2300	0000		Mali, ORTM/R Mali	5995do		
2300	0000		Mexico, R Educacion	6185do		
2300	0000		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
2300	0000		New Zealand, R New Zealand Intl		15720pa	
2300	0000	DRM	New Zealand, R New Zealand Intl		17675pa	
2300	0000		Papua New Guinea, R Central	3290do		
2300	0000		Papua New Guinea, R East New Britain		3385do	
2300	0000		Papua New Guinea, R Northern	3345do		
2300	0000		Papua New Guinea, R Vanimo	3205do		
2300	0000		Papua New Guinea, R Western	3305do		
2300	0000		Papua New Guinea, Wantok R Light		7325do	
2300	0000		Russia, VO Russia	9465ca		
2300	0000		Solomon Islands, SIBC	5020do	9545do	
2300	0000		UK, BBC World Service	3915as	6195as	
			7490as	9740as	9890as	11850as
			12010as			
2300	0000		USA, AFN/AFRTS	4319usb	5765usb	12759usb
			13362usb			
2300	0000		USA, Overcomer Ministry	9370na		
2300	0000		USA, VO America	5895va	7480va	7575va
			12150va			
2300	0000		USA, VO America	5820va	7460va	9490va
			11840va			
2300	0000		USA, WBCQ Monticello ME	7490na		
2300	0000	Sat/Sun	USA, WBCQ Monticello ME	5110na		
2300	0000		USA, WEWN/Irondale AL	15610eu		
2300	0000	Sat/Sun	USA, WHRI Cypress Crk SC	11775eu		
2300	0000	smtwhf	USA, WHRI Cypress Crk SC	7315ca		
2300	0000	m	USA, WINB Red Lion PA	9265am		
2300	0000		USA, WTWW Lebanon TN	9479na	9930sa	
2300	0000		USA, WWCR Nashville TN	6875eu	9350af	
			9980ca	13845na		
2300	0000	irreg	USA, WWRB Manchester TN	3215na	9370na	
2300	0000		Vanuatu, R Vanuatu	3945do	7260do	
2300	2305		Nigeria, FRCN Abuja	7275do		
2300	2315		India, AIR/Srinagar	4950do		
2300	2315	smtwh	Moldova, R PMR/Transistria	9665eu		
2300	2330		Australia, ABC/R Australia	9610as	11695as	
2300	2355		India, AIR/Port Blair	4760do		
2330	0000		Australia, ABC/R Australia	17750va		
2330	0000	Sat/Sun	Indonesia, AWR Asia/Pacific	17650as		
2330	0000		Vietnam, VO Vietnam/Overseas Svc		9840as	
			12020as			
2355	0000		India, AIR/Mumbai	4840do		

Larry Van Horn, N5FPW
larryvanhorn@monitoringtimes.com
Blog: http://mt-milcom.blogspot.com
Twitter: MilcomMP

Military Tanker Call Signs and Frequencies

The United States Air Force operates hundreds of tanker aircraft, the largest aerial refueler fleet on Earth. The rest of the world has perhaps as many as 250 tankers, of which 80 belong to the U.S. Marine Corps. In short, the Air Force possesses a near monopoly on large-scale aerial refueling capability.

It is a unique asymmetric advantage, but it wasn't easy to attain. Aerial refueling has had a long, difficult, and convoluted history. Air Force leaders have recently placed acquisition of a new fleet of tankers atop USAF's priority list; recognition, if one were needed, of the tanker's enormous value.

There is no area of the Air Force's aerial refueling capability more important than the Coronet mission. Coronets are movements of aerospace forces in support of contingencies, rotations, exercises or aircraft movements for logistics purposes.

From a spectator's point of view, a U.S. Air Force Coronet mission may seem simple; a group of tankers flies with a group of fighters across the ocean, ensuring the smaller aircraft have enough fuel to get home.

Beyond that first glance, however, the "air bridge" is a complicated, critical mission which takes precise planning and coordination to complete.

While heavy aircraft are refueled during their flights between continents, Coronets are specialized missions designed to let fighters traverse long distances safely.

Fighters move for a variety of reasons. Planes must be rotated in an out of the operational theaters to avoid overuse, meet maintenance requirements and, in some cases, stay with the units to which they're assigned.

While the intent is essentially the same as any other air refueling flight – allow aircraft to take on more gas without having to land – the procedure for a Coronet is different.

On a standard refueling sortie, a tanker will enter an orbit in an area of sky set aside for them. Fighters scheduled to refuel with the tanker know where it is and go to them.

With a Coronet, the airspace designated for refueling moves with the group of aircraft and takes more coordination to avoid mishaps. Planes must be at precise coordinates and altitudes at the exact time scheduled for the mission to be a success.

In a standard air refueling mission a receiver may take off, meet up with the tanker for fuel and then leave for their mission, Coronet fighters must top off several times during the flight. In the event a fighter must leave the tanker and land, they have to have enough fuel to get to a predetermined divert base.

❖ Random Aerial Refueling Frequencies

While Coronet refueling missions can use established aerial refueling tracks and anchors, and their associated assigned frequencies for communications, most of the time, due to the nature of this mission, a Coronet flight will use frequencies from a pool of random aerial refueling frequencies.

Mid-air refueling mission. (Courtesy: Department of Defense)

When published tracks/anchors are inadequate for any special mission/sortie due to certain mission requirements and operational considerations, a special track/anchor may be established by the Defense Department. Special tracks/anchors are not published in the DoD FLIP planning documents, but may be described in letters of agreement with other agencies such as the FAA. Special tracks/anchors may also be established for one time use by direct coordination with the appropriate ATC facility.

Since these refueling missions are not assigned to any specific track or anchors, they are identified to specific large geographic areas around the world and are known as random aerial refueling tracks/anchors.

Table one is a list of the known random aerial refueling plans: Continental United States (CONUS), the Atlantic Region, Caribbean and Canada.

One of the monitoring tips I recommend to radio hobbyists, if they have free memory banks available, is that they program all of these random aerial refueling boom frequencies from Table One into one bank/group in their scanner, even if a particular route or random plan is not within radio range.

I have observed that these frequencies are sometimes used off the aerial route as an air-to-air channel by receivers and tankers. You might hear some interesting communications that would otherwise be missed if you don't have these AR frequencies programmed into your scanner.

❖ Refueling Call Signs

There are many different U.S. Air Force units that have tanker aircraft assigned and conduct aerial refueling operations. Table Two is a list of some of those units, where they are located and the call signs that have been used by their assigned aircraft.

The best part of monitoring aerial refueling operations is that it is the one aspect of monitoring the military that anyone with a military air capable scanner can do no matter were they live in the United States. On any given day, military aircraft fly overhead and during some of their mission take on fuel from flying Department of Defense (DoD) gas stations or aerial refueling tankers.

Table One: Continental United States (CONUS) Random AR Frequencies

364.275/283.075	Alpha Primary/Secondary
247.025/234.525	Bravo Primary/Secondary
378.200/375.650	Charlie Primary/Secondary
373.550/371.150	Delta Primary/Secondary
314.100/297.900	Echo Primary/Secondary
298.325/289.700	Foxtrot Primary/Secondary
285.150/276.100	Golf Primary/Secondary
266.500/275.950	Hotel Primary/Secondary
254.600/255.750	India Primary/Secondary
236.750/228.600	Juliet Primary/Secondary
343.100/322.850	Kilo Primary/Secondary
352.100/368.950	Lima Primary/Secondary

Atlantic Region Random AR Frequencies

279.200/305.200	Alpha Primary/Secondary
285.200/289.400	Bravo Primary/Secondary
268.400/259.000	Charlie Primary/Secondary
270.400/289.600	Delta Primary/Secondary
318.000/278.676	Echo Primary/Secondary
355.000/291.900	Foxtrot Primary/Secondary
294.625/261.050	Golf Primary/Secondary
317.375/270.050	Hotel Primary/Secondary
360.250/274.425	India Primary/Secondary
308.800/271.475	Juliet Primary/Secondary
319.175/320.625	Kilo Primary/Secondary

Canadian Region Random AR Frequencies

242.050/243.450	Alpha Primary/Secondary
282.000/289.950	Bravo Primary/Secondary

288.950/305.125	Charlie Primary/Secondary
268.200/270.550	Delta Primary/Secondary
258.100/289.100	Echo Primary/Secondary

Caribbean Region Random AR Frequencies

256.000/314.400	Alpha Primary/Secondary
266.300/226.000	Bravo Primary/Secondary
282.500/288.750	Charlie Primary/Secondary
279.725/324.150	Delta Primary/Secondary
291.000/262.650	Echo Primary/Secondary
340.300/252.600	Foxtrot Primary/Secondary
318.300/240.200	Golf Primary/Secondary
Caribbean Interplane	314.300 349.100

Table Two: USAF Unit Tanker Call Signs

USAF AMC Common	Reach
USAF AFRC Mission	Cody
USAF AMC Annual Rodeo	Rodeo

Coronet Missions
Adobe Blue Bobby Bora Cabal Cacti Cafe Clean Esso Ethyl Gold Gulf High Test# Jest Mobil Petro Petrol Rummy Shell Texaco Woodn
NORAD Combat Air Patrol Tanker Missions
Bankr Carlo Chock Count Earl Nation Nice Roving Rubber Swath Tankr Taboo Teflon Topcat Wide Wink Zombi
Red Flag Exercises Nellis AFB, NV (KLSV)
Arco Baja Ghost Gulf Horse Huge Krait
Northeast Tanker Task Force Skater

305AMW	Joint Base McGuire-Dix-Lakehurst, NJ (KWRI)	Force Hoist Mover Opec Team Wstlr
60AMW	Travis AFB, CA (KSUU)	Gucci Orca Primo Toga Xtndr
100ARW	RAF Mildenhall, UK (EGUN)	Quid
101ARW	Bangor IAP, ME (KBGR)	Maine
107ARW	Niagara Falls IAP, NY (KIAG)	Fuzzy Power
108 Wing	Joint Base McGuire-Dix-Lakehurst, NJ (KWRI)	Deuce Force Hoser Jersey Rocco
117ARW	Birmingham IAP, AL (KBHM)	Dixie
121ARW	Rickenbacker IAP, OH (KLCK)	Sluff Tazz
126ARW	Scott AFB/MidAmerica Airport, IL (KBLV)	Coder Happy
127 Wing	Selfridge ANGB, MI (KMTC)	Jeep Motown
128ARW	General Mitchell IAP, WI (KMKE)	Upset
134ARW	McGhee Tyson Airport, TN (KTYS)	Soda
137ARW	Will Rogers World Airport, OK (KOKC)	Soonr
141ARW	Fairchild AFB, WA (KSKA)	Expo
151ARW	Salt Lake City IAP, UT (KSLC)	Utah
154 Wing	Joint Base Pearl Harbor-Hickam, HI (PHIK)	Hoku
155ARW	Lincoln MAP Airport, NE (KLNC)	Huskr
157ARW	Portsmouth International at Pease, NH (KPSM)	Pack
161ARW	Sky Harbor IAP (Phoenix), AZ (KPHX)	Copper
163ARW	March ARB, CA (KRIV)	Grizzly
168ARW	Eielson AFB, AK (PAEI)	Arctic Chena
171ARW	Pittsburgh IAP, PA (KPIT)	Steel
18 Wing/	Kadena AB, Okinawa (RODN)	Tora
184ARW	McConnell AFB, KS (KIAB)	Jayhawk
185ARW	Sioux City (Sioux Gateway Airport), IA (KSUX)	Batt
186ARW	Meridian RAP (Key Field), MS (KMEI)	Jake Keys
190ARW	Topeka (Forbes Field), KS (KFOE)	Tempo Wylie
22ARW	McConnell AFB, KS (KIAB)	Turbo
366 Wing	Mountain Home AFB, ID (KMUO)	Aspen
434ARW	Grissom ARB, IN (KGUS)	Indy Mash
452AMW	March ARB, CA (KRIV)	Rats
459ARW/	Joint Base Andrews Naval Air Facility, MD (KADW)	Decee
507ARW	Tinker AFB, OK (KTIK)	Okie
6AMW	MacDill AFB, FL (KMCF)	Bolt Pirat
6AMW	MacDill AFB, FL (KMCF) (with 927ARW aircrew)	Auto Pistn
763 Exp ARS	Al Dhafra AB, UAE (OMAM)	Pythn
916ARW	Seymour Johnson AFB, NC (KGSB)	Backy Lucky Regal
92ARW	Fairchild AFB, WA (KSKA)	Zaggs
931ARW	McConnell AFB, KS (KIAB)	Kanza
97AMW	Altus AFB, OK (KLTS)	Gassr Texon (Wing call sign)
Pemco Aeroplex	Birmingham IAP, AL (KBHM)	Clown Pemco

❖ ARTCC Update

This month we will continue our FAA Air Route Traffic Control Center tour with a look at the frequencies used by the Albuquerque ARTCC (Note: All frequencies listed in the tables in this column are in MHz and the mode is AM.)

Table Three: Albuquerque ARTCC RCAG Frequency List

RCAG Freq V/U Pair (MHz)	RCAG Location (ICAO Identifier)	Sector No-Name Altitude (Notes)
118.650/269.475	Clines Corners NM (QCC)	Sector 79-Tanner High Alt
120.550/285.400	Zuni NM (ZUN)	Sector 93-Gallup High Alt
120.950/263.100	Tesque Peak NM (QOW)	West Mesa NM QSA) Sector 70-Panhandle High Alt
120.975/278.300	El Paso TX (ELP)	Fort Stockton TX (FST) Sector63-ElPaso High Alt
124.325/288.250	West Mesa NM (QSA)	Zuni/Pueblo NM (ZUN) Sector 17-Lavan Low Alt
124.500/306.200	Prescott AZ (PRC)	Winslow AZ (INW) Sector 45-Winslow Low Alt
125.075/279.500	Clines Corners NM (QCC)	Mesa Rica NM (QWC) Sector 95-Las Vegas High Alt
125.250/307.300	Ajo AZ (QQO)	Buckeye AZ (BXK) Sector 42-Gila Bend Low Alt
125.400/269.300	Globe AZ (QXY)	Sector 46-Tucson Low
125.525/269.450	El Paso TX (ELP)	Sector 89-Sunland High Alt
126.225/341.700	Globe AZ (QXY), Animas NM (QSC)	Truth or Consequences NM (TCS) Sector 80-Cochise Ultra High Alt
126.450/288.300	Ajo AZ (QQO)	Sector 49-Buckeye Low Alt
126.850/285.600	Tucumcari NM (TCC)	Sector 21-Clovis Low Alt
126.925/353.850	West Mesa NM (QSA)	Zuni NM (ZUN) Sector 58-Black Rock Ultra High Alt
127.850/285.475	Mt Dora NM (QMD), Amarillo TX (AMA)	Childress TX (CDS) Sector 15-Borger Low Alt
128.125/317.750	Winslow AZ (INW)	Sector 50-Payso High Alt
128.200/285.500	Animas NM (QSC), Truth or Consequences	NM (TCS), El Paso TX (ELP) Sector 19-Deming Low/High Alt
128.225/291.600	Mt Dora NM (QMD)	Sector 72-Cimmaron Ultra High Alt
128.450/298.900	Prescott AZ (PRC)	Sector 43-Drake Low Alt
128.675/360.800	Mesa Rica NM (QWC)	Sector 96-Tucumcari Ultra High Alt
132.125/307.050	Amarillo TX (AMA)	Sector 98-Dalhart Ultra High Alt
132.325/251.100	Tucumcari NM (TCC)	Sector 87-Texico Ultra High Alt
132.450/371.900	Ajo AZ (QQO)	Sector 65-Phoenix Ultra High Alt
132.650/257.600	Alamogordo NM (ALM)	Roswell NM (ROW) Sector 23-Roswell Low/High Alt
132.800/346.350	Clines Corner NM (QCC), Raton NM (RTN)	Sandia Mountain NM (ABQ) Tesuque Peak NM (QOW) Sector 16-Sandia Low Alt
132.900/239.050	Globe AZ (QXY)	Zuni NM (ZUN) Sector 38-Miami Low/High Alt
133.000/281.500	Mount Lemmon AZ (TUS)	Animas NM (QSC) Sector 90-San Simon High Alt
133.050/269.350	Mt Dora NM (QMD)	Sector 71-Kento High Alt
133.225/270.350	Fort Stockton TX (FST)	Guadalupe Pass TX (GDP) Sector 78-Fort Stockton Ultra High Alt
133.650/284.600	Clines Corner NM (QCC)	West Mesa NM (QSA) Sector 94-Corona Low/High Alt
133.925/282.350	Winslow AZ (INW)	Sector 67-Winslow High Alt
134.325/259.300	Bagdad AZ (QBD)	Sector 37-Hippi High Alt
134.450/327.150	Mount Lemmon AZ (TUS), Animas NM (QSC)	Silver City NM (ZAB) Sector 47-Silver City Low Alt
134.600/251.150	West Mesa NM (QSA)	Zuni NM (ZUN) Sector 68-Albuquerque High Alt
134.750/239.250	Amarillo TX (AMA)	Sector 97-Amarillo High Alt
135.150/350.200	Ajo AZ (QQO)	Globe AZ (QYZ) Sector 91-Gila Bend High Alt
135.325/370.900	Prescott AZ (PRC)	Sector 92-Prescott High Alt
135.725/339.800	Globe AZ (QXY)	Sector 39-Fosil Low Alt
135.875/292.150	Carlsbad NM (CNM), El Paso TX (ELP)	Fort Stockton TX (FST) Sector 20-Salt Flat Low Alt
----------/252.000	King Mountain TX (QOM)	TSU-Military Tactical Special Use Low/High Alt
----------/256.700	Roswell NM (ROW)	TSU/MOA- Military Tactical Special Use in Beak MOA Low Alt
----------/259.200	Roswell NM (ROW)	TSU/MOA- Military Tactical Special Use in Beak MOA Low/High Alt
----------/263.050	Bagdad AZ (QBD)	Sector 37-Military MOA Low/High Alt
----------/265.400	King Mountain TX (QOM)	TSU-Military Tactical Special Use Low/High Alt
----------/267.900	Tucumcari NM (TCC)	TSU/MOA- Military Tactical Special Use in Pecos MOA Low/High Alt
----------/279.550	Bagdad AZ (QBD)	Sector 37-Military MOA Low/High Alt
----------/300.000	King Mountain TX (QOM)	TSU-Military Tactical Special Use Low/High Alt
----------/321.300	Animas NM (QSC)	TSU-Military Tactical Special Use Low Alt
----------/321.300	Raton NM (RTN), Roswell NM (ROW),	Truth or Consequences NM (TCC), Zuni NM (ZUN), Amarillo TX (AMA), El Paso TX (ELP) TSU-Military Tactical Special Use Low/High Alt
----------/353.600	Roswell NM (ROW)	TSU/MOA- Military Tactical Special Use in Beak MOA Low Alt
----------/364.200	Silver City NM (SVC)	TSU-NORAD AICC WADS Military Tactical Special Use Low/High Alt

Chris Parris
chrisparris@monitoringtimes.com
www.mt-fedfiles.blogspot.com

Internal Revenue Service Radio System Update

One particular federal government agency that has been in the news over the last few months has been the Internal Revenue Service (IRS). A division of the Department of the Treasury, the IRS has its roots in the Revenue Act of 1862, intended to raise money to fight the Civil War. The agency used the IRS name as early as 1915, but it was officially identified as the Internal Revenue Service in 1953. These days, the IRS is the agency identified with federal tax collection and enforcing the tax codes.

The IRS operates multiple divisions and facilities around the country, including ten major processing centers where your tax returns are processed. Among the various divisions of the IRS we find the Criminal Investigation Division, or IRS-CI, and the Treasury Inspector General for Tax Administration (TIGTA), formerly known as the Treasury Office of the Inspector General (OIG). These two divisions represent most potential for interesting federal frequency monitoring.

The IRS has had a history of changing things around in their radio communications over the years, so it is sometimes hard to figure out what they might be using at any given time. When I first started monitoring federal frequencies, the IRS law enforcement operations appeared to be mainly using UHF frequencies, particularly repeaters on 418.2000, 418.2250 and 418.2500 MHz. In addition to their own repeaters, some IRS agents had the ability to use the DEA repeaters in the same band of frequencies.

I have always assumed that the IRS and DEA had a mutual agreement to use these channels, but I will never forget one time I heard an IRS unit come up on a DEA repeater and ask the DEA Dallas Region radio dispatcher for a radio check. The dispatcher had no idea who this unit was or what agency he was with, even though he identified himself as an IRS agent, the DEA dispatcher flat out refused to talk to him. I guess someone didn't get the memo.

The IRS as well as the Treasury Department itself have been subscribers to the nationwide Customs and Border Protection (CBP) VHF radio network on 165.2375 MHz, and still are as far as I can tell. With recent upgrades to their own radio network, the IRS may not be using the CBP channels as much as they have been in the past. At one time, the Treasury Department was planning on consolidating their various radios systems into a nationwide trunked radio system, similar to the Justice Department's Integrated Wireless Network (IWN).

Planning was started around the same time as the IWN project was getting off the ground, but it was determined that the Treasury Department might be better off by simply joining in the Justice Department's IWN project and partnering with the planning and development already done. After years of planning and waiting for the IWN to come to reality, the Treasury Department simply decided to develop their own conventional radio system.

These days, the IRS enforcement and investigative operations appear to have transitioned to full time use of APCO P-25 digital on their legacy VHF frequencies. UHF channels are still in use, mostly as operations and security at IRS facilities around the country. The Federal Protective Service (FPS) supports smaller IRS offices that don't have their own security forces.

Here are the frequencies that have been identified as being allocated to and used by the Treasury Department, and specifically the IRS:

163.1000	167.1000	409.2250	415.8000
163.1250	167.1500	409.2500	415.8750
164.1000	167.9750	409.7750	416.0500
164.2500	168.3500	409.8750	416.2000
164.5375	172.6375	411.1250	416.3250
165.1000	173.0250	411.5250	416.8000
165.3375	173.8625	411.5500	417.0250
165.4125	406.4250	412.2250	417.6500
165.4625	406.5500	414.3250	417.7250
165.9125	406.7250	414.7000	417.7500
165.9500	406.8000	414.7500	418.0500
166.0000	406.8750	414.9000	418.0750
166.2000	407.8000	415.0000	418.1000
166.4625	408.4000	415.1000	418.1750
166.5375	408.6500	415.4250	418.2000
166.5875	409.1000	415.5500	418.2250
166.9750	409.1750	415.6000	418.2500
167.0000	409.2000	415.7250	418.5750

Now let's look at some specific locations and what's been heard on these frequencies. Most IRS VHF P25 channels appear to be using a Network Access Code (NAC) of N100. Some have suggested that the TIGTA (formerly IOG) operations are using a NAC of N1F1. And the primary repeaters for IRS operations may have adopted the system used by other federal agencies of using different NACs to access different repeaters on the same frequency.

As with all the frequency lists published in this column, unless otherwise noted, all frequencies are narrowband FM, and "PL" indicates sub-audible tone squelch, "D" indicates digitally coded squelch and "N" indicates P-25 digital Network Access Code (NAC). Here are some confirmed loggings of IRS channels around the country:

163.2125, N100 – IRS TAC 1, most likely a nationwide assignment
163.6375, N100 – IRS TAC 2, also nationwide
164.5375, N1F1 – IRS TIGTA
165.1000, N1F1 – IRS TIGTA
165.3375, N1F1 – Possible IRS TIGTA TAC channel
165.9500, N001 thru N010 – IRS NET 1, using various NACs
165.9500, N100 – Some areas used as a simplex TAC, or NET 1 repeater out
167.0000, N001 thru N010 – Input to the 165.9500 repeater using various NACs
172.6375, N1F1 – Input to the 164.5375 MHz repeater
409.7750, 103.5 PL – Philadelphia, PA, now reportedly using Motorola TRBO digital
411.5500, D023 – Andover, MA Campus Service Center
414.7000, 123.0 PL – Reported in analog in the Birmingham, Alabama area
415.7250, 123.0 PL – Reported in analog in the Birmingham, Alabama area
418.1750, 123.0 PL – Reported in analog in the Birmingham, Alabama area
418.2000, 123.0 PL – Reported in analog in the Birmingham, Alabama area
418.2250, 123.0 PL – Reported in analog in the Birmingham, Alabama area

So give some of these IRS and Treasury channels a listen and see what comes up in your area. Let me know if you catch anything!

CDC Trunked System

There has been a federal UHF trunked radio system listed in the frequency database of the Radio Reference web site that has been listed as "unidentified" for some time. No further information has been posted. You can find that listing here: **www.radioreference.com/apps/db/?sid=7033**.

I finally received some information confirming the identity of that trunked system and its owner. The system is operated by the Center for Disease Control and Prevention, also known as the CDC. While the CDC has facilities all across the United States, they have several major centers in and around the Atlanta, Georgia area. This trunked system supports activities at those facilities. The CDC operates under the umbrella of the Department of Health and Human Services. We took a look at DHHS agency communications back in March of 2008 edition of the Fed Files.

Here are some specifics of the CDC trunked radio sites:

System ID = 3B9
WACCN = BEE00

Site 1 – Atlanta, GA
406.1125, 407.8125, 409.3000, 410.0375
Site 2 – Lawrenceville, GA
408.8375 409.0375 409.2375
Site 3 – Roybal Campus, Chamblee, GA
406.7750 408.4375 408.6375

The Radio Reference listing has a Site 4 listed, using a control channel frequency of 408.8375 MHz (the same as site 3), but I have not yet been able to confirm the location of Site 4. The system voice channels are using a P25 NAC of N3B1. Next time you are in the Atlanta area, give these frequencies a listen and let me know what you were able to hear.

❖ Road Trips

I recently took a couple of driving trips around various areas of the country and took my radios with me. I thought I would share what I was able to search out while traveling. These are the "raw" data that I wrote down as I drove (be careful doing that, by the way). I wasn't able to identify the exact agency or transmitter location at the time, but I have added my best guesses where I could.

I-84 from Portland, OR to Kennewick, WA through the Columbia River Gorge:

162.9625, 100.0 PL – Umatilla National Forest
164.2750, 192.8 PL – Department of Energy Hanford Reservation
164.4000, 192.8 PL – Department of Energy Hanford Reservation
164.4875, CSQ – Data
164.5000, 136.5 PL – Army Corps of Engineers, The Dalles Dam
164.5250, CSQ – Data
164.8250, CSQ – Data
166.6875, 156.7 PL – Umatilla National Forest
168.3750, 156.7 PL – Bureau of Indian Affairs, Yakima
168.4500, 127.3 PL – Possible US Geological Survey
169.5500, 123.7 PL – Olympic National Park
170.1125, CSQ – Data
170.2250, CSQ – Data
170.3375, N718 – IWN trunked system voice channel
170.5250, 110.9 PL – Wallowa-Whitman National Forest
170.5250, 167.9 PL – Wallowa-Whitman National Forest EMILY repeater
172.9000, N001 – TSA at KPSC airport, Pasco, WA
173.3375, 218.1 PL – Data
173.4625, N146 – Army Corps of Engineers, McNary Dam
173.4875, CSQ
406.0125 – Umatilla Army Chemical Depot trunked radio system
407.5625 – Umatilla Army Chemical Depot trunked radio system
408.1625 – Umatilla Army Chemical Depot trunked radio system
408.2000, N114 – Federal Protective Service
408.3625 – Umatilla Army Chemical Depot trunked radio system
409.3375, N555 – Possible US Forest Service link
410.1000, CSQ – National Weather Service UHF link
410.3625 – Umatilla Army Chemical Depot trunked radio system
411.2250, N788 – Possible US Forest Service link
412.6250, CSQ – National Weather Service UHF link

One of the reasons I took this trip was to confirm the status of the trunked radio system at the Army Chemical Depot in Umatilla, Oregon. There were reports that the system was no longer on the air and may have been taken down in the process of closing down the chemical disposal facility. However, when I arrived near the base, the trunked system as still on the air and in operation, at least for now.

I-79, I-77, I-81 and I-26 from Pittsburgh, PA to Asheville, NC:

162.2250, N339
163.0375, N190
163.1000, N190
165.1375, 103.5 PL – VA Medical Center, Johnson City, TN
165.2875, N650 – BATFE, Charleston, WV
166.0125, CSQ – Paging
167.8625, CSQ – VA Medical Center, unknown West Virginia
169.7750, N293
170.1000, N293
171.5500, 103.5 PL
172.5000, N4C5
172.7250, D051 – Blue Ridge Parkway
172.7250, N120 – Blue Ridge Parkway
172.7500, N130 – Jefferson National Forest
173.5875, N220
173.7625, N130
406.2125, N001
406.8125 – US Bureau of Prisons, Morgantown, WV trunked system
407.0125 – US Bureau of Prisons, Morgantown, WV trunked system
407.4125, N001
408.2125 – US Bureau of Prisons, Morgantown, WV trunked system
408.4000, N167
408.8125 – US Bureau of Prisons, Morgantown, WV trunked system
409.4375, N293 – VA Medical Center, Asheville, NC
410.4625 – Unknown Motorola trunked system, SYS 170, N170, R001

This trip took me through a lot of national parks and federal managed forest areas, so I suspect much of the VHF traffic was related to those areas.

❖ DEA on VIPER

During my most recent visit to the Asheville, North Carolina area, I dutifully began to search the VHF and UHF federal frequencies as I always do, but noticed something missing. Years ago, I often heard the Drug Enforcement Administration (DEA) agents from the Asheville office on their 418.9000 MHz repeater. However, it has been a while since I've heard any activity from them, so I started searching around and discovered that they have started to use talk groups on the North Carolina statewide 800 MHz trunked radio system known as VIPER.

VIPER stands for Voice Interoperability Plan for Emergency Responders. The radio system is based on the Motorola SmartZone Omnilink (Type II) trunking technology, using both analog and digital voice modes. The system supports all different types of public safety agencies across the state of North Carolina, with many trunked sites and frequencies in use. And, while the system was designed for the needs of the various agencies in North Carolina, there are talk groups reserved for federal agency use as well. Among the federal users with access to VIPER are the FBI, DHS ICE, National Guard, the Army Corps of Engineers and the DEA.

After programming in the nearest VIPER 800 MHz trunked sites to Asheville, I began hearing quite a bit of activity on several talk groups that were clearly engaged in some sort of surveillance operation. Multiple vehicles were watching other vehicles and soon it became apparent where the DEA had settled for this operation, at least. I confirmed the DEA use of these talk groups via listening and the VIPER system information on the Radio Reference web site:

22832	US DEA Wilmington
22848	US DEA Fayette
22864	US DEA Raleigh
22880	US DEA Greensboro
22896	US DEA Charlotte
22912	US DEA Asheville
22928	US DEA Common

This is not uncommon in various states or large metropolitan areas that are served by a wide-area public safety trunked radio system. Often federal agencies will acquire both radios for interoperability with local police agencies and their own talk groups for federal operations, if desired. This does not mean that they have given up their federal VHF or UHF channels. It is simply another communications tool for their use, depending on the requirements of the operation. In some cases they simply like using the state radio system because it works better for them.

If you are not hearing as much activity from your favorite federal agency on their frequencies, look around and you might be surprised where they have moved.

The **CommRadio CR-1** is a true software designed receiver, but does *not* require a computer. Enjoy the benefits and performance of state-of-the-art SDR, but in a conventional radio package. The CR-1 SDR is independent of a host PC, using embedded digital signal processing technology that provides a degree of portability and performance previously unavailable to the radio enthusiast. Coverage includes: 500 kHz-30 MHz, 64-260 MHz and 437-468 MHz in AM, SSB, CW, WBFM, NBFM modes. The incredible performance is combined with exceptional portability and ease of use. The radio may be powered via USB or 6-18 VDC input. Enjoy *top-shelf* American technology in a compact, metal case measuring 5.64 x 2.43 x 6.10" 1.8 lbs. With printed manual and DC cord.

Visit **www.universal-radio.com** for details!

universal radio inc.

Universal Radio, Inc.
6830 Americana Pkwy.
Reynoldsburg, OH 43068
➤ **800 431-3939 Orders & Prices**
➤ **614 866-4267 Information**
➤ **dx@universal-radio.com**

Ron Walsh VE3GO
ronwalsh@monitoringtimes.com

End of Some Eras

All too often, I feel it is necessary to dedicate this column to another radio friend who has become a silent key. George Sansom VE3GWS, passed away recently, ending an era. George is one of the last remaining people who worked with me during my time as president of the Canadian Amateur Radio Federation. George took over editing our magazine *TCA (The Canadian Amateur)* when we needed help and also led the team which brought about the merger of CARF and CRRL into the Radio Amateurs of Canada (RAC). It is sad to see all those people who worked so hard for amateur radio become silent keys. 73, George, SK.

Many of the things I grew up with have gone the way of history. This was best illustrated when the Roy Rogers Museum, in Branson Missouri, closed its doors forever. One of my childhood heroes and a movie genre have faded with time. It is sad to see some radio eras come to an end. The Night of Nights in July commemorates the end of commercial Morse code. Fortunately, the Maritime Radio Historical Society has preserved the commercial Morse station at Point Reyes, California.

I, along with many others, grew up listening to marine traffic on 2182 kHz and the other 2 MHz marine frequencies. We could hear all the Great Lakes and when the stations closed for the winter, traffic from the coasts and Gulf of Mexico could be heard. However, as of August 1, 2013, the United States Coast Guard will no longer keep a radio guard on the International Distress frequency of 2182 kHz and the International Digital Selective Calling (DSC) frequency of 2187.5 kHz.

Additionally, marine information and weather broadcasts on 2670 kHz will terminate concurrently. The Coast Guard will keep a continuous watch on VHF channel 16 (156.8 MHz) and on the existing voice and DSC frequencies in the 4/6/8/12 MHz bands as described in the Coast Guard Navigation Center Website, **www.navcen.uscg.gov.**

As of June 9, 2013, the HF/SSB weather forecasting offered by Herb Hilgenberg ceased to be broadcast. Herb had one of the few private HF marine station licenses in Canada and offered this service for over 25 years. Having reached the age of 76 he decided to only do reports for vessels that registered with him and then, once those contracts were done, he terminated the service. Climbing towers to fix antennas became more difficult I am sure!

His weather forecasts were noted as being very accurate and helpful. Various Rescue Centers asked him for help many times during his time on the air. So "VAX498 South Bound II Coastal" will no longer be heard on the HF marine bands. Herb does have the amateur radio call VE3LML; I hope we will hear him on the ham bands. Another familiar voice joins the silent Sackville, NS station of Radio Canada International in the history of Canadian radio.

169 years after the first commercial telegraph line was installed, the last commercial telegraph system shut down in June. The closure of India's Bharat Sanchar Nigam Ltd. (BHNL), brings to an end the era of telegraph and relegates it to the history books.

Samuel Morse, his assistant Alfred Vail, and physicist Joseph Henry invented the single wire telegraph in 1837. Two years later the first commercial line went from Washington to Baltimore. Two days later the pony express was dissolved. The pony express just could not compete with the speed of the telegraph. It seems ironic that the pony express could deliver a letter faster than the modern postal system. As I look at my late father's telegraph equipment I see the first Internet. Let us hope that some of the younger generation will maintain the sites such as Point Reyes and the telegraph station when the commercial operators no longer can!

I recently visited the Joint Rescue Coordination Center in Trenton, Ontario, and learned that, like the sub rescue station in St. John's, Newfoundland, which was merged into the Halifax RCC, the substation in Quebec City will be merged into the JRCC at Trenton. Their new operations room is quite the set up.

The marine station in Inuvick NWT has been closed down and is now being remotely operated from the Iqualuit station on Baffin Island, Nunavut. I have heard they are having some problems with this operation. It looks like more stations will become remote operations. I believe that the Thunder Bay radio station and its remote operations on Lake Winnipeg and also Churchill, Manitoba, on Hudson Bay, may soon become remotely controlled from Sarnia, Ontario. Personally, I fear that these stations could become overloaded with incidents and traffic as they have a shorter, but very active, season. Also, if we lose the main station, then everything is down. With the increased activity in the arctic, is this a good idea?

Consider that VBR Prescott Radio controls eight remote sites from the west of Lake Ontario to Cornwall, Ontario, including their tower on Lake Simcoe. They also do Arctic Broadcasts via satellite since they are a continuously operating station. I know they have emergency power backups, but are we concentrating too much in one area and also losing the local knowledge that could be vital in emergency situations? I need only recall the disorientation of a satellite that took all the communications in northern Canada out.

HF stations as a backup are now being rethought. Some parts of the Canadian military have seen that HF can still be very useful and necessary. Perhaps the broadcast media will begin to see that as well.

Technology does march on and we have some interesting developments in marine radio. The use of Automatic Identification System (AIS) is increasing, as can be seen on several websites. I note the many pleasure craft that now have AIS aboard. I have had to delete them at times to focus on the commercial traffic. I have also had many people who want me to examine them for marine radio license ask me more questions about DSC and how to use it.

One use I have been advised about is the MRASS. This is a Mariner Radio Activated Sound Signal. The sound signal at Ocean City Inlet Jetty Light (LLNR 225) has now been converted to one. When mariners are within the range of approximately one mile of the signal,

The 730 foot, "Algoma Enterprise," leaving lock 8 of the Welland canal.

"Catherine Desgagnes," upbound in the flight locks of the Welland Canal.

they click their microphone five time on channel 83A (157.175) MHz. This activates the sound signal for a period of 30 minutes. The signal will still exhibit the characteristics listed in the Light List. It is good to see that they ask for comments on the signal and what the mariner use to navigate the waterway. I must thank Herb WA3HGT and Dick K2HZ for the information sent to me.

However, there is an old adage that the more things change the more they stay the same. I received a notice from RAC (Radio Amateurs of Canada) that the Table of Frequency Allocations for Amateurs will be amended. The international allocation in the 600 meter band, 472 to 479 kHz, has been added. It will soon be 100 years since the beginning of Canadian marine radio on the Great Lakes when frequencies in this area were used by the Marconi station VBH here in Kingston. Hopefully we will see some activity on this part of the spectrum next year. The spot allocations in the 60 meter band, 5 MHz, are closer to approval as well.

As for mail, I received many good comments on the article about operating from the *USS North Carolina*. Jim N4DEE, in Conway, South Carolina, reminded me that the higher frequency listening I did was on the RBC receiver not the RBB. Can't wait to get my hands on that set again and do some real SWL work.

John Musgrave, Oona River, BC, wrote to say that he liked the article as well. John has been cruising the West Coast and, as always, sends some photos of the area. That is the one area that might get me to leave Kingston.

However, the most unexpected reader input also came from John. Ironically, I was just about to answer a letter from him when my phone rang. The caller asked if he was speaking to me and, when I said yes, he announced it was John Musgrave. He was anchored at the south end of the Queen Charlotte Islands and was calling on a satellite phone. It was also the first satphone call I have ever received.

He was looking for an address of a radio supplier to purchase a noise reducing device. He has been unable to hear the Great Northern Boaters Net due to noise from a neighbor's inverters. Even in his remote locations, RF noise is becoming a problem. It is good to finally speak to John after corresponding for several years. He also mentioned listening to Radio Australia on their 15 MHz frequency and that got me turning on my receiver here.

❖ Band Intruders

The amateur radio bands are always monitored for intruding stations. We have some commercial and pirate operations as always, but some of these have a marine connection. There are many reports of driftnet buoys operating in the 8000 to 28500 kHz range, using CW IDs. Bearings indicate the Atlantic Ocean west of Portugal or Spain and the Adriatic Sea as sources of the buoys.

The IARU Region report for June has quite the selection of these buoys in the 10 meter band. Georg DK7KG has listed many buoys between 27000 and 29351 kHz. There are illegal voice operations as well. Dutch language has been heard on 3500, 3505 and 3545 kHz while Spanish vessels can be heard on 3550, 3555 and 3774 kHz. I was amazed at the IARU report indicating how many of the illegal transmission are using sophisticated digital transmissions and even ALE.

There are many of these buoys between 1800 and 3600 kHz. They often appear in the 160 meter amateur band. They run five watts and can be heard over great distances at times. They are not just Korean and Japanese boats, but fishing vessels out of Canada and the United States using the illegal frequencies. It seems that legal radio activity on or near the frequency used by the beacon can usually cause the operator of the illegal beacon to change frequencies. A picture of one Japanese-made unit shows it has a receiver and can be reprogrammed by radio. I refer people to the article by Mario Filippi N2HUN in July *MT*, "*The Fleet is in: Angling for Radio Buoys*," for more on listening to these buoys.

We have worked diligently in many international conferences to preserve our amateur frequencies and should report all illegal users to our national amateur radio societies or the IARU.

Since 5 MHz frequencies will soon be used in the amateur bands, I thought some marine related frequencies in that range might help me learn the propagation pattern there. I used Hugh Stegman's last three columns and also Shortwave Watch (**www.shortwavewatch.com**) to get some active frequencies. I stayed with CW and SSB marine stations. However, the aircraft frequencies and digital transmissions in this range would offer great listening.

The standard frequencies of 5696 and 5717 kHz for the USCG and Canadian SAR activities are regularly noted. The USCG also uses 5732 USB. Kinloss Rescue in the UK is often heard on 5680 USB, talking to aircraft and other rescue units.

The Russian navy uses CW in this frequency range. RIR98 contacts the Black Sea Fleet on 5083 kHz. Kalingrad uses 5213 and Sevastopol uses 5341 kHz CW. Russian naval ships have been reported on 5019 and 5101 kHz. The Indian navy uses 5150 for Tuticorn Naval Radio VTK. 5065 CW is used by the Malaysian Navy.

The Russian stations can be identified by the beacons used on these CW frequencies: 5153.7 kHz "D" Odessa, "P" Kalingrad, "S" Severomorsk, "C" Moscow. There is a CW propagation beacon, DRA5, on 5195 kHz.

USB transmissions have been reported from the Israeli navy on 5146, the Irish navy on 5254, the Italian navy on 5270 and the Turkish navy on 5763 kHz. 5206 has been reported for numerous naval exercises. Fishing vessels have been heard on 5120 and in the Portuguese language on 5517 LSB.

With the longer nights in October, hopefully some of these stations will be heard and reported. I would appreciate reports of any transmissions you hear. As for myself, I enjoyed operating portable and activating Amherst Island on the amateur bands among other short expeditions with the Frontenac County Emergency Radio Group.

I would also echo Ken Reitz's comments in his August "Beginner's Corner" column. The 2-meter amateur band and some excellent repeaters in the Kingston area go unused. Remember the 220 MHz band: What you do not use you lose! I personally go on the repeaters during every weather and traffic situation that I hear. Let's get the 2-meter rigs back in the vehicles and use this radio resource.

My column was prophetic in many ways, but in one way that I did not expect. Today I talked with another amateur who has the first copy of *Monitoring Times*. The discontinuing of publication of *MT* is certainly an end of an era in radio. I have been honored to be allowed to write for and have my photographs published in this magazine. I do hope that our readers continue to enjoy their radio hobby as enthusiastically as ever and that I hear many of them on the amateur bands.

LF Engineering Co.

Manufacturers of Low Frequency Equipment for LF/VLF Communications, Natural Radio Research, AM Broadcast, Marine and Shortwave Radio.

Low Frequency design work since 1982

Active E-Field Antennas • Loop Antennas

860-526-4759 • www.lfengineering.com

Kevin O'Hern Carey, WB2QMY
kevincarey@monitoringtimes.com

Gearing Up

The month of October, at least here in the northern hemisphere, is a good time to prepare for the upcoming DX season on longwave. It heralds the arrival of quieter conditions on the band, and with the longer nights come much longer intercepts. Soon the weather will turn colder, and in many locations, snowier. I know about the theory of antennas working better when they are installed during a storm, but the reality is that such work can be very unsafe. For many readers, October might be the last chance to get things in order before the onset of harsh weather.

In the August issue, we discussed antenna and cabling checks you can make to get your station ready for the new season. You may want to review that issue if you have some remaining tasks outside, or need to address cabling issues inside the shack. This month we'll discuss two "soft" issues: Getting your resources lined up and record keeping.

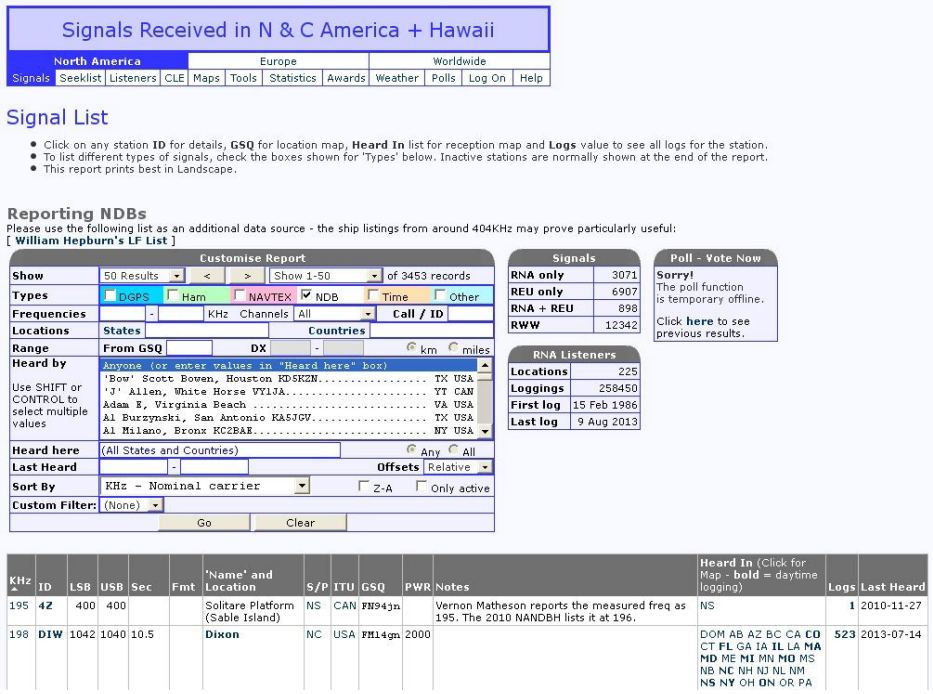
❖ The Early Days vs. Today

When I got started on longwave, about the only way I had to identify stations was to read the loggings of others in the longwave press. Later, Ken Stryker and Joe Woodlock (originator of this column) came out with *The Aero/Marine Beacon Guide*, which was extremely helpful. Toward the end of that publication's run, we began to see new resources popping up on a new medium known as the Internet, and that became a game changer.

The first online resources were in "raw" database format and offered access to the core information, but very few options on searching or sorting the data. As the web began to develop, there were several hobby-oriented sites to choose from, and today, online methods have clearly taken the lead with print resources becoming rare in many shacks. We've covered many electronic resources over the years, but two I'd like to highlight are listed below.

The NDBRNA database at **www.classaxe.com/dx/ndb/rna/index.php** is hard to beat. Site creator Martin Francis of Ontario, Canada has done an impressive job of collecting and presenting beacon loggings from all across North America in an easy-to-use format. Want to see if a particular beacon near you has been heard from afar? No problem: it will not only tell you who has heard it, but when, and where they are located. Chasing a challenging DX target and want to know what else is on or near that frequency? Again, no problem; all of this is shown. You can search for an unidentified beacon you have heard, and even add your own loggings to the list to help others in their search.

While not specifically geared toward the DXer, the site at **www.fltplan.com** is also very appealing. It presents detailed information on not only beacons, but the airports they serve. Once you get to the home page, just select "Navaids and Fixes" on the left-hand pane. You are then routed to a page allowing searches by location, the first letter of the beacon name, or by the first character of the identifier. As a test, I typed in "A" to find my local AVN/344, and there it was, just a few scrolls down the list, Clicking on AVN brought up full information for the beacon, its coordinates, and who's responsible for maintaining it. (This could be helpful for QSLing.) I also searched by state to get a listing of all beacons located in New York. You do not need to be a registered user of the site to access this level of data. Be sure to give it a try!



The NDBRNA site (www.classaxe.com/dx/ndb/rna) is an excellent place to identify your loggings.

❖ Keeping a Logbook

A logbook gives you a reference point on what you have heard in the past and makes it easier to spot changes in the band from year to year. Whether you keep it electronically or on paper is less important than just starting to keep one. Your log should include the basics of frequency, ID, and location, of course, but you can also add columns for distance, ID pitch, number of ID's per minute, and more. The limit is up to you!

An electronic log can be created using any of the popular word processing or database programs out there. The beauty of electronic is that you can sort the information in different ways, and quickly search for a past intercept. If you wish, you can still print the log out periodically to have a handy reference in the shack or on the road.

In my volunteer work with the *Lowdown* journal (**www.lwca.org**), I offer a free logging template available to any LWCA member. While the primary purpose is to make it easier to manage contributions to the journal, some listeners find it useful as the basis of their own logsheet design. I encourage *Monitoring Times* readers to look into what the LWCA can offer for keeping up on longwave news.

❖ DGPS De-mystified

As remarkable as GPS is, it is not perfect. The accuracy of standard GPS is subject to several variables, including ionospheric delays of signals, multipath fading, and receiver clock variables. In addition, the military may, at any time introduce intentional error rates to prevent the system from being used by hostile forces against the United States or its allies. This intentional "dithering" is known as Selective Availability (SA), and although its regular use was disabled years ago, it can be reactivated with little or no advance notice.

Standard GPS units are capable of accuracies within 10 to 20 meters (30 to 65 feet) under ideal conditions. Nevertheless, some users require a level of precision beyond this to do their work. These users include surveyors, cartographers, and mariners operating in tightly restricted harbors. When precision counts, a supplemental system known as Differential GPS (DGPS) comes into play.

How it Works

DGPS greatly improves the accuracy of standard GPS. It works on the principle that the latitude and longitude coordinates for fixed transmitting stations, such as longwave beacons, can be determined with extreme accuracy using existing U.S. Geological Survey information. This data is then compared to the *claimed* position reported by a 1500 MHz GPS receiver located at the beacon site, and an error factor is generated based on the difference between the two readings.

The error factor is broadcast by the beacon in the form of a data stream, which is received by DGPS-equipped users in the vicinity of the station. The corrections are automatically applied to GPS receivers, and they allow users to achieve highly accurate positioning. Accuracies of 1 to 3 meters are the norm with DGPS, and in some cases sub-meter accuracy is possible. The drawing below shows the basic principles of the U.S. Coast Guard DGPS system.

The Coast Guard maintains a vast network of DGPS-enabled beacons in the 285 to 325 kHz band. These frequencies used to be the domain of marine beacons (remember those?), some of which operated in a sequenced fashion, especially those around the Great Lakes in cooperation with Canada. Rather than tear these stations down when they became obsolete, the Coast Guard re-tooled some of them for DGPS service, saving taxpayer dollars in the process. You can tell a DGPS station when you hear it by listening for the warbling note on its carrier (CW or SSB receiving mode required). There are scores of these stations operating in North America today.

Decoding DGPS

Interested in viewing some DGPS signals on your computer? This can be an interesting diversion to "conventional" beacon chasing with Morse code. With DGPS, a wealth of information is provided in text form, including transmission frequency (kHz), position coordinates, ID number, service range, equipment health and more.

To view the signals, you'll need a software program that works in conjunction with your computer's soundcard. One popular tool for DGPS reception is *RadioRaft*, now at version 3.21. It decodes a number of other digital modes as well as DGPS. For more information on this software, visit **http://www.pervisell.com/ham/raft_en.htm**. A simple hardware interface is also required with the program, but one is clearly described on the website.

Another package that can be used for DGPS (and NAVTEX too) is *DSC Decoder*. Full information and a free download for this software may be obtained at **www.coaa.co.uk/dscdecoder.htm**.

An essential website for DGPS enthusiasts is the Coast Guard's "navcen" section at **www.navcen.uscg.gov/?pageName=dgpsMain**. Here, you'll find a wealth of information on these stations, including a list of active sites and their identification numbers. Click the submenu titled "By Site DGPS Status & Operating Specifications" for site-specific data. Happy surfing! And, if you have some DGPS intercepts you'd like to share, please forward them to me for use in a future column.

DGPS Loggings

The DGPS logs below were supplied by John Collins, KN1H (NH). All of these were logged using an Icom IC-R75 receiver with a 380-foot wire antenna.

DGPS Logs from NH

FREQ.	ID	ST/PR/ITU	CITY
286	#804	NJ	Sandy Hook
288	#942	NL	Cape Ray
290	#799	ME	Penobscot
291	#788	PA	Hawk Run
292	#778	SC	Kensington
293	#803	NY	Moriches
294	#771	NC	New Bern
295	#843	WV	St. Marys
295	#939	NB	Partridge Isl.
296	#929	QC	St. Jean Richelieu
298	#831	MI	Upper Keweenaw
300	#926	QC	Riviere du Loup
301	#847	MD	Annapolis
303	#824	NC	Greensboro
304	#777	WI	Mequon
305	#782	TN	Dandridge
306	#772	MA	Acushnet
307	#834	MD	Hagerstown
309	#927	QC	Lauzon
310	#944	NL	Cape Norman
311	#863	IL	Rock Island
312	#935	NS	Western Head
313	#821	VA	Portsmouth
313	#925	QC	Moise
314	#808	FL	Card Sound
315	#940	NL	Cape Race
316	#800	ME	Brunswick
319	#936	NB	Point Escuminac
319	#838	MI	Detroit
322	#839	NY	Youngstown
324	#834	NY	Hudson Falls

VLF Antenna Option: Active Antennas

Many newcomers to longwave try to use the same "random length" wire antenna they use for shortwave, and while it may work in low-noise locations, it often results in little more than static being heard on longwave, or perhaps a few close-in stations.

There are several commercial active antennas available, including the popular L-400B from LF Engineering Co. (see *MT* review at **http://tinyurl.com/y9zb2td**). I know that not everyone has the budget for a commercial antenna, especially if longwave is only a "sideline" activity. So, how about building one? A simple design, complete with a printed circuit board (PCB) design, can be found at **http://tiny.cc/KEBjh**. The author, Adrian Knott of the UK, states that the frequency coverage is approximately 10 kHz to 200 kHz, but changes in the filter components should allow reception well above this range. Time to experiment!

Natural Radio

From time to time, I receive inquiries from readers who would like to explore natural radio at the rock bottom of the radio spectrum. The scarcity and expense of commercially available equipment leads many to explore homebrewing options for this gear.

Natural Radio the easy way: The Bare Bones Basic (BBB-4) is easily built at home, but offers performance rivaling commercial units.

The March and April 2006 issues of *Below 500 kHz* carried a two-part article on constructing the BBB-4 "Bare Bones Basic" receiver, originally designed by Stephen McGreevy, a pioneer in Natural Radio listening and recording. The BBB-4 is a very capable unit that can be used to get your feet wet in Natural Radio and it can even serve intermediate listeners quite well. These installments will give you the information you need to build one of these simple, but effective units.For information on getting a 10-year anthology of past issues of *MT*, visit**www.grove-ent.com/frequencylists.html**.

Discover Longwave!

BeaconFinder II Directory

- 100's of beacons
- 75+ pages, 3-hole punched
- Covers 0-530 kHz spectrum
- $13.95 postpaid

Sounds of Longwave

- Hear Natural Radio, Milcom, WWVB, beacons, Euro-BC, Lowfers, more!
- $13.95 postpaid *(specify CD or cassette)*

Kevin Carey
Box 56, W. Bloomfield, NY 14585

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
marcellis@monitoringtimes.com

Read This before You Plug it In!

This month I had intended to complete the Echophone EC-1 project, but time has run out on me! In a few days I'll be leaving for a vacation trip culminating in attendance at the annual Antique Wireless Association Convention in Rochester, New York. The preparations have kept me away from my workbench, so I'll have to substitute another topic, getting back to the Echophone next time.

What I'm going to do this month is present a systematic set of actions to complete before applying power to that nice old vintage receiver you picked up at last Saturday's radio meet or found in Grandma's attic. Follow this scheme and when you get to the end you might find that you have a working radio!

First Steps

As soon as you begin work on the radio, make a note of the model number and, if you don't have a schematic, take steps to locate one. An excellent online source of free schematics and service notes for many vintage broadcast radios will be found at **www.nostalgiaair.org**.

After you remove the radio from its cabinet, begin work by examining the line cord. It's very common for these cords to be in dangerous condition with brittle, cracking insulation, especially if they are rubber or plastic zip cords. If you have one of these, don't give it the benefit of the doubt! Cut it off right now. Then it won't be in your way as you continue through these pre-power steps.

However, if the cord happens to be fabric covered, hold off on any surgery, even if the cord is quite frayed, until you inspect it under the chassis near its entrance. If you see three wires, the cord contains a resistance wire that is part of the radio's heater circuit. Chances are the wire has become brittle with age and is broken. You'll find out later, but for now leave the cord intact.

One final caveat. If you will be working on an AC-DC radio (no power transformer) as most of us do from time to time, you *must* equip yourself with an isolation transformer. This is simply a transformer with a 115-volt input and a 115-volt output. The input side is plugged into the wall and the radio is plugged into the output side. In that manner, the person working with the radio is protected from dangerous, and even possibly lethal, direct contact with the "hot" side of the AC line that he otherwise might encounter when touching any metal part of the radio.

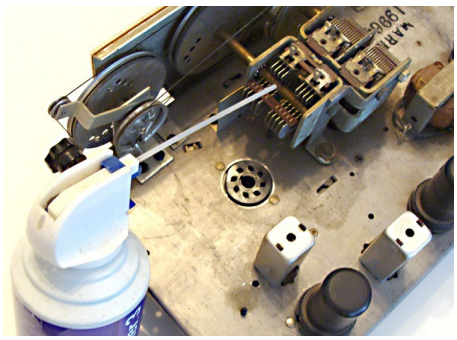
While it's true that the problem can be avoided by equipping the radio with a carefully wired polarized plug, that protection goes away if the radio is plugged into an outlet that is incorrectly wired. It is the position of this columnist that no power should be applied to an AC-DC radio except through an isolation transformer.

Unfortunately, isolation transformers tend to be expensive, but Antique Electronic Supply (**www.tubesandmore.com**) carries a small one that is capable of running most table model AC-DC sets. The cost is $22 (catalogue # P-TN-51X). However, you would have to supply your own AC plug and line cord as well as a socket to plug the radio into and some type of enclosure.

Tube Removal and Checking

This is a good time to remove the tubes for checking. It would be ideal if you now have access to a tube placement chart. There may be one pasted inside or under the cabinet, or you may already have a copy of the service notes. If you have the chart, check each tube as you remove it to make sure it was in the right socket. It's not unusual for mix-ups to occur.

You may even encounter a tube that doesn't belong in the radio at all. Or you might find something that does belong in the radio and looks like a tube but has a metal cover pierced with ventilation holes. The latter is a *ballast*. It contains a resistance that, like the third wire in a line cord, is part of the radio's heater circuit.

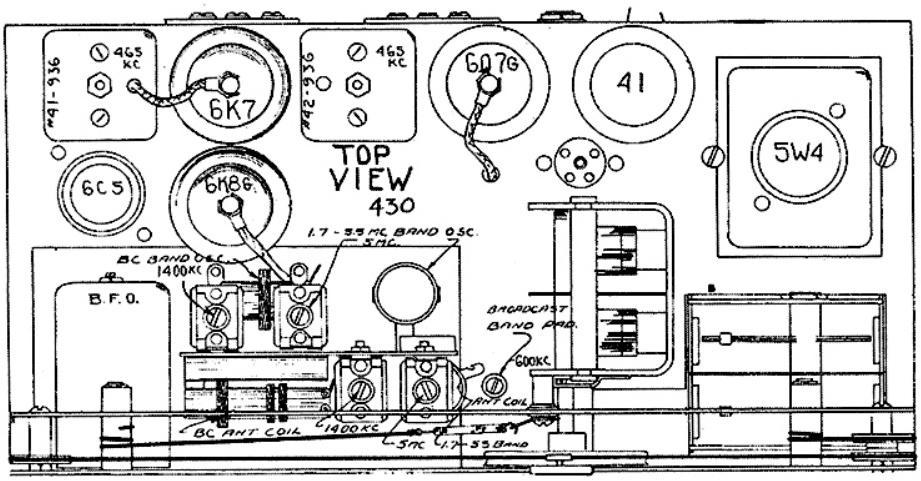


A compressed air spray can is very useful for cleaning between variable capacitor plates.

If you don't have a chart yet, make a drawing of the socket locations on the chassis and note the tube type you found in each socket and the location of the ballast, if any. You can check your drawing after you get the data.

With the tubes out of the radio, you'll want to clean them, check them, and put them in a safe place. To clean the glass, use water with a tiny bit of dishwashing liquid. But, if you don't want to lose the tube designation, avoid cleaning over it. It may look like it is etched into the glass, but it's just stamped on and will wipe right off.

If a tube doesn't pass the "short" test in your checker, or reads "dead" on the quality test, you definitely want to get rid of it. But, don't discard it if its only fault is that it shows a quality value less than the tube tester expects. Most testers aren't that accurate and the only true test of tube quality is how it performs in your set. Some checkers will test ballasts, but probably you will have to take the condition of yours on faith, at least for now.



Typical manufacturer's chassis drawing shows tube type installed at each location.

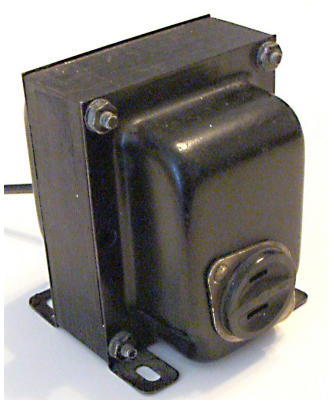
Cleaning and Inspection

With tubes set aside, turn your attention to housekeeping issues. A large, soft, artist's paintbrush will do a good job removing any loose dust both above and below the chassis. But you'll want to pay special attention to the tuning capacitor plates. Dust between them may cause noise later, when the set finally comes to life. A compressed air aerosol-can such as Dust-Off should make short work of cleaning between the plates.

Use a rag with plain water, or with water mixed with a tiny amount of dishwashing liquid, to clean the grime that is left on top of the chassis after you remove the dust. You may need

to resort to a solvent such as mineral spirits for gummy deposits that water won't cut, but use it sparingly and in a well-ventilated area. There isn't much you can do to deal with rust except to steel-wool it a little, though there are special metallic paints available that will freshen up a chassis if the radio is really a special one.

Now you are going to give the set a thorough visual inspection, especially below the chassis. Use your nose too. Look for components that have overheated or burned. Also check the integrity of the hookup wire. Some sets have wire with insulation that has become brittle with age and will flake off at a touch, leaving the wire inside dangerously exposed. If there is a hookup wire problem, remove and replace the wires one at a time so you won't lose track of what you are doing! Try to use wires of the same color as those you are replacing.



Small commercial isolation transformer has a socket for powering radio under test. Its cord and plug are not shown.

Check for signs of missing parts such as empty screw holes, shadow outlines on the chassis, etc. Look also for butchered circuitry such as crude solder joints, taped dead-end wires, and amateurishly-installed components. If the outrages visited upon this radio seem too great, you may choose not to continue with the restoration. Otherwise, you'll have some interesting detective work to do with the help of the manufacturer's schematic in restoring the original circuitry using equivalent parts.

Burned or overheated components must be replaced, of course. You may have to refer to the schematic to find the values of resistors that have become so discolored that you can't read the color code. And, the presence of burned components raises another issue; that it is almost certain that one or more of the paper capacitors in the radio have shorted out.

❖ Capacitor Issues

Now there are choices to be made. From a study of the schematic, you might figure out which capacitor, if shorted or leaky, would have thrown the destructive voltage across the burned part or parts. You would then replace it and go on with the restoration. Incidentally, you would not be able to confirm your fix with an ohmmeter check of the removed capacitor. Paper capacitors have to be tested for excessive leakage with their normal voltage applied, something that requires the use of a capacitor checker.

The other approach is to do away with the diagnostic step, interesting though it can be, and simply replace all of the capacitors wholesale. I'm of the latter school, taking the position that if one capacitor has failed, the others, of similar manufacture and age, cannot be far behind. However, as regular readers of this column will note, I've been known to avoid wholesale replacement if the radio looks very clean, has obviously been stored under decent environmental conditions, and is not a set that I plan to use heavily.

Another choice has to do with the appearance of your capacitor replacements. There are purists who take the perfectly understandable position that appearance shouldn't be compromised, even with under-the-chassis component replacements. These folks melt the innards out of the old wax-covered capacitors, insert the modern replacements and re-seal with more wax. It's not particularly hard to do, but is a little more busywork than I'd want to get into!

Electrolytic capacitors require special mention. These are the ones in the power supply and sometimes in the audio output stages of your radio. They may be located in a can or cardboard tube atop the chassis or in a cardboard tube underneath. Usually they are multi-section with two, three, or more individual capacitors in the same enclosure, though they also may be found as single units. They are also recognizable because they have much larger capacity values than the paper units and have polarity (plus and minus) markings.

I won't spend much more time here on electrolytics because I devoted an entire column to them just two issues back, in August. However, it is important to note that electrolytics are much more susceptible to failure than paper capacitors because their operation depends on the insulating properties of a chemical compound (the *electrolyte*) that dries out and deteriorates with age. It's often necessary to replace the electrolytics even if there is still plenty of life left in the paper capacitors. We'll touch on electrolytics again shortly, when we discuss powering up your radio for the first time.

❖ Contact Cleaner and Lube

The last housekeeping chore before beginning to power up your radio will be to apply contact cleaner/lube to all controls and switches. After years of disuse, the contacts on these items can acquire a film of corrosion and grime. The result is noisy and erratic operation of volume and tone controls, band switches, and other operating controls. A good product for treating this condition is Radio Shack catalogue #64-148 TV-Tuner Cleaner .

On potentiometers such as volume and tone controls, look for openings around the solder lugs through which you can spray the product. If a control is sealed up really tightly, you might have to resort to drilling a small hole in the side or back of the cover. Use a new, sharp drill bit rigged with a stop to keep it from plunging after it pierces the metal. When it comes to rotary switches such as band switches, it's probably better to spray as little as possible. Instead, use a Q-tip saturated with the cleaner to coat the contacts individually. Spray only to get to contacts you can't reach directly.

❖ Time for the Smoke Test

But, if you've done your homework, you're now (with some exceptions) in a position to apply power to your vintage find. Go ahead and install a new line cord if you've cut off the old one and replace the tubes. But, the power must be applied gradually and carefully to avoid damage to components that might be caused by short circuits still remaining in the radio. Ideally, you should plug the radio into a Variac (variable voltage transformer) so that you can raise the line voltage slowly. If the radio is an AC-DC model, the Variac should be plugged into your isolation transformer, which in turn is plugged into the wall.

If you don't have a Variac, you might be able to get by using a "lamp bank" in place of it. Wire a regular household lamp socket in series with a plug and an electrical outlet. Plug the radio into the socket and plug the lamp bank plug into the wall (or into your isolation transformer if the set is AC-DC). You should be able to slowly raise the voltage by screwing in bulbs of progressively higher wattage, perhaps a 40, then a 60, then a 100, if these sizes are still available at your hardware store. I haven't tried this myself. Use a meter across the set's 115-volt input to verify the voltage change.

As you raise the voltage by whatever means, you need a way to assure yourself that there is no destructive short circuit. I like to connect a voltmeter across the power supply output to make sure that the supply is making B-plus voltage and that the voltage is rising as the set's line voltage is increased. I'm ready to shut off the power instantly should there be a sudden decrease in B-plus, which would definitely mean that some component had failed.

If there is no failure, there is a good chance that your radio will now be receiving signals so that you can progress to the next phase of restoration, which is touching up the alignment. If you are working with a radio with a 3-wire line cord or a ballast, and it is silent, you'll probably find that the tubes are not lighting, a sign that the line cord resistor or the ballast is open circuited. But, that would be a matter for another day.

Join the **AWA**

ANTIQUE WIRELESS ASSOCIATION

THE ORIGINAL AND LARGEST HISTORICAL RADIO-COLLECTOR GROUP

- **Publishes *AWA Journal* with:**
  - **Battery and AC receiver restoration**
  - **Vacuum-tube history and collecting**
  - **Old-time amateur-radio contests**
  - **Communications receivers**
  - **Free want-sell-swap ads**
  - **Early television**
  - **Horn loudspeakers**
  - **Reviews of current books**
  - **Keys and land-line telegraphy**
  - **News of U.S. and foreign clubs**
  - **Information on public radio museums**
- **Maintains unique radio-TV museum.**
- **Produces the annual Rochester meet.**
- **Co-sponsors local meets.**
- **Publishes the annual AWA Review.**

Membership is only $25 per year U.S.A. ($30 per year elsewhere). Write to:

AWA Membership Director
PO Box 421, Bloomfield, NY 14469-0421

www.antiquewireless.org

ANTENNA TOPICS

Dan Farber, AC0LW
danfarber@monitoringtimes.com

The Big Dipole Revisited:
What I Did On My Summer Vacation

This month, I'd like to share some new experiences and perspectives with the "big dipole." Regular readers of my column will recognize this antenna as the 102 foot long, center-fed dipole fed with ladder line that has been my go-to antenna for the past several years. I've sung its praises mightily; it's gotten me excellent results on every band, 160 through 6 meters inclusive, it's been an excellent SWL antenna, the "dollar-to-QSO/logging" ratio is superb. Yet, like anything else in our daily environment, it's possible to become complacent, and even snowblind, about such a boon. I found that a little re-thinking and opening my eyes gave the big dipole even more room and reason to shine.

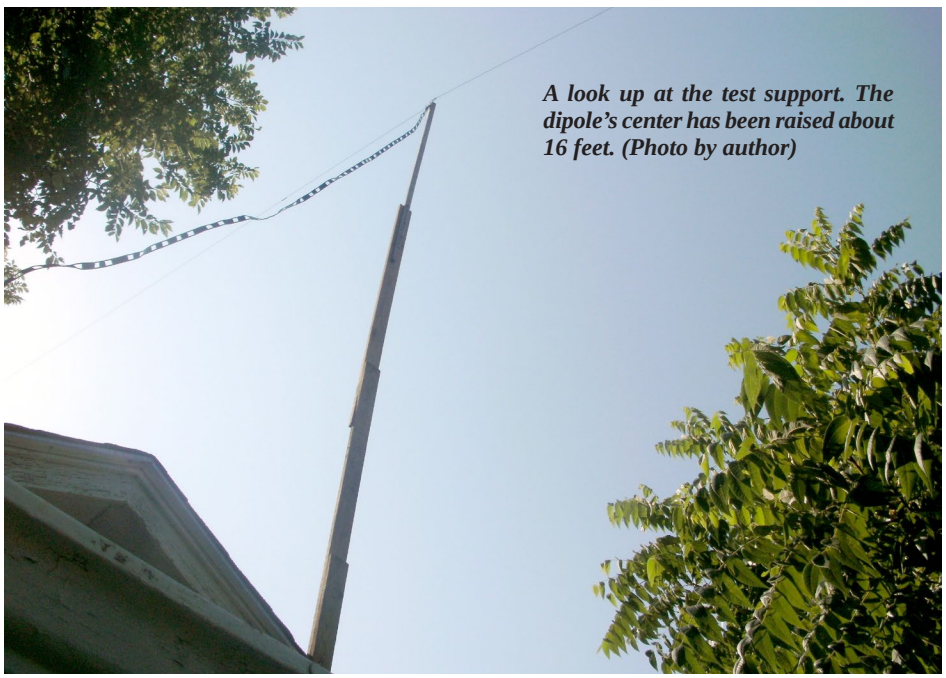
❖ Perfect World vs. Real World

I suppose the default image most of us have of this big dipole, installed at our QTH, looks something like this: The terrain is uniformly level; there are two trees available, at least 30 feet tall, and more than 100 feet apart; the house is located midway between them, so well centered, in fact, that the ladder line drops straight from the center of the dipole to the shack entrance. The perfect world! Ah, how sweet it looks on paper. If your real-world situation is like this, you are to be envied.

On the other hand, the real world lay of the land might look considerably different. I was blessed with the tree availability and spacing, and the shack being fortuitously straight below the feedpoint and a little south. But the terrain is vastly different. My property slopes off sharply toward a neighborhood creek, as many in the area do; the rock foundation wall which is at ground level at the front of the house is six feet tall at the rear of the house, 36 feet to the east.

When I am at the eastern edge of my lot, pushing the lawnmower, looking uphill, the house looks like a little white shrine, high in the Himalayas. And, the tree on this east side is short; E-Z Hang got me over the top of it, but it's actually only 23 feet up. Standing on the back porch, you can see the east end of the dipole at close to eye level, some forty five feet away.

Of course, I knew all this, but somehow it didn't register. I guess I was lulled by such things as it allowing me to work Algeria on 40 meters and Antarctica on 30 meters; its impressive performance on ten meters, whenever the band would open, and its fierce gain and directivity on six. Sure, it locked up my PC upstairs when I'd tune up on 12 and 15, and fluorescent light fixtures in and near the shack would dim during transmit on 160. I figured these were the hazards of trying to load up a non-resonant antenna fed with ladder line and a tuner, like maybe the specific length of the feedline being an issue at a particular frequency, and so forth.



A look up at the test support. The dipole's center has been raised about 16 feet. (Photo by author)

Running the antenna as a "Marconi," or "T-vertical," was even more unpredictable. On 40, for example, it would tune up fine, but every fluorescent light in the house would blink on and off as I keyed the rig on CW; on 160, I could tune it up, but the tuner would pop and sizzle unless I lowered power, say to 50 or 60 watts.

Again, all of this seemed like the accepted wisdom about a ladder-line fed systems; no shielding as with coax, so mismatches tend to spray a lot of RF around the shack and the house, interfering with lights and computers and giving the operator occasional mild RF burns when cabinets, mic or key are touched. (I don't know if you've ever had it happen, but an RF burn on your lips from a mic is a really special event.)

❖ Ya Gotta Be Smarter than the Antenna

Eventually, though, it dawned on me that if I could just contrive to raise the *center* of the antenna, to the height of the rope hanging at the west end, then I would have a new situation. Instead of a *sloping dipole*, which is actually what

I had, I would now have a sort of half-sloper; the west leg of the dipole flat and level, the east leg sloping downhill.

The feedline would now be longer, by about 18 feet, perhaps eliminating some of the mismatches that happened because the line was a critical length at some frequencies; and the antenna and feedpoint would now sit a lot higher above the house, perhaps reducing or eliminating some of the *common-mode* interference to lights and devices.

To test my theory, I cobbled together a Rube Goldberg center support from treated one-by-two and one-by-four lumber, and deck-screwed it to a treated two-by-four screwed to the fascia board in just the right spot. You can see this contraption in the accompanying photo. The foot of the one-by-four reaches the kitchen roof, so the whole weight isn't hanging on four deck screws.

I loosened the rope at the east end, to get enough slack, and raised the antenna with the lumber contraption, then pulled and re-tied the east rope to raise that end of the dipole back up. I soldered on enough additional ladder line to reach the rig comfortably, then sat down to test my altered system.

I must have been holding my mouth right, because *all* of the tune-up issues disappeared, as did all of the common-mode interference problems. Being raised away from the house seems to have made it quieter on receive, too, although so far I haven't noticed any other real changes in performance. But it has always *performed* well, it was just hard to tame.

I think I've found a solution that tames it, and retains the antenna's good performance. Now, all I need to do is build a more permanent center support, perhaps from PVC pipe. It's worth noting, though, that my cobbled-up lumber support has withstood some windy weather very well in the last few days; a PVC support, properly mounted and guyed, will probably last for a while. One nice side effect I noticed, that I hadn't considered before, is that, since the center is now fastened to a support, the big dipole sways almost not at all when the wind blows. I had gotten used to seeing it swing around in the wind quite a bit before. Might mean a little less wear and tear on everything, especially the center connector, right?

And So...

The moral to all of this is: Take a good look at how a wire antenna will interact with the terrain, and how close to structures (like the house!) it will end up. Remember, the real world is a lot less likely to look the way antenna books show in their diagrams. A little common sense, very late in coming, let me easily address issues with my big dipole, and it's much more fun to use now. Hopefully my experiences will help some of you to defeat similar problems. Be careful on the roof, and I'll see you on the bands. Happy operating!

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

What is Interference?

(Photos courtesy of the author)

When I typed this headline, it almost seemed pointless. We all know what interference is, don't we? Of course, we do. Now, try to define it in a way that will hold up in court! I may be perfectly willing to listen to WBBM with a signal from Alabama in the background. My next-door neighbor may well find the WBBM signal unlistenable. Is the Alabama station interfering? It depends on who you ask! Fundamentally, there are three ways in which two radio stations may interfere with each other. We'll explore them this month.

Co-Channel Interference

If two stations attempt to broadcast on the same frequency, from transmitters too close together, they will interfere with each other. On AM radio you'll hear the two stations' programming mixed together; on FM radio you'll hear the two stations switch off (or a noisy mess). Since TV switched to digital transmission, if two stations operate on the same channel too close together you won't receive either station.

How close is "too close?" That sounds like an engineering question but, in a way, it's more of a political question, especially on AM. Given an adequate receiver and antenna (and an open frequency), AM stations can be received world-wide at night. If we have a station operating on 1070 AM in Los Angeles, on an adequate receiver, that California station could be heard in Maine. We cannot allow use of 1070 in bordering New Brunswick; it would interfere with the Los Angeles station on the frequency.

An "adequate receiver", however, might cost $2,000, and an "adequate antenna" might be upwards of 200 feet in length. There might, maybe, be someone in Maine willing to spend that much money and effort in order to receive Los Angeles. There are probably many more "somebodies" in New Brunswick who'd like to have an additional choice on the AM radio dial. We will, in all probability, define this California station as impossible to receive in Maine and allow use of the frequency in New Brunswick.

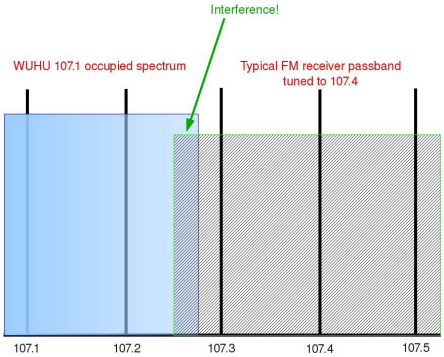
Bumper sticker for a pirate radio station, found on a light pole in Chattanooga...

The definition of "interference," of whether we'll allow reuse of a given frequency, depends on the sensitivity of the typical consumer radio. If radios are more sensitive, they can receive stations from further away. A given frequency can cover a wider area. Stations on this given frequency must be further apart, and there must be fewer of them. The "better" the typical radio is, in terms of sensitivity, the fewer stations we can have.

This sensitivity varies wildly. This is why many operators of "pirate" unlicensed stations believe they aren't causing any interference. They check their frequency with a less-sensitive radio (or antenna) and hear nothing.

Adjacent-Channel Interference

If two stations attempt to broadcast on nearby frequencies, from transmitters too close together, they will interfere with each other. One station will "spill over" into the other one. You'll hear "splash," a highly-distorted signal from one station mixed with the other station's signal.



Why 107.1 and 107.4 are "too close" together.

How "nearby" is too nearby? Again, this is a political question. Receivers have different levels of "selectivity," the ability to separate stations on nearby frequencies. Most radios cannot separate a desired station from an undesired station on the next frequency; 800 kHz cannot be separated from 810 kHz and 106.9 MHz cannot be separated from 107.1. Older radios were less selective. FCC regulations generally require stations in the same city to be at least four channels apart. If AM 810 is in use in a city, the closest other AM channels that could be used would be 770 and 850. If 107.1 FM is in use, the closest available channels would be 106.3 and 107.9.

Again, the selectivity of radios varies wildly. Modern radios are fully capable of separating stations two channels apart, instead of four. The FCC has begun authorizing two-channel separation for low-power FM and "translator" stations. Here in Nashville, for years we have had FM stations on 95.5, 96.3, 97.1, and 97.9. These would have precluded use of any frequency between 94.9 and 98.5 for another Music City station. Today, however, we have translators operating or authorized on 95.9, 96.7, 97.5, and 98.3.

The "better" the typical radio is, in terms of selectivity, the *more* stations we can have.

Overload Interference

If someone builds a 50,000-watt AM station in your backyard, you're probably going to have a hard time receiving any other AM station! When a radio receives a hugely strong signal, it is going to begin behaving in a strange, unpredictable, and undesirable way.

The FCC has established "blanketing" regulations to address this situation. An AM station delivering more than 1V/m, or a new FM station delivering more than 115 dBu, must at its own expense cure any resulting interference. (You don't need to know what "1 V/m" or "115 dBu" are, just that they're a LOT of signal!) As with adjacent-channel interference, a better-quality radio is less susceptible to this type of problem.

How does the FCC Deal with it?

On AM, during the day, most new AM stations may not deliver more than 1/20 the signal of an existing station on the same frequency at any point where the existing station is strong enough to provide service. 0.5 mV/m is "strong enough to provide service." On the first adjacent channels, the new station may not deliver more than ½ the signal of the existing station. On frequencies separated by two channels, the new station may not deliver more than 5 mV/m at any point where the existing station does. On frequencies separated by three channels, the new station may not deliver more than 25 mV/m at any point where the existing station does. 0.5 mV/m is a fair signal, 5 mV/m is a strong signal, and 25 mV/m is a really strong signal.

I cannot begin to understand how you calculate whether a potential new AM station will cause interference at night. I have over 30 years' experience as a TV engineer, but I do not pretend to come anywhere near understanding AM engineering.

On FM, the FCC has divided stations into ten "classes." For each class of station, there is a minimum distance its tower must be separated from other stations of a particular class on the same channel or first three adjacent channels. For example, a Class A station on 103.1 MHz must be at least 165 km from a Class C station on the adjacent channel 103.3 MHz. Under limited

circumstances, shorter separations are allowed. The calculations are similar to those used for daytime AM service.

❖ The End of Analog TV Continues

Most analog TV disappeared in the U.S. in 2009, and in Canada just last year. Analog TV has now begun to disappear in Mexico. On July 18, the last Tijuana station to activate a digital signal did so, and the city's analog channels were shut down.

The Mexican government has also announced a revised schedule for the analog shutdown in several cities across the north of the country. In Cd. Juarez, Nuevo Laredo, Reynosa, Matamoros, and Monterey, analog TV will be shut down on May 29, 2014. Mexicali has been added to the list of cities whose analog will be closed on November 26, 2014.

Most of the Canadian province of Newfoundland and Labrador is now without over-the-air TV. The CBC closed their analog relay transmitters throughout the province last year. At the end of July, the province's private NTV joined the CBC in closing their analog relays. Both networks' flagship transmitters in St. John's, the capital, have been converted to digital and continue to operate.

❖ Radio, Online and Otherwise

The FCC is now party to a dispute between Pandora, the custom Internet radio operation, and ASCAP, the music-licensing firm. Pandora offers a service that streams music to your computer, selecting songs based on the first song you select and "thumbs-up"/"thumbs-down" reviews you give to each subsequent song played. Pandora also pays a much higher rate for music licensing than regular radio stations which stream their programming online.

Pandora has come up with a way to get those music licensing fees reduced. They've negotiated an agreement to purchase a regular radio station, KXMZ-FM 102.7 MHz near Rapid City, South Dakota. The transfer of a broadcasting license to a new owner requires FCC approval, and that approval process is in dispute.

ASCAP argues that Pandora failed to disclose its ownership. They also suggest Pandora has no intention of using KXMZ to serve the public of South Dakota. Pandora, on the other hand, suggests ASCAP's ownership data is outdated. More interestingly, Pandora suggests that their online technology has made it possible for them to tailor KXMZ's programming to serve the Rapid City audience to a degree no competing station can.

❖ Letters

In August, I printed a picture of the bottom of the WOR-710 tower "showing the wiring necessary for the aircraft warning lights." I think I probably chose the wrong photo. What you saw does, in fact, show the wiring for the aircraft warning lights – but the WOR tower doesn't use a device that's common at many other AM stations. This device is certainly unusual in appearance; most visitors to AM towers quickly notice it! Michael Shovan WB2KHE wants us to see "The miraculous Austin Ring Transformer."

AM radio towers are isolated from the ground. The power from the transmitter is attached to the tower, and radiated from there. Because of this power, the base of the antenna is at a fairly high voltage. AM radio towers are also often tall enough to be a hazard to aircraft. The government requires that such towers carry warning lights, to ensure pilots know to keep their distance.

The warning lights pose a problem. Somehow, ordinary AC current must be sent up the tower to power these lights. But the wiring necessary to operate these warning lights would become part of the antenna. It would disturb the efficiency of the antenna. And, it would feed RF power back into the building, where it would likely interfere with the reliable operation of other equipment and quite possibly, the transmitter itself.

That's where the Austin Ring Transformer comes in. This is a device that happily passes low-frequency AC current up the tower to light the lights, while blocking the station's RF power. Look for one of these at your local AM tower. They look like two large wedding rings, one threaded through the middle of the other. Both are usually painted black or grey and located at the bottom of the tower.

Michael's wish is my command! A photo of one of the Austin Rings at WADO-AM 1280 kHz appears with this month's column. As a bonus, you see two grey balls atop the ring. These are to discharge static electricity, which builds up on the tower during storms.

Austin Ring transformer at WADO-1280.

Michael probably doesn't want me to print this next part, but he didn't tell me not to. Back in the mid-1970s, while working at WKIP-1450 he got his hands across both sides of the Ring transformer. The voltage across this transformer is often rather high and a painful RF burn resulted. There is a good reason the FCC requires AM towers to be well protected with a fence! And, a good reason why, if you visit an AM tower site, you should keep a safe distance from the tower.

STATION REPORT

DELETIONS:

Stations deleted:

Fort Chipewyan, Alberta	1450	CBKE going to 99.9 FM
St.-Quentin, New Brunswick	1230	CBAF-21 going to 91.1 FM
Hugo, Oklahoma	1340	KIHN
Hemphill, Texas	1240	KPBL
Manor, Texas	1440	KELG
Pflugerville, Texas	1600	KOKE
West Lake Hills, Texas	1560	KTXZ

Web links for this month's column:

americanbandscan.blogspot.com My AM DX blog.
www.austin-insulators.com/radio/xfmr-s.html Austin "Ring" transformers for tower lights.
licensing.fcc.gov/cdbs/CDBS_Attachment/getattachment.jsp?appn=101565636&qnum=5000&copynum=1&exhcnum=1 ASCAP attempts to prevent Pandora Internet Radio from buying a "real" radio station.
https://licensing.fcc.gov/cdbs/CDBS_Attachment/getattachment.jsp?appn=101567874&qnum=5000&copynum=1&exhcnum=1 Pandora's reply to the above petition.

CCRadio2

One of Our Best Radios

- AM, FM, Scannable 2-Meter Ham, Weather Band and NOAA Weather Alert
- Built-in Twin Coil Ferrite® AM Antenna for Max. Reception
- Signal & Battery Strength Meters

$159.95

C.CRANE

Free Catalog

800-522-8863 · ccrane.com

MT First Look: AOR AR6000 Wide-Frequency Desktop Receiver

By Bob Grove W8JHD

As radio communications become more complex and users more numerous, licensees migrate upward in frequency. Satellites and microwave links pervade the formerly-vacant spectrum with every imaginable service. Some receiver manufacturers are accommodating this trend by producing products with higher and higher frequency ranges – 6-GHz in the case of this new AOR product we are reviewing this month.

In simplest terms, the AR6000 receiver from AOR may be best described as an extended-frequency-coverage AOR AR5001D. But such an off-handed dismissal does it an injustice; it's worth reviewing the features of this sophisticated receiver by itself.

In the September 2010 issue of *Monitoring Times* I wrote the review on the AOR AR5001D. This venerable receiver is still in production and is available for government sale and export from Universal Radio at $4799. Here were my impressions of that receiver from our *MT First Look* review in 2010.

❖ The AOR AR5001D bottom line

The AOR AR5001DB wideband communications receiver covers 40 kHz to 3150 MHz (less cellular) in: USB, LSB, CW, Wide FM, Narrow FM, AM and AM Synchronous modes. APCO P-25 mode is available optionally. 2000 Alpha memories store frequency, mode, step, de-emphasis, AGC mode, CTCSS, DCS, auto notch, antenna port and attenuator settings.

Bandwidths included are 200 Hz, 500 Hz, 3 kHz, 6 kHz, 15 kHz, 30 kHz, 100 kHz, 200 kHz and 300 kHz (-3 dB). There are two dual frequency modes. In the dual offset mode you can listen to two frequencies in the same band (± 5 MHz). In the regular dual frequency mode you can listen to a VHF/UHF frequency and an HF frequency, even if different modes. The special tri-frequency mode allows HF reception, combined with the dual offset mode.

This radio features five VFOs, DTMF tone decode, CW pitch control, Auto notch, noise reduction, noise blanker, keypad entry, a precision signal meter and SD card port. It also has a high resolution spectrum display function. The AR5001D comes with well filtered DC supply, manual and SD card.

The AOR AR5001D is an astounding receiver. Its wide frequency range, built-in real time spectrum display, lightning-fast scan and search speeds, high sensitivity, sharp filtering, SD card file capability, and wide dynamic range set a new standard of performance for the communications industry.

The new AOR AR6000 communications receiver

❖ Fast Forward to the AOR AR6000

The AR6000 still utilizes well-developed analog technology, while utilizing digital signal-processing circuitry. Unlike a computer-hosted, software-defined receiver (SDR), this is a stand-alone receiver, complete with a front panel and real knobs, yet it does offer computer control through a USB interface.

An illuminated, mechanical, signal-strength meter is present on the AR6000 panel. It is calibrated in S units, dBm, and microvolts. The scale printing is quite small, challenging readability for us old-timers.

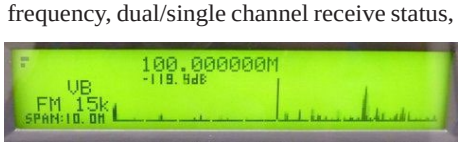
Frequency range is continuous from 40-kHz through 6-GHz, thus making it legally available only to agencies that qualify such as government, military, laboratories, and cellular providers. Reception modes include AM, FM, WFM, FM stereo, USB, LSB, and CW.

Frequency tuning may be done in selectable steps as fine as 1 Hz below 3.15-GHz, or 2 Hz between 3.15 and 6-GHz.

Storage of up to 2000 memory channels is provided, and an SD memory-card slot allows storage of received audio transmissions up to approximately eight hours per GB, thus a maximum of about 240 hours with a 32 GB card. The squelch function controls the recording to avoid long blank spaces.

LCD Readout

The legends on the green screen make it arguably the busiest in the marketplace, with alphanumeric representation of receive frequency, dual/single channel receive status, key lock, clock/calendar/sleep timer settings, SD card status, priority function, antenna selection, squelch open/close, attenuation level, received signal strength, RF amplifier status, auto receive mode, tuning step, memory bank selection, scan/search status, DCS/CTCSS squelch code, detection mode, frequency pass, auto memory, AGC on/off, IF bandwidth, VFO selection, Spectrum span bandwidth, and dual band receive audio level.



The 10 MHz-span, segmented, bargraph spectrum display

Selectivity

Depending upon the mode being received, bandwidths of 500 Hz, 3 kHz, 6 kHz, 15 kHz, 30 kHz, 100 kHz, and 200 kHz are available.

Tuning Steps

Fine tuning steps are selectable from 1, 10, 50, 100 Hz, 1, 5, 6.25, 9, 10, 12.5, 20, 25, 30, 50, 100, 500 kHz.

Attenuation

To avoid strong-signal overload, an attenuator may be invoked for 10 or 20 dB reduction of signal strength. An automatic signal-strength-sensing mode can also do this for you.

Spectrum Display

The LCD screen becomes a spectrum display at the touch of a switch. Spans from 400 kHz to 10 MHz bandwidth may be seen, with signals appearing as vertical line spikes across the display. The tuning controls may be used to slew reception to those spikes, allowing reception of the detected signals. However, since the signals are simply shown as segmented bargraph lines, no visual analysis of the signal's envelope is possible.

For a more detailed look at the signals, the AR6000 has a 45.05 MHz analog IF output with a span of 15 MHz for coupling to a conventional spectrum display or analyzer.

Dual Receive

Any two frequencies within five MHz of one another, and utilizing the same mode (except WFM) can be monitored simultaneously.

Search Feature

An upper and a lower limit of start-and-stop frequencies may be entered to permit the automatic tuning to slew through the spectrum, up or down, searching for active frequencies. A "pass" selection allows manual entry of unwanted frequencies, such as dead carriers or unwanted continuous signals, to be skipped during the search.

Memory

2000 memory locations may be selected to store information for each frequency such as mode, tuning step, attenuator setting, de-emphasis, antenna input, AGC mode, CTCSS, DCS, auto notch, and 12 user-text characters for user comments. One priority channel may also be selected.

Scan

Memory channels may be scanned at a fast 100 channels per second; a scan pause of 1 to 60 seconds may be selected to allow for replies on an active channel. Voice scan avoids channels that are carrier only. Mode scan permits scanning by one mode in a bank of mixed modes, such as AM aircraft and FM marine communications.

Noise Attenuation

The AR6000 offers a noise blanker for pulse noise, an auto notch filter to suppress a constant tone like a heterodyne, and noise reduction for random noise.

IF Shift

This is a very useful feature that has become commonplace in many ham radio and high-ticket receivers produced today. When two signals are close in frequency, co-channel interference may be reduced by shifting the IF passband of one of them away from the other.

Squelch

The receiver accommodates conventional signal-level squelch to eliminate background noise between transmissions, and also CTCSS (tone-encoded squelch), DCS (digital coded squelch), and DTMF (dual tone).

Preselection

Since the AR6000 begins its reception range at 25 MHz, it is advantageous to suppress long wave, medium wave, and shortwave signals that could cause overload interference. It does this by selecting any one of eight pass band filters from 40 kHz to 25 MHz.

Rear Panel Connections

A look at the accompanying rear panel photo shows a busy cluster of connectors and one rocker-style power switch. There are two separate N-connectors for appropriate antennas for the low and high frequency ranges, a BNC style IF output accessory port, an RCA analog video output jack, a sub-D auxiliary interface, a 10 MHz SMA standard reference input connector, a USB port, and a 12 VDC power jack. An AC/DC power supply is provided.

The rear panel is a busy place with easy access to the receiver's circuitry

Options

An APCO P-25 decoder is available, as is an interface for remote Internet control, and an I/Q output of up to one MHz signal bandwidth for external recording on a computer or other storage device for signal analysis.

❖ The Bottom Line

The new AR6000 is unquestionably one of the most versatile analog receivers ever produced, and has good specifications to back it up. Its enormous frequency range is an advantage to the government/military market familiar with the AOR predecessors, the AR5000 and AR5001D.

The ARO AR6000 lists for $7599 and is available for purchase by government/military or for export only from Universal Radio (**http://www.universal-radio.com**).

Table One: AOR AR6000

Manufacturer Specifications

Frequency range: 40-kHz to 6-GHz
Fine tuning step: 1-Hz and 2-Hz above 3.15-GHz
Reception modes: USB, LSB, CW, AM, Synchronous AM, FM, WFM, FM stereo, (P-25 optional)
Independent VFOs: 5 (A-E)
Memory banks: 40, each customizable from 5-95 channels
Memory channels: 2000 (50 channels x 40 banks), 1 priority channel
Number of pass channels: 1200 (30 ranges by 40 banks)
Scan Speed: Approximately 100 channels/steps per second
Frequency stability: Drift less than +/-1 ppm after 5 minutes warm up, less than +/- 0.01 ppm with an optional GPS unit.
Receiver Configuration:
40 kHz – 25 MHz Direct conversion
25 MHz – 220 MHz Double conversion
220 MHz – 360 MHz Triple conversion
360 MHz – 3.15 GHz Double conversion
3.15 GHz – 6 GHz Down converter
Down Converter Frequency:
3.15 GHz – 3.8 GHz, 1st Local – 3.1 GHz, Converted frequency 50 – 700 MHz
3.8 GHz – 4.6 GHz, 1st Local – 3.7 GHz, Converted frequency 100 – 900 MHz
4.6 GHz – 6.0 GHz, 1st Local – 4.3 GHz, Converted frequency 300 – 1.7 GHz
Intermediate Frequencies:
1st IF 294.5 MHz/1.7045 GHz, 2nd IF 45.05 MHz/294.5 MHz, 3rd IF 45.05 MHz
Intermodulation (IP3) (all measurements with preamplifier off):
+20 dBm @ 14.1 MHz
+9 dBm @ 50 MHz
+8 dBm @ 620 MHz
0 dBm @ 1250 MHz
+3 dBm @ 2450 MHz
Spurious Rejection
40 kHz – 25 MHz Rejection above 70 dB
25 MHz – 2 GHz Rejection above 50 dB
2 GHz – 3.15 GHz Rejection above 40 dB
Noise Figure (NF) (preamplifier off):
25 MHz – 1 GHz lower than 7 dB
1 GHz – 2.75 GHz lower than 10 dB
2.75 GHz – 4.6 GHz lower than 12 dB
4.6 GHz – 5.8 GHz lower than 14 dB
5.8 GHz – 6 GHz lower than 18 dB
Selectivity -3 dB/-80 dB:
CW 500 Hz (380/500 Hz)
AM 6 kHz (5.5-6.9 kHz)
SSB 3 kHz (2.7-3.1 kHz
FM 15 kHz (14.2-15.6 kHz
WFM 200 kHz (200-250 kHz)
Sensitivity :
SSB 10 dB S/N 3 kHz IF bandwidth; AM mode 10 dB S/N 6 kHz IF bandwidth; and FM 12 dB SINAD 15 kHz IF bandwidth
40 kHz – 50 kHz SSB Less than 6.0 uV; AM Less than 15 uV
50 kHz – 60 kHz SSB Less than 4.0 uV; AM Less than 10 uV
60 kHz – 70 kHz SSB Less than 3.0 uV; AM Less than 7 uV
80 kHz – 100 kHz SSB Less than 1.5 uV; AM Less than 4 uV
100 kHz – 25 MHz SSB Less than 0.7 uV; AM Less than 2 uV
25 MHz – 2.75 GHz SSB Less than 0.5 uV; AM Less than 2 uV; FM Less than 0.4 uV
2.75 GHz – 3.15 GHz FM Less than 0.6 uV
3.15 GHz – 4.6 GHz FM Less than 0.5 uV
4.6 GHz – 5.8 GHz FM Less than 0.7 uV
5.8 GHz – 6 GHz FM Less than 1.5 uV
Audio output: Two watts at an eight ohm load
Antenna impedance: 50 ohms
Operating temperature range: 32-122 degrees Fahrenheit (0-50 degrees Celsius)
Power requirement: 10.7-16 VDC at two amps (12 VDC), Negative ground
Dimensions: 12-inches deep (304mm) by 8.67 inches wide (220 mm) by 3.82 inches high (97 mm)
Weight: 12 lbs. (5-kg)

Front view of the AOR AR5001D communications receiver

Table Two: AOR AR5001D

Manufacturer Specifications

(Abbreviated Specs from September 2010 MT review)

Frequency coverage: 40 KHz ~ 3.15 GHz (Cellular blocked on consumer version)
Receive modes: NFM, WFM (stereo output), AM, Synchronous AM (SAM), LSB, USB, ISB, AIQ (AF-IQ)
DRM compatibility: 12 kHz I/Q output for DRM PC receiver
Decode modes: CTCSS, DCS, DTMF, APCO P25 (with optional P25-2300 decoder)
Memory channels: 2000 alphanumeric memories
Scan/search speed: Up to 1000 channels per second
Memory banks: 40 (adjustable 5 - 95 channels per bank) and 40 search banks
Audio output: 2 watts into 8 ohm load @ 10 % THD
Audio output jacks: 600 ohm line, low impedance speaker
Operating temperature: 2 - 144 degrees F
Power requirement: 10.7 ~ 16.0 VDC (12 V DC @ 2 A); standard coaxial power jack with back panel DC switch
Dimensions (not including projections): 8.66"W x 3.82"H x 12"D
Weight: 11.1 lbs

Loyd Van Horn, W4LVH
globalnetmt@gmail.com
Twitter: @GlobalnetMT

The "Other Side" of Internet Radio

Most folks have their favorite radio stations to tune in online. Often, this will be a station that carries their favorite music genre. Or, perhaps location is the draw with a station in a hometown or somewhere exotic. But, just under the surface lies an entirely different side of Internet radio, one that caters to a niche that could really only be served by the power of the Web.

Government conspiracies, the search for Sasquatch, alien abductions – these are no longer just the realm of late-night Coast-to-Coast AM conversations. The fringe's voice is louder than ever thanks to Internet radio. And, lest you think we are talking about a handful of people tuning in, these stations boast some pretty large audiences.

The Global Radio Alliance

One of the larger venues for news from the fringe is KGRA-db: The Global Radio Alliance. Beginning operations in the spring of 2012, KGRA boasts on its Web site a staggering 100 million listeners per month. Show topics run the gamut from Area 51 aliens to using scientific research methods to hunt ghosts. In between, prepare yourself for in-depth discussions on military cover-ups, the hunt for bigfoot and a plethora of paranormal.

KGRA-db is based in Kansas City, Missouri and Portland, Oregon and is a fully-licensed digital broadcasting station in addition to its Web presence. With nearly 20 different regular programs airing on KGRA, there is something to be found here for anyone seeking to break from the mainstream and head beyond the fringe.

Radio Papaya

Have something on your chest and George Noory or Rush Limbaugh won't take your call on-air? Keep sending in letters to the editor at your local paper only to never see it in print? The Internet is chock-full of talk radio stations that run from hyper-local amateurs to professionally-run studio presentations – and they are ready for you to speak your mind.

One of the more interesting stations I have stumbled across is Radio Papaya (formerly BlaBla Radionet). Radio Papaya promises to be a station that, "won't shove a bunch of topics down your throat." What they will do is allow you to call in and discuss whatever is on your mind. Hearing a caller have a point that you take contention with? The hosts at Radio Papaya will allow you to discuss your opinions with the other callers too. Think of it as a wrestling battle royale, where the hosts are the referees handing folding chairs to the combatants.

Weirdsville! Web Radio

Okay, enough of the talk, let's find some tunes. When the current Top-40 won't do and even classic rock radio is playing the same handful of songs you hear every single day, what is a Web surfer to do? Take up residency

in Weirdsville!

It may sound like the soundtrack to a dream one might have under the influence of heavy medication, but Weirdsville's Web site proclaims to play everything from acid surf and psychedelic lounge, to "schizo" country and "noise skronk." If you are a music-lover that proclaims to have heard it all, you might want to tone that down a bit until you have spent some time in Weirdsville.

Weirdsville doesn't stream full-time, rather they break up their broadcasts into podcasts that you can either download to listen to later or stream in an .m3u format. Each podcast provides a list of each artist and song title in case you stumble across something particularly enchanting. Like sorting through a bin of obscure vinyl records at a flea market, Weirdsville! gives listeners a virtual dig through the subterranean underground of online music.

Horror Theatre

Gone are the days of radio theater. When one could tune in a station to hear drama and suspense reverberate from the depths of tube-powered radios as everyone in the family gathered in anticipation for another exciting episode.

Not entirely, actually. The folks at Horror Theatre have managed to hold onto that forgotten time and brought radio theater back to the masses. With more than 500 hours of spine-tingling action, Horror Theatre proves that one's imagination is the ultimate special effect.

With classics such as Strange Dr. Weird, Hall of Fantasy and Lights Out, Horror Theatre brings Halloween and campfire ghost stories straight to your computer or mobile device anytime you want. Whether you leave the lights on or off is up to you.

Pangea's World of Weird

With a name that harkens back to an ancient continent that once constituted a single landmass for the whole of Earth, you know you aren't getting your usual talking heads radio show.

While not a full-fledged station, Pangea's World of Weird is a show on the BlogTalk Radio Network. Each Wednesday night, the show hosts "delve into the mysteries of our planet." One can expect to find a healthy dose of the usual UFO and cryptid conversations, but also be ready for tales of ghosts, werewolves and natural remedies to heal our bodies. Miss an episode? The podcasts are also available through the link in the table below.

And that is just Scratching the Surface

A station devoted entirely to birds singing? Yup, you can find it online. Want to hear what a morning stroll down Bourbon Street would sound like? How about being at the Fisherman's Wharf in San Francisco? Sound Transit is a Web site where people can record the sounds of locations all around the world and upload them for others to enjoy. Close your eyes and imagine yourself as part of a protest march in Brooklyn or sitting in a cornfield in Puerto Rico as insects fly around your head.

Just as the Internet itself is as vast and diverse as the people who use it, so too is Internet radio a cacophony of ideas, sounds and voices that make up the whole of the human experience. If by chance, though, you don't find that station you are looking for, why not make it yourself? Join the global Internet radio community and give people just like you a voice online!

GlobalNet Links

KGRA-db - **www.kgraradio.com/**
Radio Papaya - **www.blablaradionet.com/**
Weirdsville! Web Radio - **www.weirdsville.com/**
Horror Theatre - **www.horror-theatre.com/**
Pangea World of Weird - **www.blogtalkradio.com/pangeaworldofweird**
Birdsong Radio - **www.birdsongradio.com/**
Sound Transit - **http://turbulence.org/soundtransit/search/**

What's NEW

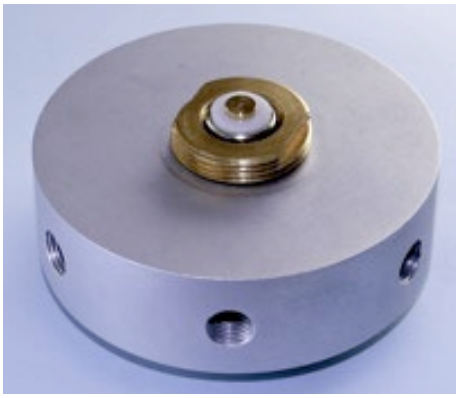
Tell them you saw it in Monitoring Times

Larry Van Horn, New Products Editor

ALPHA~NODE™ Hub

How would you like to create your own custom antenna? With the new ALPHA~NODE™ Hub you can quickly assemble various antenna configurations.

The patent pending Universal Antenna Hub provides maximum flexibility and ease of assembly when you configure or design a radio antenna system. It is easy to configure HF, VHF, UHF ground plane, J-Pole or multi-band vertical antennas.



Mount the active element by simply attaching a ready-made NMO antenna or your custom antenna component to readily available adaptors. These include NMO, 3/8-24 antennas, fiberglass whips, telescoping antennas, and antennas with UHF and BNC mounts. The selections for the radial system can be a combination of up to six horizontal or six downward sloping 3/8-24 threaded whips or 3/8-24 adaptors with custom cut radials. The ALPHA~NODE™ antenna hub slides over a standard 1.25 to 1.5 inch outside diameter mast, locking to the mast by internal setscrews.

Each antenna hub can be supplied with your choice of 5/8-24 threaded hole (no adaptor), an NMO to UHF connector, an NMO to N connector or a UHF to UHF connector and comes complete with set-screws and Allen key for tightening to a mast.

The location of the feed point connector to the mast allows the coaxial cable to be inside the mast and aid in decoupling the cable from the RF field, minimizing the RF contribution to distortion in the radiated pattern.

Typical users of the hub include: Amateur radio (including Field Day operations), DXpeditions, emergency stations and go-kits, scanner and shortwave listeners, police and fire base stations, aircraft and marine base stations, commercial radio, antenna experimenters, remote stations, low earth orbit and weather satellite reception, GMRS/MURS and extended WiFi installations.

This product was designed and is manufactured in the United States by Alpha-Node Hub, P.O. Box 299, Bolton Landing, New York 12814. To order go to the company website at **http://alphanodehub.com/**.

MFJ SSB Adventure Series Transceivers

The popular MFJ SSB Adventure single-band transceiver series are now available for 12, 15, and 17 Meters. Transceivers in this series are designed for portable operation and the minute you turn on the radio you'll marvel at how well it performs. Weak stations roll in with surprising clarity, faithfully reproduced by a single conversion receiver. On transmit, MFJ's exclusive Constant Current™ speech processor cuts thru noise and interference like a far more complex radio.

Take this performance along on your next vacation or business trip – MFJ rig microphone, power supply, and antenna can easily fit into your brief case or carry-on bag. The simple operation eliminates the microprocessor mumbo-jumbo of more complicated ham rigs and their ease of operation lets you get on the air in minutes.

These single-band transceivers feature quiet, double-balanced mixer front-end, single conversion clarity and plenty of gain for great receiver sensitivity. If a signal is there, you'll get it loud and clear

The Adventure series has an analog calibrated S-meter – not a useless bargraph – that makes adjusting an antenna tuner or finding the best beam heading clear-cut.

Other features of these radios include

- Excellent Selectivity: Eight poles of tight IF filtering cut adjacent chatter and focuses transmitter power where needed.
- Smooth VFO: No annoying synthesizer jump or obscure keypad commands to deal with. Effortless tuning, custom reduction-drive, ball-bearing capacitor.
- Powerful audio: Big audio even in noisy locations from a special Signetics audio chip and rugged three-inch speaker that boasts one-Watt audio output at 10% THD.
- Low Current Requirements: You'll never have to lug around a heavy power supply to run this radio. It draws 50-100 mA on receive and 1.2 amps peak on transmit at 13.8 VDC.
- Rugged Transmitter: Bullet-proof output transistor runs cool, easily tolerates 3:1 VSWR and feedline shorts or opens. Output power is 20 watts PEP.
- Built to last: Conservative design, plate-through PC board, quality components, handsome brushed-aluminum panel and a tough, metal case, ensure years of service. Size 6.5-inches wide by 2.5-inches high by 6-inches deep.

In addition to the three new units mentioned above, MFJ also has SSB Adventure transceivers that cover 6, 10, 15, 20, 40 and 80 meters. If you want a matching MFJ microphone for any of the units below (except the 9406x) add $10 to the prices indicated.

MFJ-9402 144.0 – 144.300 MHz $310
MFJ-9406x 50.0 – 50.3 MHz $290 (includes microphone).
MFJ-9410 28.300 – 28.600 MHz $280
MFJ-9412 24.890 – 24.990 MHz $280
MFJ-9415 21.200 – 21.400 MHz $260
MFJ-9417 18.080 – 18.170 MHz $260
MFJ-9420 14.150 – 14.350 MHz $260
MFJ-9440 7.150 – 7.300 MHz $260
MFJ-9475 3.750 – 4.000 MHz $260

For more information see the MFJ website at **www.mfjenterprises.com/**.

MFJ-941EK Antenna Tuner Kit

MFJ Antenna Tuners are some of the best ever made (I have two of them in my ham shack). But have you ever wished you could just build your own? But once you get a list of the prices and add in the time and effort to put one together, you realize it is just not worth it.

MFJ has now made it fun and economical to build and test your very own MFJ antenna tuner. You get the popular MFJ-941E, with all of its parts; you do the assembly yourself. The finished kit features 1.8-30 MHz coverage, 300 Watts power handling, 1.5 inch Cross-needle SWR/Wattmeter, 1000 Volt capacitors, Lexan front panel decal, all aluminum chassis and cover. All knobs, hardware, components and switches are here to build your very own MFJ tuner.

MFJ's lighted Cross-Needle meter (The light uses 12 VDC or 110 VAC with MFJ-1312D) shows SWR, forward and reflected power all at a glance in 300/60 and 30/6 watt

ranges, eight position antenna switch lets you select two coax lines, random wire/balanced line or dummy load (direct or through).

An efficient 12 position air wound inductor gives lower losses and more power out. It has a 4:1 balun and 1000-Volt capacitors. The aluminum cabinet has a durable scratch-proof multicolor Lexan front panel.

The MFJ-941EK sells for $130 and is available from many amateur radio retailers or MFJ at **www.mfjenterprises.com/**.

World's Largest HF+6M SWR/Wattmeter

MFJ recently released a new product that they bill as the "World's Largest HF+6M SWR/Wattmeter." The meter measures 6½-inches diagonally across the meter scale. This one you can see (even my poor eyes can!). Its huge scale gives you ultra-fine resolution and its big, high-contrast numbers makes reading a breeze – even across your shack.

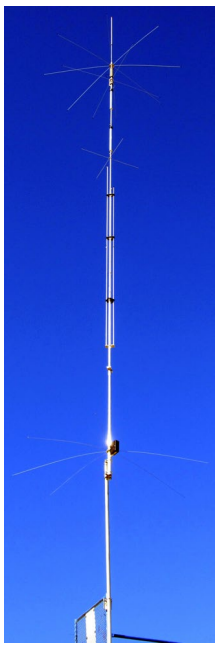
The meter needle position and motion gives you an accurate indication of what's going on quickly without actually reading the scale – like your analog watch. MFJ's exclusive True Active™ peak reading circuit captures true peak or average forward and reflected power readings. MFJ-868B has 20/200/2000 Watt ranges that makes it valuable for low or high power operation.

The full SWR scale also makes reading SWR easier and much more accurate. MFJ's Wattmeter Power Saver™ circuit turns on the meter only when RF power is being measured. Frequency coverage for this wattmeter is 1.8 to 54 MHz, it uses a nine volt battery or 12 VDC or 110 VAC with optional MFJ-1312D to power the meter. The cabinet measures 7-inches wide by 5.5-inches high by 5-inches deep.

The MFJ-868B sells for $150 and MFJ now has a companion meter, the MFJ-867 that is similar to MFJ-868B giant wattmeter, but covers 144/220/440 MHz frequencies. It has 400/200/20 Watt ranges and sells for $160.

Cushcraft R9 Antenna (6-80 Meter Vertical)

Cushcraft's world famous R8 now has a big brother! Its Big Brother R9 now includes 75/80 Meters for local ragchewing and worldwide low band DX without radials. Its omni-directional, low-angle radiation gives you operation on nine HF bands: 75/80, 40, 30, 20, 17, 15, 12, 10 and 6-meters with low SWR. You can change frequencies instantly and no antenna tuner is needed.



The R9 can handle a full 1500 Watts SSB/CW to help when the going gets tough to break through pileups and band conditions are poor.

This vertical is super easy to assemble, installs just about anywhere, and its low profile blends inconspicuously into the background in urban and country settings alike. The compact footprint of the R9 installs in an area about the size of a child's sandbox – no ground radials to bury with all RF-energized surfaces safely out of reach.

Using thick fiberglass insulators, all-stainless steel hardware and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points, the R9 can handle pretty much anything Mother Nature can dish out.

The Cushcraft R9 is 31.5 feet tall, weighs 25 lbs, uses mounting mast from 1.25 to 2 inches, and has a wind surface area of four square feet. Wind survivability rating is 60 mph maximum.

Two optional accessories are available for the R9.

The R-8TB that sells for $80 is a tilt-base lets you tilt your antenna up and down easily by yourself. Makes it easy to work on by yourself, no need to call your ham buddies over to help take it down and lift it back up. There is also an R-8GK ($57) three-point guy kit for high winds.

The Cushcraft R9 sells for $640 and you can get more information at **www.cushcraftamateur.com/**.

DZKit Releases its New Sedona Enclosure

Sedona is an aluminum enclosure that is designed to house a mini-ITX PC motherboard, which you can order from your favorite PC retailer such as TigerDirect, Amazon, Newegg or Microcenter. It can also accommodate a variety of SDR's such as the RFSpace SDR-IQ, PM-SDR and others.

Standard features include a 12-button keypad that's compatible with the Yaesu FH-1 or FH-2 (FT-1000, FT-2000 and FT-950 rigs) as well as Sienna. It also has a low-power antenna switch and a dual panel meter that monitors voltage and current. DC power input from Anderson Powerpole connectors is daisy-chained out to other equipment. There's also room to hold a Xonar Essence STX High-Def shielded soundcard when you have a rig that provides I/Q outputs.

You can think of Sedona as a standalone SDR with built-in PC, or as a panadapter / secondary receiver or as a "do-it-yourself" accessory box.

The Sedona is available from the Valley Ham Shack (**http://valleyhamshack.com/dz-kit_products**) and sells for $600.

Ten-Tec Announces Two New Products

Just prior to the Dayton Hamfest this year, Ten-Tec, Inc., of Sevierville, Tennessee, announced that they would be releasing two new amateur radio products into the ham radio marketplace.

Ten-Tec's first product announcement was for a new smart memory autotuner – the Ten Tec Model 278. In their announcement they indicated that this unit would be a standalone auto tuner that will tune 10:1 SWR. Features include: Simple operation, SWR fault protection, tunes with between 5 to 30 watts, handles 100 Watts of input power, bypass operation and has 100 smart memories for fast tuning. No further information has been released by the company on this tuner.

The second unit that Ten-Tec announced was a Model 506 Rebel QRP Transceiver. This model is an Open Source, QRP, factory-built, radio. It uses a chipKIT Uno 32 Arduino compatible prototyping platform as the main processing unit that holds the program.

The goal of this radio is to give ham radio operators a platform on which to write code and make changes to a basic QRP radio. As it comes from the factory, it is a basic QRP rig with some cool features in small package.

First, it is a CW-only transceiver that operates on 40 or 20 meters. You change bands by moving some jumpers on the PC board to select some different filters and frequencies. The hardware and software are open sourced, which means that you can modify the original code to make this radio unique to your operating needs.

The chipKIT Uno32 is based on the popular Arduino™ open source hardware prototyping platform, but adds the performance of the Microchip PIC32 microcontroller. The Uno32 is the same form factor as the Arduino™ Uno board and is compatible with many Arduino™ shields.

Keep an eye on the Ten-Tec website at **www.tentec.com** for more information on both of these products.

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

The Best in Radio Communications

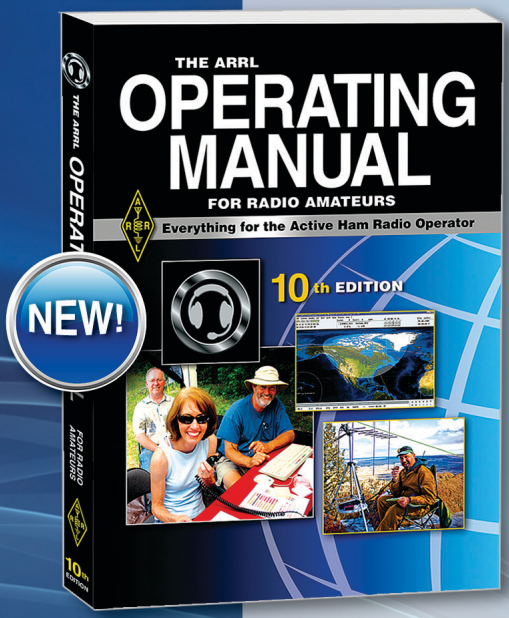
Essential Publications for Every Ham!

90th Edition! It Just Keeps Getting Better!

The ARRL Handbook—**2013 Edition**

The ARRL Handbook for Radio Communications is widely recognized as being the standard reference among radio amateurs and other technologists—experimenters, engineers and students. It's filled with essential information from across the expanse of radio communication fundamentals, covering nearly every aspect of radio and antenna design, equipment construction, and station assembly. CD-ROM included!*

Hardcover Book and CD-ROM. Retail **$59.95**
Softcover Book and CD-ROM. Retail **$49.95**

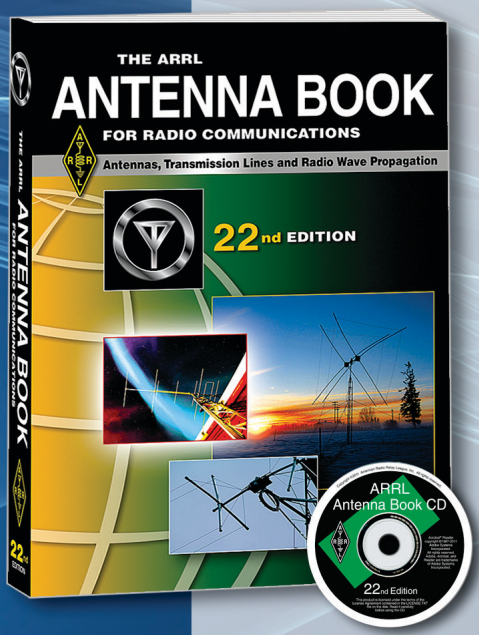


Everything for the Active Ham Radio Operator!

The ARRL Operating Manual—**10th Edition**

The ARRL Operating Manual for Radio Amateurs is the most complete guide to Amateur Radio operating. You'll find everything you need to know—from exploring the broad range of ham radio activities, to sharpening your on-air skills. Put your equipment to use!

Softcover Book. Retail **$34.95**



Exciting Antenna Projects and Design!

The ARRL Antenna Book—**22nd Edition**

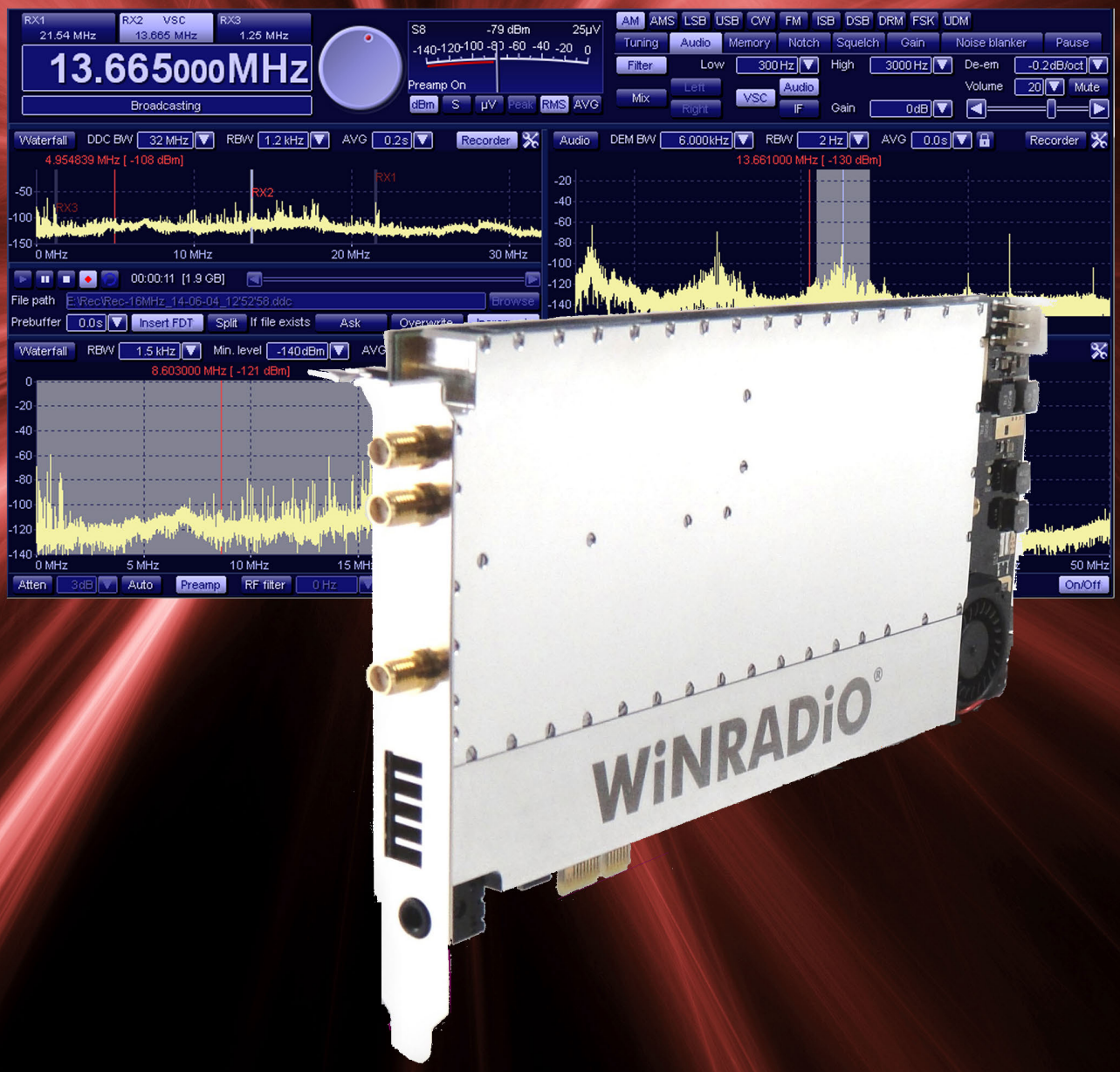
The ARRL Antenna Book for Radio Communications includes all of the information you need for complete antenna systems—from planning, to design and construction. It includes antennas from the HF low bands through VHF, UHF and microwave; fixed station, portable, mobile, maritime, satellite and more. CD-ROM included!*

Softcover Book and CD-ROM. Retail **$49.95**

*System Requirements: Windows® 7, Windows Vista®, or Windows® XP, as well as Macintosh® systems, using Adobe® Acrobat® Reader® software. The Acrobat Reader is a free download at www.adobe.com. PDF files are Linux readable. The ARRL Antenna Book utility programs are Windows® compatible, only. Some utilities have additional limitations and may not be compatible with 64-bit operating systems.

ARRL The national association for AMATEUR RADIO®
www.arrl.org/shop

The all-new Excalibur Ultra.
Now it gets ultra-exciting.



- Space-saving PCI Express card
- 50 MHz wide real-time spectrum analyzer
- 32 MHz recording and processing bandwitdh (the entire shortwave band!)
- And much more!

More details at:

www.winradio.com/ultra

*WiNRADiO® by RADIXON®: Great receivers ahead of their time.*SM