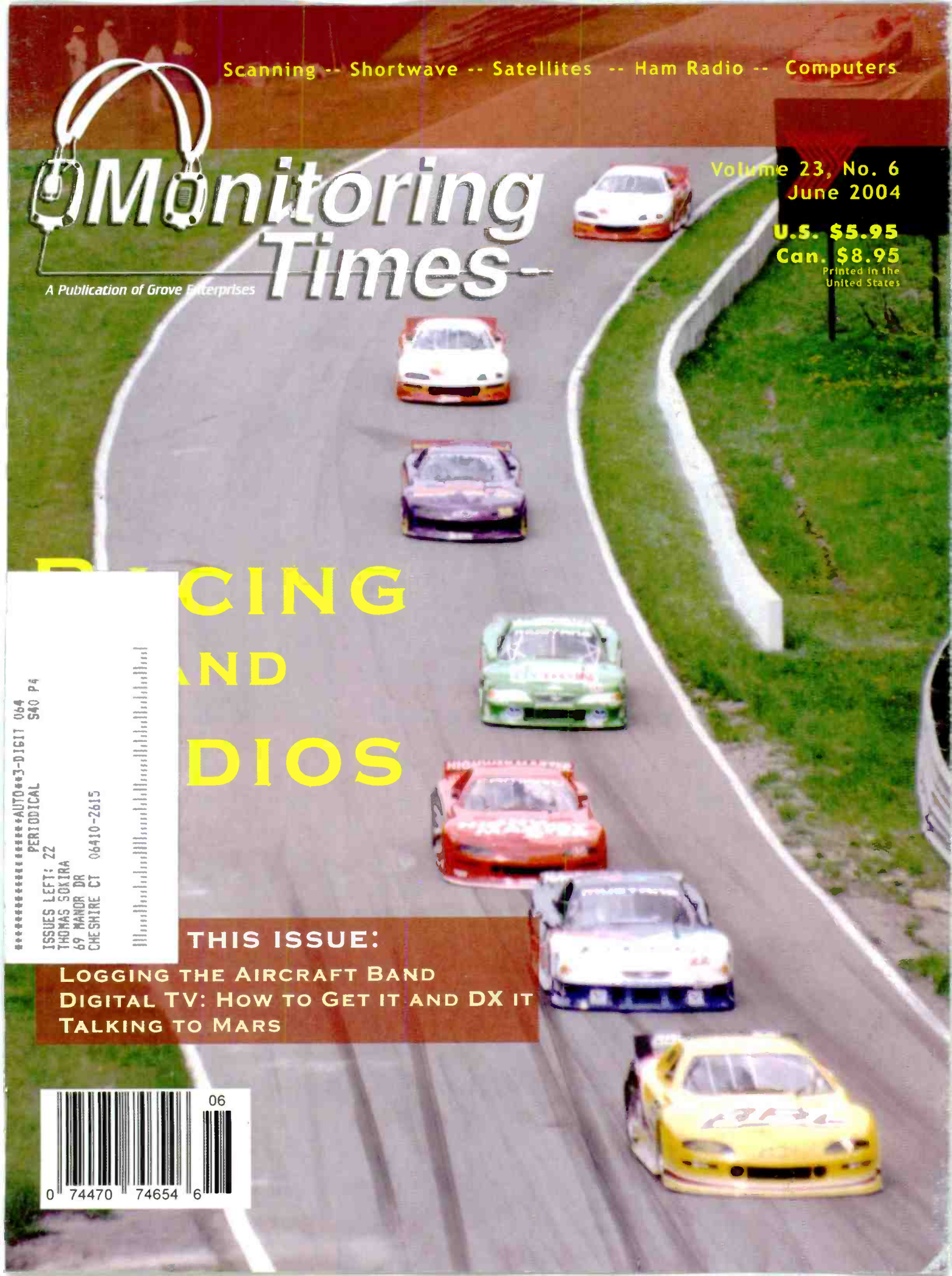

Scanning -- Shortwave -- Satellites -- Ham Radio -- Computers

Monitoring Times

A Publication of Grove Enterprises

Volume 23, No. 6
June 2004

U.S. $5.95
Can. $8.95
Printed in the United States

RACING AND RADIOS

**********AUTO**3-DIGIT 064
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ISSUES LEFT: 22
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69 MANOR DR
CHESHIRE CT 06410-2615

IN THIS ISSUE:

- Logging the Aircraft Band
- Digital TV: How to Get It and DX It
- Talking to Mars

06
0 74470 74654 6

AOR ARD25 Digital to Analog Conversion Unit

Decode APCO 25 Digital Signals with an Analog Receiver!

AOR has created an APCO 25 digital decoder for use with receivers that have a 10.7 MHz IF output!

It's true! Now you can receive standard (unencrypted) APCO Project 25 digital signals using an ordinary analog receiver that has a 10.7 MHz IF output. The ARD25 processes the 10.7 MHz signal, converts the digital transmission and sends it to the internal speaker, or your station speaker. Simply connect the ARD25 and begin listening to APCO 25 digital signals your analog receiver could not previously process.

Many high quality receivers were "left behind" when some public agencies began to use APCO Project 25 digital modulation. If your receiver has a 10.7 MHz output port, the ARD25 can translate those digital signals to intelligible audio. In addition, you can also channel your receiver's analog output through the ARD25. It will automatically recognize analog signals and pass them to the ARD25 internal speaker or to an external station speaker.

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- Add "new life" to your existing receiver
- Compact size
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- Lets analog signals pass through
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Receivers that can use the ARD25 include the AOR AR-ONE, the AR8600 series and AR5000 series, as well as other receivers and monitors that have a 10.7 MHz IF output port.

The ARD25 is yet another breakthrough product from AOR, the Authority on Radio™

Some words of caution — The ARD25 is not effective on systems that use encryption or digital modulation other than APCO Project 25. It cannot translate signals from receivers that do not have a 10.7 MHz IF output, as the full channel bandwidth is needed to convert the signal from digital to analog. The ARD25 does not add trunking capabilities to your receiver. Some jurisdictions may limit the use of devices such as the ARD25.

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Specifications

Receiver type:	Software-Defined DSP-based DDS receiver PC-based (PCI card) with on-board DSP
Frequency range:	9 kHz to 30 MHz (1Hz resolution)
Modes:	AM, LSB, USB, ISB, DSB, CW, FM
Bandwidth:	1 Hz to 15 kHz *continuously variable in 1 Hz increments*
Sensitivity:	0.25 µV (AM, 10dB S/N)
S-meter sensitivity:	0.1 µV

Specifications are subject to change without notice. © 2004 WiNRADiO

www.winradio.com

Monitoring Times

Vol. 23, No. 6 June 2004

Cover Story

Radios and Racing

By Ron Walsh

MT's new columnist is not only nuts about boats, but he also loves auto racing. Ron Walsh has worked at the Molson Indy Toronto for 14 years and always totes a scanner. Scanners and racing are a natural fit, but there are a few tricks to making the radio a helpful tool instead of a frustration. Plan ahead before you buy your equipment, and program the frequencies into your radio using a few tricks that will save you time. Story starts on page 12.

On our cover: The TransAm field, photographed by Ron Walsh VE3GO.

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VHF Aircraft Band in South Louisiana 14

By Thomas Marcotte

"Who uses all those frequencies?" Tom wondered to himself a few years ago. There are 750 VHF AM aircraft frequencies, and Tom set out to identify, if possible, all the active frequencies and who used them within his listening radius in southern Louisiana. We think you'll be impressed with the results of his years of logging and research.

Receiving Digital TV Signals 18

By Ken Reitz

Digital and High-Definition Television is gaining impetus as it approaches the date (December 2006) by which analog broadcasts are supposed to be turned off. What will this mean to owners of analog sets? What's the difference between DTV and HDTV? What equipment do you need to receive it? Ken Reitz separates the facts from the hype and sees a promising future.

DXing Digital Television 21

By Glen Hale

In digital reception you can't get a snowy picture – you either have a picture or you have nothing. Many hobbyists assumed that would be the end of DXing TV, but not so. Not only can you get distant signals, but identifying your digital catch is even easier.

Talking to Mars 23

By Laura Quarantiello

The Mars Exploration Rovers are two tough little scrappers, but they would be little more than metal scrap if it weren't for the line of communication to and from the Rovers that tell them what to do and tells the scientists what they've found. Lest we take this accomplishment for granted, Laura Quarantiello reminds us of the obstacles scientists overcame to successfully position two Rovers on opposite sides of a planet that is so far away it takes 10 minutes for a radio signal to reach it.

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

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Editorial e-mail: editor@monitoringtimes.com
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Reviews:

As John Fugliozzi says, "Relax, It's Summer!" So most of our product columns are a little different this month.

In case you are thinking about buying a scanner to take on vacation or you plan to look for one at hamfests, Bob Parnass has some good advice on how to choose a scanner, plus some good operating tips as well (p.78).

John Cataldo found a FREE software program which, though it's called **Ham Radio Deluxe**, works just great with a variety of shortwave receivers as well (p.80).

Bob Grove discovered a geiger counter kit originally sold by Heathkit is still available. The **Monitor 4 Geiger Counter Kit** is being made by S.E. International as a kit or preassembled. It still works as good as it ever did and is an easy assembly project. (p.82).

Jock Elliott wants more than a close-up view of the action; he wants to keep a record of it. So he's trying out the **Simmons CaptureView** binoculars which come with a digital camera attached (p.86).

This month's On the Bench project recounts Mark Fine's experiment with achieving DRM reception using an unmodified receiver and **Dream** software (p.83).

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G3 WiNRADiO g313i

Introducing a breakthrough

Just when you thought that there is nothing new in radios, along comes the new WiNRADiO G313i software-defined shortwave receiver!

This new, low-cost receiver inaugurates the third generation of wide-band, PC-based receiving equipment from WiNRADiO. It is the first commercially-available receiver where the final IF stage, as well as the all-mode demodulator, are entirely executed in software, controlled by your personal computer.

While the Standard Demodulator of the G303i provides the level of performance of a quality shortwave receiver--including synchronous AM demodulation and a real-time spectrum scope--the optional Professional Demodulator of the G303i-P offers continuous IF filter bandwidth adjustment, interactive block diagrams, two additional audio spectrum scopes, and even inbuilt THD and SINAD measurement facilities. Additional software upgrades, including a Digital Radio Mondiale (DRM) demodulator, will be available soon!

Receiver type	DDS-based dual-conversion superheterodyne with software-defined DSP-based last IF stage and demodulator
Frequency range	9 kHz - 30 MHz (optionally 9 kHz - 180 MHz)
Tuning resolution	1 Hz
Mode	AM, AMS, LSB, USB, DSB, ISB, CW, FM
Image/Spurious Rejection	80 dB
IP3	+8 dBm @ 20kHz
MDS	-135 dBm
Phase noise	-148 dBc/Hz @ 100 kHz
RSSI accuracy	2 dB
RSSI sensitivity	0.1 µV
Bandwith	1 - 15000 Hz (adjustable in 1 Hz steps)
Scanning speed	40 channels/s

Sensitivity (AM/SSB/CW 10dB S/N) (FM 12dB SINAD)	Mode	0.009-0.1 MHz	0.1-2 MHz	2-30 MHz
	AM, AMS, ISB, DSB	2.0µV	1µV	0.25µV
	LSB, USB	1.0µV	0.7µV	0.15µV
	CW	0.5µV	0.2µV	0.07µV
	FM	2.2µV	0.4µV	0.2µV

Intermediate frequencies	IF1: 45 MHz IF2: 12 kHz
Frequency stability	2 ppm (0 to 60° C)
Antenna input	50 ohm (SMA connector)
Output	600 ohm line audio
Form factor	2/3 length PCI card
Interface	PCI 2.2 compliant
Dimensions	Length: 195 mm (7.68") *(excluding mounting bracket)* Height: 99 mm (3.90") *(excluding edge connector)* Thickness: 19 mm (0.75") *(incl. components on either side)*
Weight	330 g (11.6 oz)

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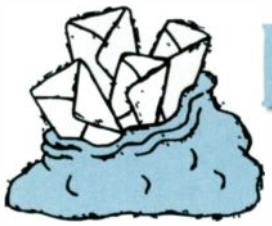

LETTERS TO THE EDITOR

Fineware and DRM

One of those folks who has worked in the background to help make *MT* such a fine product is also a fine fellow – Mark Fine, that is. Mark has been providing his schedule updates to *MT* for the past 7 years. However, after 15 years of running a sideline business, pressures from his "day job" have forced Mark to make the difficult decision to close up Fineware. Mark has discontinued commercial sales of software and stopped updating the Radio Listeners Database that supported Fineware's smart receiver control software, *Monitoring Times*, and the NASWA *Journal*. "I've always enjoyed helping you to create a quality product," Mark told frequency manager Gayle Van Horn.

Mark has not lost his interest in shortwave: far from it. At this spring's Winterfest, Mark demonstrated his set-up for DRM (digital shortwave) reception using an unmodified receiver and Dream software. You can read his account of the development process for this application and the results on page 83.

Following are some of Mark's additional comments on the implications of digital shortwave on future broadcasting.

"One of the recurring themes at the Winterfest was 'how to save the shortwave listening hobby.' The High Frequency (HF) spectrum has surely come under a time of turbulence and constant transition. The end of the Cold War saw a change in the end of many shortwave stations as Communist propaganda waned, countries 'reorganized,' and many stations left the air. Other stations envision more cost effective means by which to get their message out as an alternative to shortwave. A case in point are the recent departures of WSHB (formerly known as Monitor Radio) and Swiss Radio International.

"Other deterrents such as CODAR HF ocean radars and Broadband over Power Lines (BPL) have certainly made shortwave listening (as a hobby) extremely challenging. There is also the argument that streaming over the internet and satellite radio has made shortwave obsolete and a lot less technically exciting. The BBC even used declining listenership as its argument when it decided to cease direct transmissions to North America and Australia. The BBC was targeting 'decision makers' rather than a small contingent of hobbyists.

"There is no doubt that listenership is declining and the average age of die-hard shortwave listeners is increasing. All of these facts point to an obvious conclusion: the hobby is dying because the media is dying. It is no longer a question of saving shortwave listening as a hobby. We must first save the medium of HF Broadcasting or there will be no hobby. It is our belief that in order to do this, shortwave must be made more attractive to a general audience.

"First, shortwave has to be listenable by the average person. This not only means improved content, but also means that it also needs to sound like an average person's FM radio. A common complaint by non-hobbyists is: 'How can you listen to all that noise?' Second, it has to be made technically exciting again. Today, radio in itself is bland and commonplace. Not many people really care where it comes from or how it got there. The number of communications engineers (such as myself) have quickly become a number of software and computing engineers.

"It is my firm belief that the technology of DRM solves a lot of these issues. It provides a method by which broadcasters and listeners alike can enjoy quality reception. The sound provided by the new AAC/SBR encoding is as crisp and clear as an FM station. More specifically, it is as good as streaming over the internet, but as receivers are built it will be more portable. Because of the wideband nature of the technology, it also has the potential to be made less prone to adjacent and co-channel interference from standard AM carrier channels. What has yet to be tested is interference from adjacent or co-channel DRM transmissions.

"DRM is a new, cost effective, and truly exciting technology that is the 'next big thing' in communications. If developed carefully, it will surely be the technology that revitalizes the shortwave medium [and the hobby]."

On behalf of that hobby, we thank you for your contributions to the enjoyment of radio listening, Mark. I highly recommend a visit to Mark's website for a very enjoyable narration of his evolution in the hobby as well as for occasional updates on whatever projects Mark engages in for high-tech fun! **http://www.fineware-swl.com/about.html**

Mark Fine and editor Rachel Baughn with Fineware's DRM demo at Winter SWL Festival 2004.

Welcome, Prime Time

While contributions of schedules and monitoring observations are always solicited and welcome from *MT* readers across the continent, to compile schedules and verify them by frequency monitoring on a regular basis is a rigorous, often monotonous and frustrating activity. It's not often you find folks to stick with it as long as Gayle Van Horn has. So we are glad to welcome another experienced monitor to give her a hand, now that Mark Fine is leaving.

We look forward to our new association with Daniel Sampson of Arcadia, Wisconsin. Here's what Daniel says about his hobby background, "I worked on putting together shortwave schedules for SPEEDX 1986-1994, for my Prime Time Shortwave website 1998-present, and for the Canadian International DX Club 1999 to present. I have roughly 15 years experience in this field. I have been listening to shortwave radio for roughly 30 years."

Check out Daniel's well-designed and informative Prime Time Shortwave website at **http://www.primetimeshortwave.com** – you'll find current time GMT, shortwave schedules in a variety of formats (even for the Palm Pilot), DX program guide, radio-related links, schedule changes, and more.

Puzzling Over New Technology

"Greetings: I am a new subscriber and would like to see the following:

"DRM: in future issues, can you address the quality of the am, fm, shortwave performance of the radio if it is not used for DRM broadcasts (in case in future DRM does not catch on and one is stuck with a $800 radio)?

"Second, with the DRM radio can the USB port be used to download the program to a digital voice recorder such as the voice activated Olympus DM 20? If so, what will be needed? If not, what would be the best alternative?

"RX320 : I enjoyed the review of the Ten-Tec RX320 but found that if it is used with a desktop computer, its performance is very poor unless you have a very good antenna, and even so the broadcasts are not as good as a Sony 2010 at the same location. In this context is the external Winradio any better or should I expect the same performance as with the new RX320 modified for DRM?

"ICOM IC-R3. I inherited one of these units and found as a novice in scanners the manual almost overwhelming and the learning curve somewhat steep. Is there a better source to help a new user to stepwize figure out how to operate the IC-R3?

"In the what's new sections, it might be a good idea to mention if any of the new radios have USB connections.

"PS. I subscribed to *Monitoring Times* after reading an issue purchased in a bookstore.

That issue pointed out that the Sony 2010 were becoming again available, and I was fortunate to obtain one to add to the two others that I have. I have painted the 25 buttons with fluorescent paint so that I can see them better at night."

– Don

"I had to tell you how much I enjoyed Ken Reitz's piece in the April 2004 'Closing Comments' in *MT*. As a 55.7 year-old trying to at least keep informed about technology, I related well to his lament.

"Many times I ask the rhetorical question, 'It's 2004. Why don't computers really work?' This is usually after trying to help my 74-year-old father-in-law troubleshoot his new Dell laptop or helping him get his DVD player past the opening menu.

" I, myself, have plenty of run-ins with technology. While trying to get my ham transceiver programming software to work with my new serial port-less laptop computer, I learned a new word—legacy. As far as I am concerned; and I think Mr. Reitz will agree—that says it all."

Rick Barrow, K3IW, Tannersville, PA

Music without Words

"Even as I read Luc Geougeon's educational article on Radio France International (March 2004), I was listening to it via *radiofrance.fr* on the Internet. It is my favorite foreign fountain of classical music. The beauty of it – and this holds for Radio Beethoven of Santiago, Chile, too – is that you can't understand a word they say.

- Ray Steen, Walla Walla, Washington

Simple Solutions...

"A little brown box from Brasstown (oh, that sounds like a country & western song) arrived for me today (a Uniden BC-296D). I absolutely could not get it to work on the Austin/Travis County digital system. I pulled the digital card and reseated it and that did the trick.

"Just thought I'd pass that on."

- John Mayson

To Gary Webbenhurst, *Bright Ideas*: "First, I'd like to tell you how much I enjoy your *Monitoring Times* column each month. It's the first piece I turn to in every issue and I'm always pleased with the brilliant ideas you provide.

"In response to your question about reproducing 4 point type, Word 2002 can do so, but you won't find '4' as an available point size in the drop down list box. You need to type in the 4 yourself in that box and voila, you'll be rewarded with the desired diminutive point size. I tested it in Times New Roman and Arial, and it worked for both those fonts. For my money, the sans serif Arial is more readable at that very small point size.

"You may apply the same approach using openoffice.org's Writer application. *Bright Ideas* readers may be interested to know that Open Office offers an office productivity suite comparable to Microsoft's, free of charge. It may be freely downloaded at **http://www.openoffice.org** and it runs on a variety of operating systems including Windows and Linux.

"Sun sells a branded, more polished and more fully integrated version of this open source suite called Star Office. I recently received the latest version, Star Office 7, and it is excellent. Star Office is available at nominal cost from **http://www.sun.com** as a download or it may be purchased on CD-ROM."

- Tyler, KC2LST

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

Happy monitoring!

-Rachel Baughn, KE4OPD, editor

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Monitoring and the Law

Jorge Rodriguez
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Eight Websites For Finding Your Monitoring Law

In 1955, before his death, a newspaper reporter was interviewing Albert Einstein. At the end of the interview, the reporter asked if he could have Einstein's telephone number so he could call if he had any further questions. "Certainly" replied Einstein. He walked over to a small table, picked up the telephone book and looked up his phone number, then he wrote it on a slip of paper and handed it to the reporter.

Trying not to look dumbfounded, the reporter asked, "You're considered one of the smartest men in the world and you can't remember your own phone number?" Einstein looked at him with amusement and replied, "Why should I memorize something when I know where to find it?"

These eight websites are sure to help anyone avoid memorizing and know where to find your own information about monitoring and the law both in your particular area of interest or where you live.

❖ Monitoring Times - Monitoring and the Law column

This very column you are reading right now, plus the ones before it since the spring of 2003 when *Monitoring Times* began a full time column dedicated to scanner monitoring laws, are archived here. In addition to monthly columns on certain state's and nation's laws, you'll find specialized articles on related topics such as the Electronic Communications Privacy Act (ECPA) and proposed state and federal legislation in the works, such as the 2002 Cyber Security Enhancement Act (CSEA). Soon every state and major city that has a scanner law on the books will be profiled and archived here along with the individual stories that help illustrate how hobbyists and radio listeners can avoid the pitfalls that have ensnarled others.

http://www.monitoringtimes.com/html/mtlaws.html

❖ Monitoring Times Listener's Lawbook by Frank Terranella, Esq.

The 1995 edition of the now out-of-print *Listener's Lawbook* by New Jersey attorney Frank Terranella can be found here. Although readers are cautioned that this book has not been revised in almost ten years, this remains one of the best compilations of scanner laws ever published and the only one we know of which has been published in a traditional print format. The text of this book is reproduced here on the Grove Enterprises website with the permission of the author. If you're interested in a print copy, used copies of the June 1995 edition *Listener's Lawbook* occasionally turn up on Amazon.com and eBay for about ten dollars.

http://www.grove-ent.com/LLawbook.html

❖ Mobile Scanner and Radar-Detector Laws in the United States

Todd Sherman's excellent online guide to Mobile Scanner and Radar-Detector Laws in the United States on the Alachua County Freenet (**http://www.afn.org**) in Gainesville, Florida, is one of the best, most current online websites to gather together the many laws on monitoring in the United States in one single place. Mr. Sherman has put a lot of work into this site and it shows. In fact, you'll find this Website referenced in many other places on the web when looking for radio scanner laws and deservedly so – this is a good starting place.

http://www.afn.org/~afn09444/scanlaws/

❖ Laws Governing Radio Monitoring in the United States

David Stark's NF2G Scannist Pages cover Federal laws such as the Communications Act of 1934, the Electronic Communications Privacy Act of 1986, the Telecommunications Disclosure & Dispute Resolution Act, and the Digital Telephony Bill, which makes cordless scanning illegal, among others. Here, too, you'll find comments on whether there is a Constitutional right to privacy with links to several essays on the topic. A piece entitled "The 1997 Cellular Witch Hunt" discusses the Cellular Telephone & Internet Association's efforts ten years after ECPA. There are also sections on FAA Regulations concerning scanners aboard aircraft and a note about amateur radio antenna regulations.

http://www.nf2g.com/scannist/us_laws.html

This link from Richard Well's website Strongsignals.net is a good starting point for anyone planning on traveling abroad with a scanner. Although the laws vary from country to county, a chart listing countries in alphabetical order along with whether they have any laws regulating the use of scanners can be found at this link.

Hobbyists traveling abroad may also want to consult the U.S. State Department as well as the proper regulatory agency in the country they are traveling to in order to insure that both their equipment and activities are permitted. And don't forget to carry with you prior proof of purchase and ownership for your radios. You don't want to be mistakenly charged a customs duty on something you bought elsewhere, only because you don't have the proof with you.

http://www.strongsignals.net/access/content/laws.html

❖ Scanning Reference

Although apparently not updated in several years, many of the federal laws featured on Clay Irving's Web page – scanning reference, laws, rules and regulations – have changed little since the last update in 1996. Here you'll find those and links to several state laws on listening to police radio.

http://www.panix.com/~clay/scanning/rules.shtml

There are now many places on the web for doing your own legal research. The online legal research field for decades was the exclusive domain of Mead Lexis-Nexis and law book publisher West's Westlaw, but today they have competition. However, out of all of them, this is still my favorite starting point for free legal research on the web. Although many will find the green bar "For the Public" area, a good starting point, the real meat of the research you can do here is under the blue "For Professionals" banner. There you'll find links to federal and state case law and statutory law.

The problem then becomes which search terms to use. There is no standard word or phrase for what hobbyists call scanners; for example, some states still outlaw scanners under the heading of "short wave radios." If you have your state or municipality's statute or code number, searching for that in quotation marks will often yield not only related laws but also cases.

http://www.findlaw.com

❖ Google

No list of places to find information on the web would be complete without mentioning the reigning king of search engines – Google. So pervasive and established that the site name itself has become a verb as much as a noun in our modern day lexicon of online speech. Internet users now not only go to Google, but they google – which means they search the web.

http://www.google.com

If you've explored the websites above and still haven't found the answer you're looking for, remember you can send your monitoring and law stories and questions by mail or e-mail right here to *Monitoring and the Law*.

Disclaimer

Information in this column is provided for its news and educational content only. Nothing here should be construed as giving specific legal advice. Persons desiring legal advice about their specific situation should consult an attorney license in their jurisdiction.

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Less -$320 Instant Rebate / Special $179.95

300 Channels • 10 banks • Built-in CTCSS • S Meter

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The Bearcat 895XLT is superb for intercepting trunked analog communications transmissions with features like TurboScan™ to search VHF channels at 100 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a Signal Strength Meter, RS232C Port to allow computer-control of your scanner via optional hardware and 30 trunking channel indicator annunciators to show you real-time trunking activity for an entire trunking system. Other features include Auto Store - Automatically stores all active frequencies within the specified bank(s). Auto Recording - Lets you record channel activity from the scanner onto a tape recorder. CTCSS Tone Board (Continuous Tone Control Squelch System) allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning pleasure, order the following optional accessories: **PS001** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; **PS002** DC power cord - enables permanent operation from your vehicle fuse box $14.95; **MB001** Mobile mounting bracket $14.95; **EX711** External speaker with mounting bracket & 10 feet of cable with plug attached $19.95. **CAT895** Computer serial cable $29.95. The BC895XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, EDACS, ESAS or LTR systems.

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Trunk Lockout • Trunk Delay • Cloning Capability
10 Priority Channels • Programmed Service Search
Size: 2 1/2" Wide x 1 3/4" Deep x 6" High

Frequency Coverage:
29.000-54.000 MHz., 108-174 MHz., 406-512 MHz., 806-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

Our Bearcat TrunkTracker BC245XLT is the world's first scanner designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. Our scanner offers many new benefits such as Multi-Track - Track more than one trunking system at a time and scan conventional and trunked systems at the same time. 300 Channels - Program one frequency into each channel. 12 Bands, 10 Banks - Includes 12 bands, with aircraft and 800 MHz. 10 banks with 30 channels each are useful for storing similar frequencies to maintain faster scanning cycles or for storing all the frequencies of a trunked system. Smart Scanner - Automatically program your BC245XLT with all the frequencies and trunking talk groups for your local area by accessing the Bearcat national database with your PC. If you do not have a PC simply use an external modem. Turbo Search - Increases the search speed to 300 steps per second when monitoring frequency bands with 5 KHz. steps. 10 Priority Channels - You can assign one priority channel in each bank. Assigning a priority channel allows you to keep track of activity on your most important channels while monitoring other channels for transmissions. Preprogrammed Service (SVC) Search - Allows you to toggle through preprogrammed police, fire/emergency, railroad, aircraft, marine, and weather frequencies. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in your scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - An LCD light remains on for 15 seconds when the back light key is pressed. Autolight - Automatically turns the backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BC245XLT automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BC245XLT also works as a conventional scanner. Now it's easy to continuously monitor many radio conversations even though the message is switching frequencies. The BC245XLT comes with AC adapter, one rechargeable long life ni-cad battery pack, belt clip, flexible rubber antenna, earphone, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, ESAS or LTR systems. Hear more action on your radio scanner today. Order on-line at www.usascan.com for quick delivery. For maximum scanning satisfaction, control your Bearcat 245XLT from your computer running Windows. Order Scancat Gold for Windows, part number **SGFW** for $99.95 or the surveillance enhanced version with audio recording part number **SGFWSE** for $159.95.

More Radio Products

Save even more on radio scanners when purchased directly from CEI. Your CEI price after instant rebate is listed below:

Bearcat 895XLT 300 ch. Trunktracker I base/mobile scanner	$179.95
Bearcat 785D 1,000 channel Trunktracker III base/mobile	$339.95
Bearcat BCI25D APCO Project 25 digital software card	$299.95
Bearcat 278CLT 100 ch. AM/FM/SAME WX alert scanner	$139.95
Bearcat 250D 1,000 ch. Trunktracker III handheld scanner	$339.95
Bearcat 245XLT 300 ch. Trunktracker II handheld scanner	$189.95
Bearcat 248CLT 50 ch. base AM/FM/weather alert scanner	$84.95
Bearcat Sportcat 200 alpha handheld sports scanner	$159.95
Bearcat Sportcat 180B handheld sports scanner	$139.95
Bearcat 80XLT 50 channel handheld scanner	$99.95
Bearcat 60XLT 30 channel handheld scanner	$74.95
Bearcat BCT7 information mobile scanner	$139.95
AOR AR16BQ Wide Band scanner with quick charger	$199.95
Sangean ATS909 306 memory shortwave receiver	$209.95
Sangean ATS818 45 memory shortwave receiver	$139.95
Uniden WX500 Weather Alert with S.A.M.E. feature	$39.95

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1,000 Channels • 20 banks • 50 Select Scan Channels
PASS channels: 50 per search bank + 50 for VFO search
Frequency step programmable in multiples of 50 Hz.
Size: 2 1/2" Wide x 1 3/8" Deep x 6 1/8" High

Frequency Coverage:
500 KHz to 823.995 MHz, 849.0125-868.995 MHz, 894.0125-2,040.000 MHz (Full coverage receivers available for export and FCC approved users.)

The AOR AR8200 Mark IIB is the ideal handheld radio scanner for communications professionals. It features all mode receive: WFM, NFM, SFM (Super Narrow FM), WAM, AM, NAM (wide, standard, narrow AM), USB, LSB & CW. Super narrow FM plus Wide and Narrow AM in addition to the standard modes. The AR8200 also has a versatile multifunctional band scope with save trace facility, twin frequency readout with bar signal meter, battery save feature with battery low legend, separate controls for volume and squelch, arrow four way side rocker with separate main tuning dial, user selectable keypad beep/illumination and LCD contrast, write protect and keypad lock, programmable scan and search including LINK, FREE, DELAY, AUDIO, LEVEL, MODE, computer socket fitted for control, clone and record, Flash-ROM no battery required memory, true carrier reinsertion in SSB modes, RF preselection of mid VHF bands, Detachable MW bar aerial. Tuning steps are programmable in multiples of 50 Hz in all modes, 8.33 KHz airband step correctly supported, Step-adjust, frequency offset, AFC, Noise limited & attenuator. Wide and Narrow AM. In addition to the standard modes. For maximum scanning pleasure, you can add one of the following optional slot cards to this scanner: **CT8200** CTCSS squelch & search decoder $89.95; **EM8200** External 4,000 channel backup memory, 160 search banks. $69.95; **RU8200** about 20 seconds chip based recording and playback $69.95; **TE8200** 256 step tone eliminator $59.95. In addition, two leads are available for use with the option socket. **CC8200A** personal computer control lead $109.95; **CR8200** tape recording lead $59.95. Includes 4 1,000 mAh AA ni-cad batteries, charger, cigarette lighter adapter, whip aerial, MW bar antenna, belt hook, strap and one year limited AOR warranty. For fastest delivery, enter your order on-line at http://www.usascan.com.

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PUBLIC SAFETY

Wisconsin Jammer

Rajib Mitra, 25, a former graduate student from Brookfield, Wisconsin, was found guilty in federal court of two counts of intentionally blocking police radio last year. Meredith York, one of the officers who often patrols the streets alone said in testimony, "The radio is a tool more important than my handgun."

The radio Mitra built was suspected of disrupting police radio system nearly two dozen times last year – often with recorded pornographic sounds that forced police to turn down their radios if the public was nearby. Mitra is to be sentenced May 12th: the maximum penalty is 20 years.

EMERGING TECHNOLOGY

BPL

Broadband over Power Lines technology is not a new idea, but serious testing began in the U.S. two or three years ago. Over a year ago there were at least a dozen private power and municipal utilities conducting trials of communications services over power lines.

So far we have heard of systems being tested by PEPCO (two trials, including one in Potomac, MD); Ameren Corp. (St. Louis, MO and IL); Pennsylvania Power & Light (town of Emmaus); and three systems announced as active: Manassas City, VA; Current Communications Group (Cincinnati, OH, and KY and IL suburbs), and Progress Energy (Wake County, NC).

MT welcomes reports of new systems activated and of the effect on shortwave from BPL systems. (See this month's *Closing Comments.*)

RFID

Some tiny radio signals will have a big effect on the way we shop – thanks to a huge nudge from the Department of Defense and Wal-Mart. Radio identification systems use electronic readers to retrieve digital data stored in microchips embedded in plastic product tags, with metal grids around the chip that serve as an antenna.

RFID tags are already being used in security badges and anti-theft, inventory control, and automatic highway toll collection systems. The Defense Department and WalMart both intend to use the system to facilitate inventory control and tracking of shipments. Using RFID, whole pallets of crates can be read instantaneously, as they do not require line of sight like bar codes.

Wal-Mart's aggressive roll-out has been scaled back a few months due to some hurdles even Wal-Mart and the DoD haven't overcome, such as the fact that products wrapped in metal foil deflect radio waves and liquids bend them; the cost of the tags is still too high for many low-profit products; and the lack of agreement on an industry standard is slowing full-scale production.

The first test for WalMart's system is scheduled to take place at a distribution center in Dallas, Texas, in April. By January 2005, WalMart hopes the "smart tag" program will involve all of Wal-Mart's 25,500 suppliers and the 3.7 billion crates they ship annually.

FCC Okays RFID Power Boost

Radio Frequency ID tags are increasingly used as security tags on shipping containers. The FCC concluded that existing rules unnecessarily limit the range of the tags and the speed and amount of data that can be transmitted and voted to allow longer and more powerful radio transmissions to and from the tags – changes that will allow the contents of containers to be more quickly identified.

To avoid interference, the new rules would restrict the use of the new tags within about 25 miles of government radar sites.

Jacksonville Airport RFID Test

Speaking of radar, Jacksonville International Airport will be one of the first in the country to track luggage with radio frequency identification tags, which officials believe will increase security and help reduce the number of lost bags. (Presumably these will be of the low-power type, with aviation radar nearby?)

The system is supposed to be installed by the fall, in time for February's Super Bowl in Jacksonville and the accompanying crush of travelers expected to use the airport, said Chip Snowden, chief operating officer of the Jacksonville Airport Authority.

No-Swipe Credit Cards

For more than a year, MasterCard and American Express have been testing "contactless" versions of their credit cards, using RFID. The cards need only be held near a special reader for a sale to go through – and the consumer can still get a receipt.

American Express's ExpressPay uses a keychain fob; MasterCard's PayPass comes on a regular-sized card that also has a magnetic stripe for swiping if need be.

The Future and Privacy Concerns

Potential uses for RFID chips, besides inventory control or consumer purchases, include such applications as a shirt with a smart tag which tells your smart washing machine to set the cycle for permanent press; a carton of milk warns when its expiration date has passed and adds itself to an electronic shopping list; a bottle of pills tracks your doses and warns against mixing it with another medicine.

These and other scenarios using radio frequency identification chips are possible, but only if privacy concerns are addressed and the technology becomes cheap and ubiquitous.

Demonstrations by Consumers Against Supermarket Privacy Invasion and Numbering, known as Caspian, already caused a German grocery store to stop using the RFID chips, and prevented a clothing retailer from putting them in some apparel.

Senator Prick Leahy of Vermont has called for a national debate on whether and where to draw privacy protection lines in the use of RFID tagging.

AMATEUR RADIO

FCC Proposes Broad Changes

April 15th, the Federal Communications Commission released an "omnibus" Notice of Proposed Rule Making (NPRM) that combined a number of unrelated proposed rule changes. Comments on the proposals put forth in ET Docket 04-140 are due by Tuesday, June 15, with reply comments by Wednesday, June 30.

Among other changes, the FCC has recommended adoption of the Amateur Radio Relay League's "Novice refarming" plan, in which "no licensees would lose any spectrum privileges and ... General, Advanced, and Amateur Extra Class licensees would gain spectrum for phone emissions, one of the most popular operating modes on the HF bands."

The FCC also proposed essentially eliminating its rules prohibiting manufacture or marketing of Amateur Radio Service power amplifiers capable of operating in the Citizen's Band (CB).

In response to an ARRL petition, the FCC proposed extending the bands available for spread spectrum experimentation and use to include 222-225 MHz. On its own initiative, it also recommended including 6 and 2 meters for SS operation as well.

Other proposed rule changes concerned emergency operations, callsigns, remote control, rebroadcast of spacecraft communications, VE testing, and more.

The Commission ordered some changes in Part 97 without requesting or requiring comment. For example, the FCC ordered the revision of the definition of an "amateur operator" in §97.3(a)(1) to reflect that it is "not the possession of a license document but rather an entry in our Universal Licensing System (ULS) that determines whether a person is an Amateur Radio operator."

BULLETIN BOARD

June 5: Huntington Beach, CA
ASWLC monthly gathering, 12-4 pm at the home of Stewart MacKenzie-WDX6AA, 16182 Ballad Lane, Lane, Huntington Beach, CA 92649. Phone: 714-846-1685 Email: wdx6aa@earthlink.net.

June 20: Monroe, MI
Monroe County Radio Com Assoc hamfest at the Monroe County Fairgrounds (M-50 at Raisinville Rd 2 mi W of Monroe), Talk-in 146.72/12; 7:30am-1pm, $6 adm. Overnight camping ($20), refreshments, indoor facilities, distributors, trunk sales, and more. Contact Fred VanDaele KA8EBI, 4 Carl Dr, Monroe, MI 4812, 734-242-9487 after 5pm, ka8eb@arrlnet. http://www.mcrca.org/hamfest.htm

June 26-27: ARRL Field Day

COMMUNICATIONS

BROADCASTING

No One Here But the Cows

Early this year, WGN-AM in Chicago and WCCO-AM in Minneapolis dumped long-running farm programs that delivered weather and market news. Farm broadcasters who once covered local communities are now responsible for entire regions, and radio stations are using more syndicated farm programming. Local coverage, the kind farmers used to listen to in their tractors or during their midday meal, has all but disappeared.

Farmers are turning to the Internet for market quotes and using other technologies to get data and information, said Jim Evans, a retired professor of agricultural communications at the University of Illinois.

Though the biggest factor for the cuts has been the loss of major advertising revenue, some farm broadcasters prefer to see the changes as an evolution, not a decline. They point to farm news networks that are flourishing in the new climate.

Randy Rasmussen, who left a Clear Channel station in Iowa to work for the National Association of Farm Broadcasters, said, "It's like what happened to farmers. If you don't change, you don't stick around."

Cow-a-bunga!

But WSNJ isn't changing its winning format. Located in Bridgeton, New Jersey, this station that time forgot now qualifies as "country nostalgia": polka, school lunch menus, farm reports, hunting and fishing news and pet advice. One of the most popular slots is a call-in show called "Country Store," during which people try to sell three-quarter-ton pickup trucks, tractors and, at least once, a cow.

The family that nurtured WSNJ for more than 50 years is selling. The much-sought FM license will go to Radio One (for a reported $35 million). That hip, urban-oriented company intends to move the operation north to Pennsauken, where it can broadcast across the Delaware River to a bigger and more lucrative Philadelphia audience.

The AM side is being sold to Jim Quinn, mayor of nearby Millville, who owns another area radio station, but he says the operation is too successful to change or move. In fact, Quinn says he is tired of trying to compete with the formula. He will keep WSNJ-AM's format virtually as is and will extend its reach by simulcasting with his other station, abandoning that station's format entirely. Quinn said people have been coming up to him to thank him for that.

No One Hears but the Cows

Dean M. Anderson is a Cow Whisperer. His colleagues call him Sky Rider because he rounds up cattle with the help of Global Positioning System (GPS) signals coming from satellites. His research is being conducted on the Jornada Experimental Range – a research ranch one-fourth the size of Rhode Island and the Agricultural Research Service's largest field station.

In the arid Southwest, fences aren't practical for rotating cattle grazing areas, where a cow may have to graze more than 640 acres to get enough grass in a year. But using his locator/controller cow collar as an electronic version of the cowboy's "gee" (go right) and "haw" (go left), Anderson has created a "virtual fence."

Anderson explains: "It is desirable to administer the sound cues when the animal is moving. As a foraging animal approaches a virtual fence line and passes a programmed point, it activates sound cues to the animal's right or left side. Software in the device mathematically determines to which side the cues should be applied, based on the animal's angle of approach to the virtual fence line. Since animals tend to move away from startling sounds, if we want the animal to move left, we'd give the cues to the right side, and vice versa."

Cows must be moved to meet their nutritional needs, to avoid overgrazing, and to exclude them from sensitive landscapes or poisonous plants.

Anderson is also having success mixing sheep and goats which have been "bonded" to cattle (it's called a "flerd"). The cattle drive off coyotes and stray dogs which prey on the sheep. The flerd tends to distribute itself more evenly over the pasture, and sheep will feed on plants passed over by the cattle. Since cows follow leaders, and bonded sheep and goats follow cows, Anderson envisions needing the virtual fence device only on the leaders.

Anderson makes it clear he isn't advocating an end to conventional fences. "Fences that mark property boundaries or protect the health and safety of people or livestock should not be replaced with virtual fences," he says. "But for management of vast acreages, eliminating internal fences may be ecologically and environmentally judicious."

ARS National Program (#205) at **http://www.nps.ars.usda.gov**.

OBITUARIES

A whole generation of pioneers in technology is rapidly passing away. There is no way we can acknowledge them all, but we occasionally mention some that caught our readers' attention.

Joseph James Zimmermann Jr., not only invented the telephone answering machine, but also invented a system used by airports to send out landing information to planes 24 hours a day (we assume this is ATIS). Zimmermann owned dozens of other patents, covering such inventions as emergency dialers, and a magnetic recorder used to monitor heart patients. Zimmerman died March 31 in Elm Grove, Wisconsin, at the age of 92.

Marianna Woodson Cobb, was a rare female radio and television engineer who could do calculus in her head. She scaled the tower atop the Empire State Building in the early 1950s to help set up a multi-structure antenna that would allow five television and three radio stations. With irony and good humor Cobb received an award from the Washington area chapter of the Broadcast Pioneers in 1991; the plaque bore her name and honored "his" contributions to broadcasting. She lived in the Washington DC area and died Jan. 15 at age 79.

Oswald Garrison Villard Jr., a pioneer in the development of radar able to see over the horizon, parlayed his youthful interest in radio into advanced research with military and other uses, including "stealth" technology to stop radar from bouncing back from aircraft. In the 1980's, Dr. Villard designed an inconspicuous antenna that could wipe out signals that jammed communications, allowing people in many countries to receive Voice of America radio programs.

We recall that Dr. Villard wrote an article many years ago for *Monitoring Times* on mediumwave DXing using a loop antenna and turntable. Dr. Villard died on Jan. 7 in Palo Alto, Calif. He was 87.

"Communications" is compiled by editor Radio Baughn from newsclippings contributed by our readers. Many thanks to this month's intrepid reporters: Anonymous, NY; Sterling Marcher, CA; Doug Robertson, CA; Brian Ragers, MI; James Rustik, WA; and via email, Anonymous, Ian Abel G3ZHI, Chanel Cordell, Bob Kozlarek WA2SQQ, John Mayson, Fred Moore, Jerry None, Michael Reynolds, Doug Smith, Larry Van Horn, Ed Yeary W4TEY

RADIOS AND RACING

By Ron Walsh VE3GO

Photos by Ron Walsh

This is a timed fuel stop! Paul, you're five seconds ahead of Bruno! Car 5 is off in corner three. We're going to adjust the shock rebound. Go! Go! Go!

Whether you are a fan of Champ Car racing, the American Le Mans series, NASCAR, or your local racetrack, it is always exciting when the new race season starts. Like myself, you are probably checking your gear in advance of the first race. My kit always includes my camera, film, extra lenses, autograph book, some " Sharpies," and, of course, my scanner.

No matter what series you follow, you can get a great deal more information and enjoyment if you have your scanner along. I have been a pass control marshal at the Molson Indy Toronto for 14 years. When I started I was the only worker to have a scanner. Now, most of the people on corner one have a scanner on their hip!

The scanner allows you to know more of what is happening on the track, in the pits and with the officials. Especially since the noise level at most events often makes the track announcers inaudible during parts of the event.

Equipment Needed

At most major races, there is some kind of radio coverage for the track announcers. A simple AM/FM radio will add to your enjoyment. For instance, Mosport International Raceway uses a low powered AM transmitter on 1590 kHz, while the Indy Toronto will use a local FM radio station for coverage. These frequencies are available in the official program.

To listen to the drivers, officials, etc., you will need a scanner. At the present time the signals are all analog and very few are scrambled. At larger races, some commercial radio suppliers rent scanners and earphones. This might be a good idea for the first time user before you spend the money for a scanner. They even rent adapters so you can have more than one headset running off the same scanner.

However, if you enjoy using the scanner, it quickly becomes economical to buy your own scanner. Be sure to check out Grove Enterprises or advertisers in *Monitoring Times* for a good buy! If you're in doubt which is the best model for your application, experienced order staff will be glad to help you narrow down the choices, but here are some of the features you need to look for.

Your scanner must cover the VHF high band (138 to 174 MHz), the UHF band (450 to 470 MHz) and should cover 850 to 870 MHz. Most of the communications at major race events are in the 450 to 470 MHz range. There are a few teams that do use the 850 MHz range. Penske Racing used this for their Champ Car Team. Some of the smaller local tracks still use VHF High frequencies to control the activity.

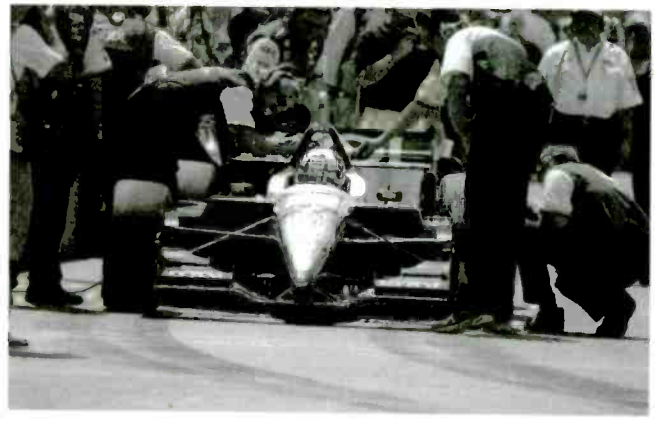
A scanner with 20 channels will do if you are monitoring only a few frequencies, but I suggest a scanner with at least 100 channels. We'll see why when we look at programming the radio.

Always be sure to carry extra batteries for your radio. If your scanner uses AA or AAA batteries, have an extra set of rechargeable batteries or alkaline cells available. You will use the scanner a lot and it is frustrating to run out of power during the event. Always recharge your battery fully before each day at the track.

One problem at racetracks is that the frequencies allocated are often also used by local businesses. Thus you may have interference on certain channels. Some times, even the "Rubber Duck" antenna gives too much signal strength. Various suppliers have a race antenna that is a very short, low gain antenna. This will allow you to hear the race but not the local business traffic. After all, the race is far more exciting than local deliveries!

One good trick is to take the antenna completely off your scanner and see what you can hear. At an oval track you may hear all the traffic even without the antenna. If you go to a road race circuit, a longer antenna or antenna with more gain may be needed. These circuits (e.g., Mosport, Watkins Glen, Elkhart lake) are usually further away from major cities and you will find less local interference. The teams often use repeaters for communication and you can hear most parts of the circuit. Be sure to program the output frequency of the repeater. (For our beginning readers a repeater has an input frequency and an output frequency. Usually the input is 5 MHz below the output frequency in the 450 MHz range.)

Racetracks are noisy (an understatement!), so some sort of earphone or headset will be



necessary. You can start with a normal small earphone. Some people use a noise protector like you would use in a noisy industrial environment to cover their ears and the earphone. This is okay, but you will soon want a scanner headset. I have seen some for as little as $20. This will block out some of the noise to protect your ears while transmitting audio. There are very good noise reduction headsets that are similar to what the drivers and crews wear. They cancel out a great deal of the outside noise, but do cost a lot more. If you use your scanner at a lot of races then the investment is worthwhile.

With your scanner, headset and a frequency list, you are ready to " start your engine!"

Frequencies and Traffic

The vast majority of cars, crews and officials are using radios in the 450 to 470 MHz range. You can find most frequencies by searching this range. I suggest you search in 5 MHz segments and record the active channels. You can later program in what you want to listen to. However, frequency lists are available at most major races. They are often provided by the promoter or the people selling and renting scanners. They are sometimes free or sold at a minimal cost.

You can get some good lists from the websites for the various series. (At some major events, some of the commercial suppliers even broadcast the up-to-date radio frequency list over their own UHF frequency.) These are good as a beginning, but some frequencies change due to local frequency use. The official program for the event also is a good source for radio frequencies.

I have included a general frequency list for race organizations. They usually do not change much from year to year, so keep your list from the last race as a good starting point for the next event.

You will also hear some media frequencies. The announcers and camera crews use the same frequency band and they are often interesting to listen to. You hear the off air comments as well as the actual race feed.

The frequencies for the race sanctioning body are also very informative. Again, they are usually in the same frequency band and are easily found by searching. Race Control, Timing, track officials and the Safety team can be heard. It is informative to know what is happening, when a caution will end, etc.

Of course the best source of frequencies is another fan with a headset and a scanner. I have had many discussions with people and shared a lot of information. In fact, I have shared information with officials and even programmed a few team radios

There is always a trailer for the race sanctioning body (NASCAR, OWRS, NHRA, Dirt etc.) A polite request of the people there usually gets the control frequencies for the race.

The best time to look for frequencies is during practice and qualifying. The radio traffic is very interesting and informative. You know what the team is adjusting and when they will try for a fast lap, etc. Also, there are fewer cars on the track and you can soon see which frequency belongs to which car.

Programming Your Scanner

There are a few tricks to programming your scanner. First of all, know the car numbers! When you find the frequency for Paul Tracy, Jeff Gordon or your favorite driver, program that frequency in the channel that corresponds to the car number. When the channel become active you know which car it is.

If you have priority channels, use one of them for the race control frequency. You can shift there if something happens on the track. If you have more than one priority channel, you can set these for your favorite teams, etc.

Use a separate bank for the media frequencies, as they are on all the time.

Once you have selected all the frequencies you want, use the empty channels in the banks to program your favorite frequencies several times. This effectively increases the scanning rate and you avoid missing the radio traffic important to you.

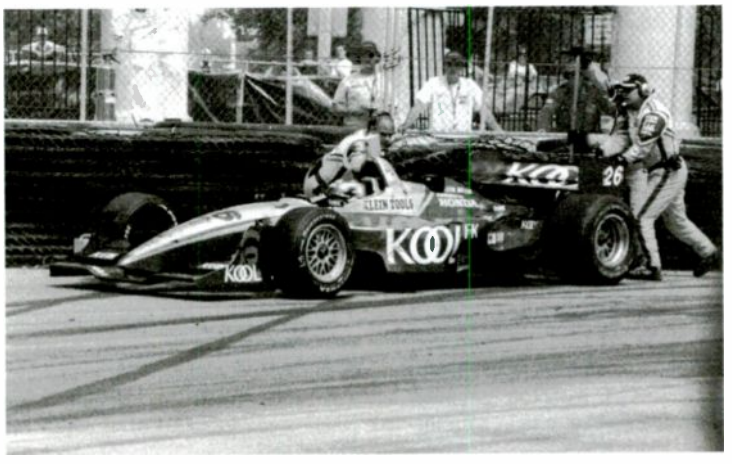
Just before the race starts, you can check your programming as all the teams and drivers test their communication system.

I hope this allows you to start using your scanner at the track and get more enjoyment from racing events. If any of the readers do attend the Molson Indy Toronto, we will be in corner 1 again this year.

Frequency List

(This is a guide as some channels may vary at each event)

American Le Mans Series	
Race Control	461.625
Corner Workers	462.725, 467.725
Other channels	467.025, 462.5625, 464.525, 467.1375, 451.225
NHRA	
Strip Control	461.075
Staging Area	464.500
Safety Safari	461.825
Officials	464.550, 461.625
Trans-Am Series	
Race Control	452.9375
Other channels	464.775, 469.775, 467.750
NASCAR	
Channel 1	464.500
Channel 2	464.775
Channel 3	464.900
Channel 4	469.500
Channel 5	462.025
Channel 6	463.850
Scoring	467.800
Inspectors	468.850
Champ Car World Series (CART)	
Race Control	457.0125, 457.1875
Safety	451.7875
Pace Cars	451.525
Other freq.	463.9375, 451.8125
TV/ Radio (450.0375 to 450.950)	
ESPN	450.150, 451.250
ABC	455.1125
CBS	455.650, 450.8
MRN	454.000



Who Uses All Those Frequencies?

A Record of VHF Aircraft Band Usage from South Louisiana

By Thomas F. Marcotte, N5OFF

Seven hundred and sixty frequency channels sounds like a bunch. But when you start to add up all of the users, it soon gets crowded.

My attempt to log all of the 760 VHF AM aircraft frequencies started small. I've been listening to VHF aircraft for about 25 years. When I got my Bearcat 220 back in 1981, I was finally able to program specific frequencies and listen to exactly what I wanted. First, I started to catalog local frequencies, tower, approach, etc. Then I began hearing this Houston Center outfit. They sure had a bunch of frequencies. It wasn't until I became a pilot that I appreciated the significance of them all.

Suffice it to say that the scraps of papers with frequencies soon started to add up. I started keeping a more durable record of all the frequencies that I confirmed. The record went in to a three ring binder that I have been keeping for over twenty years. Many of the frequencies I've captured are unchanged in all that time.

From Innocent Beginnings ...

My first effort at logging every channel in a VHF-AM band segment was in the 128.825 MHz to 132.000 MHz company aviation sub-band. In this sub-band are the private communications which take place between aircraft and their operators. Included are airlines, small fixed base operators (FBOs), and other aviation companies. Most frequencies are licensed to Aeronautical Radio Incorporated (ARINC), a private company which then coordinates the operation of the radio stations for the end users.

Because most licenses are held by ARINC, it is not always easy to figure out who the real user is. Listening and logging is the best way. ARINC occasionally makes frequency changes for the end users, so you have to keep on your toes to keep with the current users.

After a few years of logging this sub-band from my QTH in south Louisiana I was able to identify the users of nearly all of the 127 channels in the 128.825-132.000 MHz sub-band in my area. Most were licensed, but some were not. I decided, what the heck, I'll tackle the whole band, 760 channels worth.

One reason that I wanted to record all the documented users was to make it easier to hunt down the, shall we say, *undocumented* users. My current equipment includes a Icom R-7000, Uniden BC 780XLT, a laptop computer and ARC780 control software to help with the task.

I began to write down all of the approach and center frequencies that I could copy. Since all aircraft above 18,000 ft are required to be under instrument flight rules (IFR), the list of frequencies for high flying jets soon grew large, including loggings from Houston, Fort Worth, Memphis, Jacksonville and Atlanta Centers.

To this list, I also added known ground stations that I perhaps could not copy, but from various resources knew were there, and that a high flying aircraft could copy if it were in my area, such as Automatic Terminal Information Services (ATIS), distant control towers, etc. A jet at high altitude can copy a ground station from about 250 miles out. I reasoned that aircraft such as fighters, Customs jets (or drug smugglers) would be unlikely to select any tactical frequency that was in use by an assigned station for at least 250 miles, as this assigned station would be a nuisance to their flight operation, legitimate or otherwise.

The 250 mile rule gets doubled when one considers that a high flying jet 250 miles from your station may be calling a station that is 250 miles the other side of his position relative to yours, giving the total distance of coverage (end to end) of 500 miles. From my location on the Gulf Coast, I decided my "area of interest" is defined by a realistic radius of about 300 miles (see map). This is a huge area, and includes many major cities with airline, government and military operations.

FAA Frequency Coordination

The reader may notice from the frequency list below that frequencies used for air traffic control are nearly exclusive to a given area. This is because the FAA performs strict frequency coordination of the frequencies which fall under their control, those being air route traffic control centers (ARTCC), local control (airport towers and approach/departure) and transmit only facilities (automatic terminal information services or *ATIS*, etc).

In the contiguous United States, center frequencies are typically separated by hundreds of miles. This allows for only a handful of facilities to use the same frequency, and is a function of the altitude of the user. Airport towers and approach controls are generally used by aircraft at less than 18,000 feet, so frequency assignments are separated by lesser distances.

Here is an example of careful frequency coordination. Albuquerque Center has a frequency used for ultra high flying jets (up to 60,000 ft or FL 600) of 133.725 MHz. The FAA has only assigned this frequency to two other locations sufficiently far away. One is Kansas City Center, the other Washington D.C. Center. Three assignments for the whole country gives assurance that the high flying jets won't hear interference, unless it is an un-coordinated user.

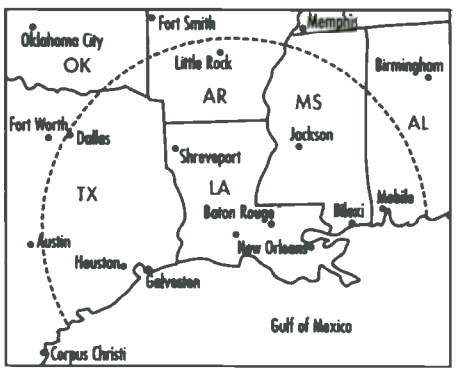
If a clandestine user or government agency was searching for a frequency to use for use for "private" communications, one of these Ultra High use ARTCC frequencies might be a tempting choice, provided the operations were at low enough altitude and greater than 300-400 miles from the FAA's assigned user. This is a good example of why monitoring frequencies which are not assigned in your local area might still yield some interesting communications.

Shooting for DX

It's quite easy to hear airliners within your home ARTCC sector. For example, my location or QTH is right in the middle of Houston Center's ARTCC area. When I listen to Houston Center frequencies, the traffic is nearly nonstop because it is so busy on the dozens of frequencies assigned.

What I like to do sometimes is load a program with only distant ARTCC frequencies in it, excluding those from Houston Center. I'll upload frequencies from Atlanta, Memphis, Jacksonville and Fort Worth Centers. Naturally these won't be heard as frequently as the home ARTCC, but it is a good way to capture only high flying flights. It's not uncommon to hear high flying jets above flight level 410 (41,000 feet) since this great height is required to reach my QTH. The FAA has done such a good job of frequency coordination that interference is rarely heard, and if it is, it is also DX (or else clandestine).

While I was not able to document the use of every one of the 760 frequencies, I was able to



come up with some interesting oddballs. A few examples are:

MHz	
118.675	Pirate seaplane operations, Louisiana coast
120.000	Customs air-air (FAA calls for no aircraft transmit on this freq, AWOS only)
120.325	US Customs air to ground, Hammond (callsign Bushwacker), LA.
120.375	DEA Houston (calling Flint)
120.375	US Marshals (callsign Justice), Alexandria, LA
123.050	Hurricane hunters air to air
123.125	NASA T-38 operations air to air and Houston Ops.
122.225	F-16's working ranges in Mississippi (Buddas)
122.850	NASA Redstone, Huntsville, AL
123.350	Lightship blimp ops and vehicles
123.525	Navy student pilots, Pensacola
129.475	Enron jets, Houston (possibly gone now after Enron debacle)
135.775	Pirate helicopter "private" channel
135.975	Fish spotters "private" channel

A good place to snoop for interesting comms might be the guard band around the emergency guard frequency of 121.5 MHz. However, I believe frequent use of one of these frequencies by clandestine operations might bring down the wrath of the authorities, as this band is monitored by satellites for emergency traffic.

The compiled list of accounted-for frequencies in my 300 mile radius is shown below. The channels are assigned every 25 kHz, so if you see one or more channels blank, it could be a good place to look for "unusual" aircraft operations. There are lots of holes in the new 136.000 to 136.975 band (Larry Van Horn loves these holes!). I've scanned all frequencies in the sub-band for days and days, and have only the few hits shown in the list.

The FAA has recommended that law enforcement operations move up from their two assigned VHF frequencies (unlisted by FAA but I believe to be 120.325 MHz and 120.375 MHz). So this is a good place to search for relocated government agencies, but I haven't heard anything of the sort yet.

Unused Frequencies

I keep a computer file filled entirely with unlogged frequencies for an occasional dump into the scanner. This is a good way to log new ones, but they are getting more difficult to find at this stage of the search. Days may go by before a hit is noted, and then sometimes it is simply the pilot transmitting on the wrong frequency, making one think there is a new hit, but it's just a frequency error made by the pilot.

This can be a fun hunt. While not all of the 760 available channels are in use in my part of the country, I'd be willing to bet that in the New York or Los Angeles area many of the holes I see are filled with interesting comms. Happy hunting!

Airborne Transmitter Line of Sight Range

How does one calculate the radio range of an aircraft? On conventional VHF aircraft systems, the reliable range is limited by line-of-sight, or the distance from the transmit antenna to the receiving antenna which is unblocked by the horizon. VHF signals can't travel very far over the horizon, so this is generally considered to be the limiting factor.

Of course, other factors can influence the ultimate range such as transmit power, the gain of transmitting and receiving antennas, the selected frequency (as a general rule lower frequencies have lower losses), and the sensitivity of the receiver. Range up to 400 miles has been demonstrated by the high powered Over the Horizon system that Northup-Grumman's Park Air Systems has set up in China with high gain antennas and 250 watt transmitters (**http://www.parkairsystems.com**).

My rule of thumb for conventional low powered VHF systems is this:

Range (miles) = 1.26 * (altitude in feet) ^ 0.5

So to calculate your range in miles, take the square root of the height in feet, and simply multiply by 1.26. For example, an airliner at 41,000 feet could reach a ground station about 255 miles away. A NASA ER-2 at 80,000 feet can call its base from a distance of 356 miles. This range is additive for aircraft to aircraft coverage. Two ER-2's talking to each other from 80,000 feet can reach over 700 miles! This is HF kind of range on VHF frequencies. The table below may be used for reference for air to ground range.

This is why high altitude aircraft have radios with higher powered transmitters; the horizon is a lot farther away and the power is needed to reach it with sufficient signal strength to be reliably received. A light general aviation aircraft radio will typically be about 7 watts, while the radio in an airliner might be as high as 25 watts. The higher power of airliner radios is needed to overcome the free space losses due to the distance to the horizon, whereas 7 watts of power is generally enough to reach the horizon on a low flying aircraft.

Air to Ground Range

Height (ft)	Range (miles)
10,000	126
20,000	78
30,000	218
40,000	252
50,000	282
60,000	309
70,000	333
80,000	356

Abbreviations Used

ACARS ..... Aircraft Communication and Recording System
AFB ..... Air Force Base
ARINC ..... Aeronautical Radio, Inc.
APP/DEP .. Approach/Departure Radar Service
ARTCC ..... Air Route Traffic Control Center
ATIS ..... Automatic Terminal Information Service
AWOS ..... Automated Weather Observation System
COMMS ... Communications
CTAF ..... Control Tower Advisory Frequency
DFW ..... Dallas-Fort Worth Airport, Texas
FAA ..... Federal Aviation Administration
FBO ..... Fixed Base Operator
FCC ..... Federal Communications Commission

Tom's List of VHF Aeronautical Frequencies

MHz	Use as logged by author
118.000	Esler Tower - Alexandria, LA
118.025	Automated Weather Observation System - Bogalousa, LA
118.050	Acadiana Clearance Delivery - New Iberia, LA
118.100	George Bush Airport Tower - Houston, TX
118.150	Approach Control - Monroe, LA
118.200	Tower - Eglin AFB, FL
118.225	Ground Control - Derrider, LA
118.275	Automated Weather Observation System - Oakdale, LA
118.300	Regional Tower - Mobile, AL Clearance Delivery - Beaumont, TX
118.325	Automated Weather Observation System - Hammond, LA
118.350	Clearance Delivery - Houma, LA
118.375	Automated Weather Observation System - Bastrop, TX
118.400	Tower - Dothan, AL
118.450	Weather - Fort Polk, LA Ryan Tower - Baton Rouge, LA
118.475	Joe Williams Navy Outlying Field - Meridion, MS
118.500	Tower - Lafayette, LA
118.525	Automated Surface Observation System - Shreveport, LA
118.575	George Bush Airport Ground Control - Houston, TX
118.600	Approach Control - Shreveport, LA Approach Control - Pensacola, FL
118.675	Seaplane air-air frequency
118.700	Houston Hobby Tower - Houston, TX
118.750	Automated Terminal Info Service - Lake Charles, LA
118.775	Memphis ARTCC
118.800	Clearance Delivery - Ruston, LA
118.900	Approach Control - New Orleans, LA (Houma Area Remote)
119.000	Tower - Fort Polk, LA Approach Control - Pensacola, FL
119.025	Automated Weather Observation System - Shell Offshore
119.200	Approach Control - Meridian, MS
119.250	Clearance Delivery - Lake Charles, LA
119.275	Scholes Automated Weather Observation System - Galveston, TX
119.300	CTAF - Waco, TX
119.350	Approach Control - Lake Charles, LA
119.400	Ryan Clearance Delivery - Baton Rouge, LA
119.450	Automated Terminal Info Service - Gulfport, MS
119.500	Louis Armstrong International Airport Tower - New Orleans, LA
119.525	Automated Weather Observation System - Ruston, LA
119.550	Tower - Andalusia, AL
119.600	Mobile Downtown Tower - Mobile, AL
119.675	Reserved for Automated Terminal Information System
119.700	Departure Control - Houston, TX
119.725	Houston ARTCC - Lafayette RCAG, LA
119.750	Approach Control Offshore - Lafayette, LA
119.775	Automated Weather Observation System - Winnsboro, LA
119.800	Approach Control - Lake Charles, LA
119.875	Approach Control - Dallas/Fort Worth, TX
119.900	Lakefront Tower - New Orleans, LA Approach Control - Shreveport, LA
119.925	Reserved for Automated Weather Observation System
119.950	Ground Controlled Approach - Lafayette, LA
120.000	Customs Air-Air and Automated Weather Observation System
120.050	Approach Control - Houston, TX Approach Control - Pensacola, FL
120.100	Approach Control - New Orleans, LA
120.125	Reserved for Automated Weather Observation System
120.200	Automated Terminal Information Service - Texarkana, TX
120.225	Shreveport Downtown CTAF - Shreveport, LA
120.250	Automated Terminal Info Service - Houma, LA
120.300	Approach Control - Baton Rouge, LA
120.325	Immigration and Customs Enforcement Victor - Hammond, LA [Callsign: Bushwacker]
120.350	Houston ARTCC - Gulf of Mexico IFR Helicopters
120.375	Deporment of Justice Operations - Alexandrio, LA [Callsign: Justice]
120.400	Houston ARTCC - College Station RCAG, TX
120.500	Approach Control - Meridon, MS
120.550	Atlanta ARTCC
120.600	Houston ARTCC - San Antonio RCAG, TX
120.625	Automated Surface Observation System - Jackson, MS
120.650	Approach Control - NAS Pensocola, FL
120.700	Tower - Lake Charles, LA
120.725	Tower - Keesler AFB, MS
120.800	Houston ARTCC - Decatur RCAG, AL
120.900	Tower - Jackson, MS
121.050	Automated Terminal Information Service - Jackson, MS
121.100	Approach Control - Lafayette, LA

121.250 Automated Terminal Information Service - Pensacola, FL
121.300 Approach Control - Beaumont, TX
121.350 Approach Control Remote Site - Lafayette, LA
121.400 Tower - Whiting, FL
121.450 Guard Band, No Communications
121.475 Guard Band, No Communications
121.500 Guard/Civilian Emergency
121.525 Guard Band, No Communications
121.550 Guard Band, No Communications
121.600 Ground Control - NAS New Orleans, LA
Ground Control - Ellington AFB, TX
121.650 Chennault International Ground - Lake Charles, LA
Clearance Delivery - Monroe, LA
121.700 Ground Control - New Oberia, LA
121.750 Russian spacecraft downlink (FM)
Dallas Love Ground Control - Dallas, TX
121.800 Ground Control - Lafayette, LA; Lake Charles, LA; Barksdale AFB, LA; Keesler AFB, MS; Polk AAF, LA
121.900 Houston Hobby Ground Control - Houston, TX
Ryan Ground Control - Baton Rouge, LA
121.975 Flight Service Stations
122.000 Flight Service Stations National Flight Watch
122.025 Flight Service Stations - Derrider Radio, LA
122.050 Flight Service Stations - TX
122.075 Flight Service Stations
122.100 Flight Service Stations
122.125 No FSS assignments
122.150 Flight Service Stations - Montgomery County Radio, TX (Galveston, TX Remote)
122.175 No FSS assignments
122.200 Flight Service Stations - Montgomery County Radio, TX
122.225 Mississippi Military Ranges - 187FW/160FS Air-to-Air Montgomery Regional (Dannelly Field), AL
122.250 Flight Service Stations - Derrider Radio, LA (Offshore Remote)
122.275 Mississippi Military Ranges - 187FW/160FS Air-to-Air Montgomery Regional (Dannelly Field), AL
122.300 Flight Service Stations - Derrider Radio, LA (Lakes Charles, LA Remote)
122.350 Flight Service Stations - Derrider Radio, LA (Lafayette, LA Remote)
122.375 No FSS assignments
122.400 Flight Service Stations - Montgomery County Radio, TX
122.425 No FSS assignments
122.450 Flight Service Stations - Unknown location
122.500 Flight Service Stations - Montgamery County Radio, TX
122.550 Flight Service Stations - Deridder Radio, LA (Alexandria, LA Remote)
122.575 No FSS assignments
122.600 Flight Service Stations - Derrider Radio, LA (Offshore Remote)
122.625 Aircraft air-air frequency
122.650 Flight Service Stations - Montgomery County Radio, TX (College Station, TX Remote)
122.700 Unicom (LA Tech aviation grads calling school) - Ruston, LA
122.725 Chevron Texaco Helicopters - Gulf of Mexico
122.750 Unicom Air-Air Common
122.775 Chevron Texaco - Picayune MS
122.800 Unicom (uncontrolled airports) - numerous small airports
122.825 ARINC Airline Enroute
122.850 Multicom - NASA Redstone Operations - Huntsville, AL
Offshore Helicopters
122.875 ARINC Airline Enroute
122.900 Multicom - Shell Jet Center Chennault International - Lake Charles, LA
122.950 Unicom - Lafayette Aero, LA; Fournet's Pelican - New Iberia, LA, and numerous Fixed Base Operators (FBO)
123.000 Unicom - Opelousas, LA; Hammond, LA
123.025 Unicom - Immigration and Customs Enforcement - Hammond, LA
Chevron Texaco Helicopters - Leeville, LA
123.050 Unicom - Hurricane Hunters
Helicopter Advisory - Intracoastal City, LA
123.075 Unicom - Brenham, TX
Helicopter air-air frequency
123.100 Civil Air Patrol/Coast Guard Search and Rescue
123.125 NASA Operations - Houston, TX
123.150 Aircraft air-air frequency
123.175 Aircraft air-air frequency
123.200 Aircraft air-air frequency
123.225 Aircraft air-air frequency
123.250 Aircraft air-air frequency
123.275 Aircraft air-air frequency
123.300 General Aviation Services - Conroe TX
123.325 Aircraft air-air frequency
123.350 Military enroute aircraft/Lightship Blimp and ground vehicles
123.375 Aircraft air-air frequency
123.400 Helicopter air-air frequency/The Other Numbers
123.425 Helicopter air-air frequency
123.450 Aircraft air-air primary frequency/The Numbers
123.475 Northwest Base - Unknown location
123.525 Sabre Jets company aircraft air-air frequency/ Aerial photo planes
123.700 Approach Control - Fort Polk, LA/Tower - Gulfport, MS
123.725 Clearance Delivery - Pensacola, FL
123.750 Approach Control - Shreveport, LA
123.775 DFW Automated Terminal Information Service - Dallas/Fort Worth, TX
123.800 Departure Control - Houston, TX
NAS New Orleans Tower - New Orleans, LA
123.825 Houston ARTCC - Western Louisiana RCAG
123.850 Approach Control - New Orleans, LA
123.875 Military aircraft air-air frequency
123.900 Approach Control - Jackson, MS
124.050 George Bush Airport Automated Terminal Info Service - Houston, TX
124.150 DFW Tower - Dallas/Fort Worth, TX
124.175 Automated Weather Observation System - Alexandria, LA
124.200 Chennault Tower - Lake Charles, LA
124.300 Approach Control - New Orleans, LA
124.350 Approach Control - Houston, TX
124.400 Memphis ARTCC - Meridian RCAG, MS
124.425 Fort Polk, LA Range Control/Atlanta ARTCC
124.450 Approach Control - San Antonio, TX
124.475 Jacksonville ARTCC (Oceanic Control)
124.600 Houston Hobby Automated Terminal Info Service - Houston, TX
Approach Control - Biloxi, MS
124.650 Clearance Delivery - Shreveport, LA
124.700 Houston ARTCC - Lake Charles RCAG, LA
124.725 Houston ARTCC
124.775 Jacksonville ARTCC
124.800 Departure Control - Meridian, MS
124.825 Departure Control - Dallas/Fort Worth, TX
124.850 Approach Control - Beaumont, TX
124.900 Lakefront Automated Terminal Info Service - New Orleans, LA
124.925 Memphis ARTCC
125.000 Acadiana Tower - New Iberia, LA
125.025 Atlanta ARTCC - Jonesville RCAG, SC
125.050 Automated Terminal Information Service - Monroe, LA
125.100 Approach Control - San Antonio, TX
125.125 Departure Control - Dallas/Fort Worth, TX
125.150 Houston ARTCC - College Station RCAG, TX
125.175 Approach Control - Fayetteville, AR
125.250 Houston ARTCC - San Antonio RCAG, TX
Approach Control - Jackson, MS
125.300 Tower - Houma, LA
125.350 George Bush Airport Tower - Houston, TX
Departure Control - NAS Pensacola, FL
125.400 Approach Control - Fort. Polk, LA
125.450 Houston Hobby Clearance Delivery - Houston, TX
125.500 Approach Control - New Orleans, LA
125.550 Clearance Delivery - Lafayette, LA
125.650 Houston ARTCC - Austin RCAG, TX
125.700 Tower - Texarkana, TX
125.750 Houston ARTCC - Rock Springs RCAG, TX
125.775 Houston ARTCC - Mobile RCAG, AL
125.875 Atlanta ARTCC - Montgomery RCAG, AL
126.050 Ellington AFB Tower - Houston, TX
126.100 Houston ARTCC - Alexandria RCAG, LA
126.200 Military Towers - Nationwide
126.250 Clearance Delivery - Lake Charles, LA
126.300 Automated Terminal Information Service - Beaumont, LA
126.350 Houston ARTCC - Lafayette RCAG, LA
126.425 Houston ARTCC - Sealy RCAG, LA
126.450 Memphis ARTCC
126.475 Departure Control - Dallas/Fort Worth, TX
126.500 Approach Control - Baton Rouge, LA
Hulburt Field Tower, FL
126.550 Tower - Dallas/Fort Worth, TX
126.575 Fort Worth ARTCC - Crumby RCAG, TX
126.625 Enroute Flight Advisory Service [Flight Watch] Fort Worth ARTCC
126.725 Houston ARTCC - Laredo RCAG, TX
126.750 Houston ARTCC - Hattiesburg RCAG, MS
126.800 Atlanta ARTCC - Huntsville RCAG, AL
126.825 Houston ARTCC - Lacombe RCAG, LA
126.875 Approach Control - Monroe, LA
126.900 Houston ARTCC - Beaumont RCAG, TX
126.950 Houston ARTCC - New Orleans RCAG, LA
127.000 Approach Control - Fort. Polk, LA
127.050 Houston ARTCC - Columbus RCAG, MS
127.100 Houston ARTCC - Rockport RCAG, TX
127.200 Louis Armstrong Clearance Delivery - New Orleans, LA
127.300 George Bush Airport Tower - Houston, TX
127.350 Houston ARTCC - Austin RCAG, LA
127.375 Memphis ARTCC - Tupelo RCAG, MS Ultra High Sector
127.400 Lakefront Clearance Delivery - New Orleans, LA
127.425 Memphis ARTCC
127.500 Approach Control - Gulfport, MS
127.550 Louis Armstrong Automated Terminal Info Service - New Orleans, LA
127.650 Houston ARTCC - Mobile RCAG, AL
127.800 Houston ARTCC - Laredo RCAG, TX
127.825 Tower - Tyndall AFB, FL
127.850 Houston ARTCC - Alexandria RCAG, LA
127.900 Houston ARTCC - Lafayette RCAG, LA
127.925 Fort Worth ARTCC
127.950 Fort Worth ARTCC
127.975 Fort Worth ARTCC
128.000 Houston ARTCC - Palacious, TX/Atlanta ARTCC High Altitude Sector
128.025 Atlanta ARTCC
128.050 Approach Control - San Antania, TX
128.100 George Bush Airport Clearance Delivery - Houstan, TX
128.125 Atlanta ARTCC
128.150 Houstan ARTCC - Rackport RCAG, TX
128.250 Tower - Barksdale AFB, LA
128.275 Memphis ARTCC
128.300 Houston ARTCC - Kingsville RCAG, TX/Merida Center
128.325 Reserved for Automated Weather Observation System
128.375 187FW/160FS Air-to-Air Montgomery Regional (Dannelly Field), AL
128.500 Memphis ARTCC
128.550 Esler Automated Terminal Info Service - Alexandris, LA
128.600 Houston ARTCC - Laredo RCAG, TX
128.700 Approach Control - Lafayette, LA
128.725 Atlanta ARTCC
128.800 Sometimes mistaken for 122.8 small airport freq
128.825 Air Logistics Helicopters
128.850 Paul Fournet's FBO - Lafayette, LA (also 122.95 and 151.745 FM)
128.875 Petroleum Helicopters - Fourchon, LA/Canadian - Houston, TX
128.900 Air Logistics Helicopters - Houma, LA
128.925 American Eagle
128.975 Northwest/Petroleum Helicopters and Rotorcraft Leasing
129.000 American Maintenance - Dallas/Fort Worth, TX
129.025 Avitat - George Bush Airport Houston, TX
129.050 TACA/Air France/Cayman - George Bush Airport Houston, TX
129.075 Million Air - Lakefront Airport New Orleans, LA
129.100 Petroleum Helicopters - Lafayette, LA
129.125 NW Jet/Million Air - Houston, TX
129.150 Petroleum Helicopters - Intracoastal (Lafayette, LA Remote)
129.175 Air Midwest - New Orleans, LA
129.200 American Airlines - Fort Worth, TX/New Orleans, LA
129.250 Southwest Airlines
129.275 Pipeline Patrol air-air frequency
129.300 Louisiana Aircraft - Baton Rouge, LA
Continental-Air Canada - Houston, TX
129.325 American Airlines - Houston, TX
129.350 Pelican - New Iberia, LA
Houston Hobby Jet Center Houston, TX
Allegro - Fort Worth, TX
129.400 American Airlines - Houston, TX
129.425 UPS Control - Lafayette, LA (Remote)
129.475 Local radio shop tests - Lafayette, LA
Enron - Houston, TX (still active?)
129.500 Sky West - New Orleans, LA
129.550 Delta/ASA [Candler]/Skywest - Atlanta, GA
129.575 ERA Helicopters
129.600 Delta/ASA [Candler] - Baton Rouge, LA
129.625 Air Logistics Helicopters
129.650 Industrial Helicopters/Scott
129.675 Continental - Lake Charles, LA; Pensacola, FL; Dallas-Fort Worth, TX; Mobile, AL
129.700 American Airlines/Helicopters - New Orleans, LA
129.725 Delta Airlines
129.750 Air Mexico
129.775 Petroleum Helicopters
129.800 Continental - Houston, TX
129.825 Exxon Mobile
129.850 Air Logistics Helicopters
129.875 Aero Mexico
129.900 American Airlines
129.925 Continental - Lafayette, LA; New Orleans, LA
129.950 American Airlines - New Orleans, LA/Petroleum Helicopters
129.975 San Francisco ARINC Enroute
American Dispatch - Dallas/Fort Worth, TX
130.000 Multicom - Alexandria, LA
130.025 ACARS
130.050 Florida West Airlines
130.075 Petroleum Helicopters
130.100 Air Logistics Helicopters/KLM
130.125 Petroleum Helicopters
130.150 Fish Spotters
130.175 America West
130.200 San Francisco ARINC Enroute
130.225 Petroleum Helicopters - Houma, LA
130.250 Sun Country and Citrus - Gulfport, MS
130.275 American Airlines Dispatch - Fort Worth, TX
130.300 United Airlines - Houston, TX/Lakewood Hospital - Morgan City, LA
130.325 Petroleum Helicopters - Morgan City, LA
130.350 Industrial Helicopters
130.375 General Aviation - New Orleans, LA/Signature - Austin, TX
130.400 ERA Helicopters - Lake Charles, LA
130.425 Airline - Houston, TX
130.450 ACARS
130.475 British Airways - Houston, TX
130.500 Petroleum Helicopters
130.525 Continental - Jacksonville, FL
130.550 Shell Offshore/TACA
130.575 Rotorcraft helicopters/Raytheon - Houston Hobby Airport Houston, TX
130.600 Avianca/Allegro - Houston, TX/Jamaican - Houston, TX
130.650 Fish spotters
130.675 Petroleum Helicopters - Intracoastal City, LA

130.700 ARINC - Gulf of Mexico Enroute
130.725 Continental Maintenance - Houston, TX/Frontier - New Orleans, LA
130.750 Atlantic Aviation - Houston, TX/Evergreen
130.775 ERA Helos - Lake Charles, LA
130.800 Avioport - New Orleans, LA
130.825 Air Logistics Helicopters
Continental Ramp - George Bush Airport Houston, TX
130.850 Air Logistics Helicopters - Intracoastal City, LA
130.875 Air Shuttle - Shreveport, LA
Air Logistics Helicopters - Intracoastal City, LA
130.900 Air BP - Atlanta, GA
Continental Load Planning - Houston, TX
130.925 ERA Helicopter - Lake Charles, LA (Lafayette Remote)
130.950 Air Trans Airways [Citrus]
130.975 Air Trans Airways [Citrus]
131.000 Air Logistics - Intracoastal City, LA
131.025 Million Air - Houston, TX
Rotorcraft Leasing - Lafayette, LA Remote
131.050 Raytheon - Houston Hobby Airport, TX
131.075 ERA Helicopters - Lake Charles, LA
131.100 Air Logistics Helicopters
131.125 KLM - Houston, TX
131.150 Petroleum Helicopters
131.175 San Francisco ARINC Enroute
131.200 Continental - Memphis, TN
131.225 Executive Jet - Baton Rouge, LA
Southwest - Houston Hobby Airport, TX
131.250 Continental Flight Planning - George Bush Airport Houston, TX
131.275 Continental Ramp - Houston, TX
131.300 Air Logistics Helicopters - Intracoastal City, LA
131.325 Allegro - Dallas, TC
131.350 Petroleum Helicopters
131.375 Petroleum Helicopters
131.400 Transit Aviation - New Orleans, LA
131.425 ASA [Candler] - Lafayette, LA; Alexandria, LA
131.450 ASA [Candler] - Mobile, AL
131.475 ACARS
131.500 Air Mexico/Louisiana Offshore Oil Port
131.525 Fish Spotters
131.550 ACARS
131.575 ERA Helicopters - New Iberia, LA
131.600 Continental - Houston, TX
131.625 DHL - Houston, TX
131.650 San Francisco ARINC Enroute
131.675 Freeport McMoran Base - New Orleans, LA
131.700 Southwest Airline Operations - Dallas, TX; Jackson, MS
131.725 Tennessee Gas Helicopters
131.750 Continental - Birmingham, AL, also Mesaba
131.775 Capital Jet - Baton Rouge, LA
131.825 Continental Maintenance - Houston, TX
131.850 Delta - Atlanta, GA
131.875 Shell Operations - Houston, TX
131.900 Millionaire - Houston Hobby Airport, TX
131.925 Chevron Texaco - Pascagoula, MS/FedEx - New Orleans, LA
131.950 American Eagle
131.975 Enterprise - Houston, TX
132.000 Mesaba - Lafayette, LA/Southwest - Houston Hobby Airport, LA
132.050 Approach Control - Fort Polk, LA
132.125 Automated Weather Observation System - Gulf of Mexico
132.150 Houston ARTCC - Polacious RCAG, TX
132.175 Houston ARTCC - Grand Isle RCAG, LA
132.225 Houston ARTCC - Galveston RCAG, TX
132.275 Fort Worth ARTCC - Scurry RCAG, TX
132.350 Houston ARTCC - Lometa RCAG, TX
132.375 Fort Worth ARTCC
132.400 Houston ARTCC - Rock Springs RCAG, TX
132.475 Automated Surface Observation System - Slidell, LA
132.500 Memphis ARTCC - Vicksburg RCAG, MS
132.550 Memphis ARTCC - Fayetteville RCAG, AR
132.600 Houston ARTCC - Mobile RCAG, AL
132.650 Houston ARTCC - Multiple RCAG Sites Oceanic Control
132.675 Atlanta ARTCC - Crossville RCAG, TN
132.700 Houston ARTCC - Alexandria RCAG, LA
132.725 Houston ARTCC - Fredericksburg RCAG, TX
132.775 Houston ARTCC - Lufkin RCAG, TX
132.800 Houston ARTCC - San Antonio RCAG, TX
132.950 Houston ARTCC - Lake Charles RCAG, LA
132.975 Atlanta ARTCC - Hickory RCAG, NC
133.000 Approach Control - Fayetteville, AR
133.025 Houston ARTCC - Newton RCAG, TX
133.075 Memphis ARTCC - Jackson RCAG, MS
133.100 Automated Weather Observation System - NAS New Orleans, LA
133.125 Memphis ARTCC
133.150 Approach Control - New Orleans, LA
133.200 Tower - Eglin Auxiliary Field 2, FL
133.325 Automated Surface Observation System - New Iberia, LA
133.400 Houston ARTCC Oceanic Control
133.500 Houston ARTCC - McComb RCAG, MS
133.550 Memphis ARTCC - Pine Bluff RCAG, AR
133.575 Houston ARTCC - Lufkin RCAG, TX
133.600 Departure Control - Houston, TX
133.625 Approach Control - Dallas/Fort Worth, TX
133.650 Houston ARTCC - Lafayette RCAG, LA
133.750 Houston ARTCC - Kingsville RCAG, TX
133.800 Houston ARTCC - Galveston RCAG, TX
133.875 Fort Worth ARTCC
134.000 Approach Control - Baton Rouge, LA
134.025 Fort Worth ARTCC
134.050 Automated Terminal Information Service - Lafayette, LA
134.075 Atlanta ARTCC - Newport RCAG, TN
134.100 Radar - NAS New Orleans, LA; Ellington AFB, TX
134.200 Houston ARTCC - Fredericksburg RCAG, TX
134.350 Houston ARTCC
134.400 Memphis ARTCC
134.425 Houston ARTCC
134.450 Departure Control - Houston, TX
134.475 Fort Worth ARTCC - Texarkana RCAG, TX
134.500 Houston ARTCC - College Station RCAG, TX
134.525 Automated Surface Observation System - Patterson, LA
134.600 Houston ARTCC - Rockport RCAG, TX
134.700 Houston ARTCC - Brownsville RCAG, TX
134.775 Memphis ARTCC - Columbus RCAG, MS
134.800 Houston ARTCC - Lufkin RCAG, TX
134.850 Jacksonville ARTCC - Ultra High Altitude Sector
134.900 Houston ARTCC - Grand Isle RCAG, LA
134.925 Houston ARTCC - Meridian RCAG, MS
134.950 Houston ARTCC - Kerrville RCAG, TX
135.000 Metro Fort Polk, LA
135.050 Houston ARTCC - Victoria RCAG, TX
135.075 Ground Control - Gonzales, False River and Galiano, TX
135.100 Fort Worth ARTCC - Shreveport RCAG, LA
135.150 Tower - George Bush Airport Houston, TX
135.200 Houston ARTCC - Hattiesburg RCAG, MS
135.325 Houston ARTCC - College Station RCAG, TX
135.375 Memphis ARTCC - Noshville RCAG, TN
135.475 Houston ARTCC - Rockport RCAG, TX
135.575 Automated Terminal Info Service - Ellington AFB, TX
135.700 Houston ARTCC - Alexandrio RCAG, LA
135.750 Fort Worth ARTCC
135.775 Houston ARTCC
135.850 FAA Flight check aircraft to ground maintenance teams
135.925 DFW Airport Automated Terminal Information Service - Dallas/Fort Worth, TX
135.950 FAA Flight Check/Helicopter air-air frequency
135.975 Fish spotters/Unidentified Spanish Speaking user air-air
Jacksonville ARTCC - Ultra High Altitude Sector
136.500 Options - Houston, TX
136.550 Continental Express (Jetlink) - Houston, TX
136.600 Jet Blue - New Orleans, LA
136.650 Continental Express (Jetlink)
136.800 ACARS
136.850 ACARS
136.875 Am Trans
136.900 Jet Airline air-air frequency
136.975 Fish spotter air-air frequency

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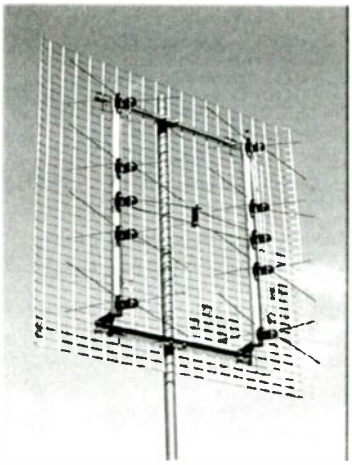


Receiving Digital Over-The-Air TV Signals

By Ken Reitz, KS4ZR

2004 is a pivotal year in the move to switch America's Over-The-Air (OTA) TV stations from analog to digital transmissions. A combination of government mandate and industry hype has brought an accelerated pace in the rush to this transition. DTV and High Definition TV (HDTV) have captured the press attention at all the big consumer electronics shows. DTV-ready sets are available everywhere and the prices on expensive HDTV sets are dropping dramatically. Behind the hype and discounts there's more to tuning DTV than just "plug 'n' play."

The DTV Basics

Completion of the FCC mandated transition to DTV is to be done by December 21, 2006, when at least 85% of homes in the U.S. must be able to tune into DTV programming. Congress may extend that date; however, when the FCC is satisfied that most Americans can receive DTV programming, the analog transmitters will be turned off.

But, that doesn't mean that your new analog TV set will be junk. Converters, capable of tuning in DTV signals and displaying them on analog TV sets will prolong the life of your set for as long as you wish. If, however, you want to be able to see HDTV programming, you will need a TV set which is capable of displaying that mode.

Many current DTV sets have both analog and digital tuners built-in. Some do not. It pays to read the manual before buying. Don't look for too much help from store employees, as few at this stage are familiar with the concept.

The more expensive DTV sets have other features, such as a 16:9 aspect ratio*, Picture-In-Picture (PIP), Digital Video Recording (DVR) capability, the ability to change screen size, channel editing, etc. But, not all DTV sets will be capable of displaying an HDTV picture. That's because the output of the tuner needs to be able display the HDTV formats: 1080i or 720p. These are the two widely used HDTV formats which provide the highest quality HDTV picture in the U.S.

Don't worry, you'll still be able to use your analog VCR to tape programs you receive on your DTV tuner. The output from the DTV tuner will be set to 480i, which is the analog standard definition format, so that the VCR can record it and play it back. You may have to adjust the aspect ratio on the DTV output to properly fit your screen, but this can be done from the DTV remote control.

Receiving DTV signals is not nearly as easy as receiving analog signals. Most DTV transmissions, regardless of original channel assignment, are done in the UHF portion of the commercial TV band. For instance, an analog station may be transmitting on channel 12 as it has for decades but the digital signal may actually be transmitted on channel 54. The tuner displays channel 54 on your set as channel 12, because that's how it's transmitted in the ID portion of the data stream. You don't have to worry about keeping the channels straight because the DTV receiver does that for you.

Bringing in the Signals

When it comes to bringing in DTV OTA signals, it's time to throw out most everything you've learned. Weak analog transmissions show up on an analog screen as a faint, snowy image. There may even be a fair amount of audio with the image. Not so with DTV. Because the transmission is digital (a data stream of 1's and 0's) the receiver is either able to collect enough signal to turn the stream into video or there's nothing.

The DTV receiver threshold – the point at which enough data is collected to form a picture – is engineered so that it takes a strong signal to "lock" on the channel. This is done to avoid extensive "tiling," the mosaic tile appearance on the screen where data is missing, or "drop-outs," the total loss of signal where the picture momentarily goes black. A high data rate ensures a steady picture.

A mast mounted pre-amp such as Winegard's AP-8700 antenna preamplifier is a must for fringe locations but not for near-in locations. For best results use RG/6 coax at lengths under 100' without splitters or other connectors. (Courtesy Winegard Co.)

So, how much signal do you need? That depends, because one of the other problems with DTV transmissions is that if you overdrive the signal (i.e., have too much signal coming into the receiver), the screen also goes black. That's why DTV receivers have convenient on-screen signal strength meters. These are typically a one button operation on the remote control which show a strip broken into three segments: red, yellow and green. The more green in the signal meter, the better. There is usually a numeric read-out of the signal strength as well. The amount of signal required for good reception varies from receiver to receiver.

Aren't normal TV antennas just as capable of bringing in quality DTV signals? In general, yes. But, there are plenty of caveats. Successful reception depends on the type of antenna used, where it's located, whether or not it is amplified, and the type of feed line from the antenna to the receiver.

Here's how it breaks down with respect to distance to the target channels:

- Most urban residents will be able to use small, indoor antennas, but they'll have to contend with "multi-path distortion," the same signal bouncing off large buildings and arriving at the receiver at different times. On an analog signal this shows up in the image as "ghosts," faint double or triple images. But, on DTV receivers, the software is confused by the conflicting data stream and a black screen results. This is particularly frustrating to the viewer because the signal strength meter will display an apparently strong signal.

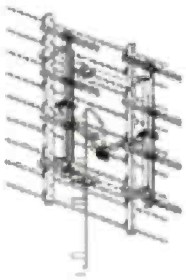
- Suburban viewers will typically also use indoor antennas, but, because many TV transmitting antennas are located in suburban areas, strong signals from nearby towers could swamp receivers, making certain channels impossible to receive without filters or attenuators.

- Rural viewers will find that traditional antenna systems which worked so well to bring in seemingly perfect analog signals may not be able to bring in enough signal to get past the DTV receiver's threshold. Innovative outdoor antennas specifically designed for receiving DTV signals work best here out to 50 miles from the transmitter.

- "Deep Fringe" is the term given to those areas which are the greatest distance away from a transmitter which still have chance of picking up usable signals. Viewers out here have to pull out all the stops to get perfect

DTV. Use of high gain directional antennas with mast mounted pre-amplifiers and rotators are needed to do the job. Deep fringe can be anywhere from 50 to 100+ miles away.

Success receiving DTV signals will depend not only on equipment but also on topography. Mountains, a source of deep fringe multi-path distortion and signal blockage, are in play here as well. Viewers in flat land areas may well exceed the 100 mile limitation experienced by their friends in higher elevations.



Deep fringe viewers may need the help of a large UHF antenna such as this Prostar 1000 from Winegard. Highly directional high gain antennas are needed to lock DTV signals. (Courtesy Winegard Co.)

Who's on the Air

According to the National Association of Broadcasters web site, as of this writing there are a total of 1,129 TV stations transmitting DTV. Of these, 580 were officially licensed or granted "official program test authority" by the FCC. A further 549 stations were transmitting experimentally or under Special Temporary Authority (STA) granted by the Commission. Of the total official and STA stations on the air, only 70 were broadcasting in the VHF band.

You may live in an area which uses both VHF and UHF for DTV programming, but most will not. If you have only UHF in your area, your reception options will be different since UHF antennas are much smaller, less visible, and easier to rotate. To find out what stations in your area are broadcasting on what channels check out the NAB web site: **http://www.nab.org/Newsroom/issues/digitaltv/DTVStations.asp**

To find out which stations are on official program test authority see the FCC web site: **http://www.fcc.gov/mb/video/files/dtvonair.html**

Digital, But Not Hi-Def

It takes special HDTV cameras, taping, and editing gear to produce HDTV content. For this reason not all programming seen on OTA DTV broadcasts is in HDTV. Most DTV channels are still broadcasting in standard definition even though it's transmitted digitally. But, more and more HDTV content is creeping into the programming line-up. At the time of this writing most HDTV content is seen during prime-time and during sports events, but some daytime soaps are seen in HDTV as well. This is why, when viewed on a 16:9 TV screen, programming throughout the day will have normal screen size for one program and wide screen for the next.

Throughout the next two years, networks, program producers and local TV stations will slowly add HDTV production facilities to their existing gear. This is where local and satellite TV are neck-and-neck. All small dish satellite channels are transmitted digitally, but only a handful of channels are HDTV. The exception to this is Voom, the all-HDTV content satellite service which offers 39 HDTV format channels on its own satellite service.

Throughout the next two years both DISH Network and DirecTV will be adding HDTV content to their line-up as will programmers on big dish C/Ku-band services. For details on the Voom satellite service see their web site: **http://www.voom.com**.

Bright Digital Future for "Free TV"

OTA broadcast television has spent the last 15 years coming in a distant third to cable and satellite's glittery offerings. Providing coverage of local accidents and political campaigns in between network fare was all that viewers came to expect from "Free TV."

That has changed. Digital OTA TV brings new concepts in local programming to local viewers. In the Richmond, VA, area, for instance, one local DTV broadcaster offers 24/7 views from atop its tower on one channel and state-wide satellite weather on another.

In the Fairfax, VA, area a local public TV station, MHz Networks, has started its own alternative to PBS by offering two channels of viewer-supported multi-ethnic programming designed to appeal to the broad spectrum of foreigners in the D.C. area. Viewers can tune in to TV series from around the world in their native language. Subtitles on many programs let the rest of us in on the fun. For more on MHz Net-

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works see **http://www.mhz.org**.

The combination of good DTV tuners and antennas designed for the DTV OTA reality will generate an excitement about "Free TV" which hasn't been seen since the first TV boom of the '50s. But, there's a long way to go. A recent industry survey shows that while 98% of households in the U.S. own color TV sets, only 8% have DTV. The potential for growth in this sector of the broadcast industry is huge.

How to Receive OTA DTV

Here are four ways to enjoy your local TV channels in HDTV if you are a cable-TV subscriber, have a C-band, DISH Network or DirecTV satellite system.

OTA and/or Cable TV:

You'll need an OTA DTV receiver such as the Digital Stream HD-1150 from Pro-Brand International. This receiver uses an external antenna (such as the Winegard SS 1000 below) and connects to your DTV set. It has a built-in menu which is easy to navigate and a sensitive receiver which searches all available channels for DTV signals and installs them in an on-screen guide.

Many stations send their programming lineup in the data stream and the built-in guide lets you see what's on now and throughout the day. You can edit the guide and channel selection keeping only those channels you're interested in.

Among other features, the HD-1150 has a V-chip lock, several Closed Caption options and Dolby® AC-3 digital audio. You'll need an HDTV compatible TV set to get the full HDTV effect; however, I found that it would display DTV channels on any analog TV set and could be looped through a VCR to record favorite OTA programs.

Access to all the extra channels available on OTA DTV is yours even without an HDTV set. MSRP is $399.00 and is available from Skyvision at 800-500-9275 or **http://www.skyvision.com**.

C-band Satellite TV:

You can enjoy watching HDTV OTA TV using the Integra IT912 receiver. Not only does it pick up OTA DTV but it also receives MPEGII Free-To-Air channels on C and Ku-band satellites and tunes MPEGII FTA HDTV signals as well. You can watch PBS's full-time HDTV feed on AMC3 Ku-band as well as all the other MPEGII FTA PBS channels also on that satellite. While it will not tune 4DTV digital satellite channels, combined with your existing analog C-band receiver, you'll finds dozens of new channels from all over the world to watch.

If you've been thinking of adding an MPEGII receiver to your C-band satellite system, the Integra IT912 is exactly what you need. And, the built-in OTA receiver lets you watch your local channels in HDTV. (MSRP: $1,299 but is discounted to $599 and available on-line at **http://www.hdtvmax.com** or call their toll-free order number 866-248-3142. *MT readers may receive an additional discount for a limited time using the coupon code: mt50off).*

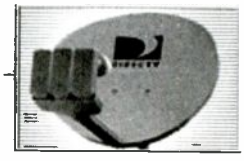
DISH Network subscribers:

If you're a current DISH Network subscriber you'll need the DISH model 811 satellite/OTA receiver which retails for $399 + $24.95 shipping and handling, but is available for $199 if you commit to a 1 year subscription to DISH Network's America's Top 180 & HDTV packages and charge it all to a valid credit card. The receiver is free along with a dish/LNB and installation to new subscribers committing to a 2 year subscription.

This offer is good for a limited time. For details call 800-WOW-HDTV or visit their web site at **http://www.dishnetwork.com** click on "products" then "HDTV." The 811 receiver tunes standard definition DISH Network programming, HDTV DISH Network programming as well as standard and HDTV OTA programming. Again, you'll need an HDTV capable TV set to view HDTV content.

DicrecTV subscribers:

You'll need an HDTV compatible TV set, the new DirecTV HD-enabled receiver and an 18 x 20" dish with triple LNB. The HD receiver is capable of receiving DTV OTA and costs $399 + $24.95 shipping and handling. You must also commit to 12 months Total Choice programming package and the entire purchase must be done with a valid credit card. Call 800-226-9723 for details or log on at **http://www.directv.com** and click on "products" then "hdtv."



To find out if your existing DirecTV system is HDTV compatible, select channel 99 on your remote. If the HDTV logo is visible you're OK. If not, call 800-805-9265 and ask for the SAT-C upgrade which is free if you install it yourself or $49 with professional installation.

❖ OTA Antenna

The Winegard SquareShooter Model SS-1000 Directional HDTV antenna is an entirely new approach to TV band reception. Its award winning design not only brings in DTV OTA signals from up to 50 miles away but it does so in a most unobtrusive fashion. It's only 15" square and 4" deep and fits anywhere. The flat, gray housing for the antenna allows it to be placed in almost any outdoor environment without drawing attention to itself. It's perfect for suburban homes, apartment balconies, or even urban high rises.

I got perfect pictures from 50 miles away just placing the SquareShooter in an upstairs window in the direction of the target station. Using the Winegard AP-8700 antenna preamplifier is a must in deep fringe locations, but not necessary if you live close-in. The built-in skew mount even lets you change the plane of the antenna to phase out interfering signals. Mounted on an optional, rotatable mast, you'll be able to tune in DTV OTA stations from several different directions.

The SquareShooter is highly directional with an average front-to-back gain of 13 dB and average gain across the UHF band of 4.5 dB. (MSRP: $149.00)

Aspect ratio refers to the width to height ratio of a TV screen. Old analog sets were 4:3 and new digital sets are 16:9 which is also the aspect ratio of a 35 mm cinema movie screen. A glossary of DTV and HDTV related terms can be found at the PBS web site: **http://www.pbs.org/digitaltv/glossary.html*

*** The Consumer Electronics Association web site: **http://www.antennaweb.org/aw/Address.aspx** lets you see which category you're in. By entering your address you'll get a list of digital stations and their exact distance in miles from your home. It also shows compass headings to let you orient your antenna toward the stations you want to receive.*

The preceding article by Ken Reitz provided an overview of digital TV broadcasting. Dire predictions have been made by some hobbyists that digital transmissions will mean the end of DXing. However, experiences over the past year have shown otherwise. Portions of the following article may seem redundant or contradictory to Reitz's approach, but that's what makes things interesting!

DXing Digital Television

By Glen Hale

There are hundreds of digital TV signals out there now that did not exist a few short years ago, and they share the same chunks of VHF and UHF frequencies that analog TV does. Because the dial is crowded, DXing digital TV can be a challenge, but as I'll show you, phenomenal TV reception distances can be achieved, and the picture quality is often perfect!

What do I need to receive DTV?

The good news is nearly all set-top boxes (STB) will convert the digital signal so a standard, analog TV can display them. All you need is an STB or a computer-based DTV tuner card to get started.

Remember those TV antennas that used to be on the roofs of nearly every house before cable TV came along? What's old and outdated is new again! Despite all the advances in technology, a good old-fashioned rooftop antenna is still the best way to receive DTV. It also helps if you have an old-fashioned rotor to turn your antenna. This will allow you to tweak for best reception much more easily.

DTV Receivers

STBs are available from a wide variety of consumer manufacturers, including Samsung, LG (formerly Zenith), Panasonic and RCA. Newer generation models, like the LG LST3100A (MSRP $399) **http://www.lgusa.com**, employ later generation receiver chips that generally receive DTV signals better than older models.

Some STBs will receive both digital and analog TV broadcasts, while others are digital only. Combination receivers that get DTV signals both over-the-air and from satellite providers like DirecTV and Dish Network are also quite common. As new receivers are released, bargains can sometimes be found on receivers that are being phased out. Alternatively, computer-based DTV receivers, like the Hauppauge WinTV-D, are readily available and can be had for a bargain (under $100) on eBay and similar sites. As more widespread acceptance of DTV takes hold, expect prices on receivers to continue to tumble.

LG LST-3100A DTV STB

DTV Antennae

The large majority of DTV stations are currently operating on UHF frequencies. Many DTV DXers focus on UHF because the antenna needed is much smaller and easier to handle than a larger VHF or combination VHF/UHF antenna.

Many of the same manufacturers that made TV antennas years ago are still cranking them out today. Channel Master, Winegard and Delhi are three of the more well-known products available in the United States. Additionally, European import Televes has a good reputation among DTV DXers as well. I recommend a combination VHF/UHF antenna for starters, though separate high-gain VHF and UHF units will generally offer better weak signal reception performance.

You'll find many TV antennas marketed as "HDTV Ready" – and they usually carry a premium price tag. This is pure marketing mumbo-jumbo. A coat hanger can be HDTV Ready. None of those slickly designed, high-priced, HDTV Ready models match the reception capability of a standard metal TV antenna. In general, the bigger the chunk of metal in the sky, the better it will receive DTV signals.

If you live in an area where rooftop antennae are a "no-no," the law is on your side. Federal law gives homeowners the right to put an antenna on their roof to receive television broadcasts. Your homeowners organization's rules are not applicable.

Now What?

Once you've gotten the equipment, you'll likely find several DTV stations already broadcasting in your area. A good list of what DTV stations you should be able to receive based on your zip code is at **http://www.antennaweb.org**. Once you've mastered getting the locals, you can start shooting for the wealth of more distant signals that are out there. Receiving the local DTV stations is not even half the fun! If you've ever been frustrated trying to watch a fuzzy, noisy picture from a station further away from you, DTV offers a fix.

Here's an example. I live just under 70 miles away from both Louisville, KY, and Cincinnati, OH. Analog TV from both of those cities is slightly snowy at best, and downright unwatchable at worst. Now that TV stations in those cities are broadcasting digitally, I receive a perfect picture from several of them consistently – much better than shoveling snow to try and watch a program.

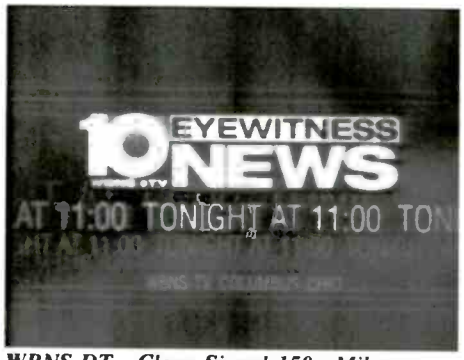
Unlike analog TV, with digital there are two ways a station is received – either good or bad. There is little in-between. When a digital signal is weak, you'll see tiling of the video. Frames of video will be garbled or will freeze altogether. The audio will squawk and break up. It's much like breakups caused by heavy rain on one of those DirecTV or Dish Network systems.

DTV DX

Under the right conditions, DTV signals can be received from hundreds, even over a thousand miles away! Distances of 100 to 200 miles are fairly common and quite easy to attain, even with a modest antenna and equipment. More exotic distances are fewer and far between, even with the best equipment. However, that's what makes the hobby more appealing. It's the novelty of it all!

The warm summer months are prime time (no pun intended) for DTV DXing. That's when tropospheric ducting and E-skip can make all VHF and UHF signals, including DTV signals, reach much further than possible under normal conditions. Tropospheric ducting is the most common mode of DTV DX. It occurs when a warm layer of air overrides a cooler layer at the surface of the Earth. DTV signals can get trapped

KETC-DT - Marginal Signal



WBNS-DT - Clean Signal 150+ Miles

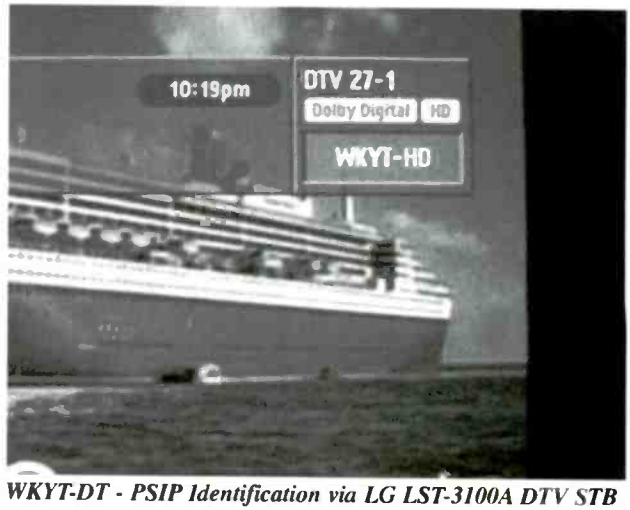
and bent in the warm layer and transported hundreds of miles away.

Tropospheric ducting, or "tropo" as it is more commonly called, usually occurs during calm weather in the spring and summer months. Tropo can be quite stable, meaning you could receive a DTV station from hundreds of miles away for several hours! My own personal best for DTV DXing is via tropo. Last summer, I received KPXR-DT from Cedar Rapids, IA, from my home in central Kentucky at a distance of 482 miles! Tropo DTV DX has been received from over 800 miles distant.

Tropo can even be predicted. DXer William Hepburn puts together a tropospheric ducting forecast that can give you a good idea when DX may be possible and where the favored directions are. The forecast is at **http://www.globalserve.net/~hepburnw/tropo.html**.

Another largely unexplored method of DTV DX is through "E-skip." In E-skip, low band TV channels (channels 2-6) bounce off the "E" layer of the ionosphere. The signals come back down to Earth generally no less than 500 and no more than 1,500 miles away. At the time of this writing, there has been only one confirmed DTV E-skip reception. DXer Girard Westerberg holds the overall DTV distance record. From Lexington, KY, he received KOTA-DT in Rapid City, SD – a distance of 1,062 miles! Girard maintains an excellent resource for DTV DXing and FM/TV DXing in general at **http://www.dxfm.com**.

E-skip is a significantly more challenging mode of DTV DXing because signals are unstable and there are only a handful of available targets – DTV stations broadcasting on channels 2-6. To try getting DTV through E-skip, you'll need a large antenna designed to receive VHF Low Band signals. E-skip, while it can happen anytime, also occurs predominantly in the summer months. There is really no proven way to forecast when E-skip will occur. It is totally random, but that is what makes it even more exciting and challenging to discover!



WKYT-DT - PSIP Identification via LG LST-3100A DTV STB

Identifying DTV DX

You know the DTV station you're watching is not local, but how do you know who it is and where it is from? Fortunately, it's much easier to make this determination with DTV than it is with standard TV. You don't have to wait for a commercial break or a station ID to get this information!

The vast majority of DTV stations broadcast a Program and System Information Protocol, better known as "PSIP," as part of the broadcast. The PSIP identifies the station and can also be used to provide programming information. Most STBs are capable of decoding PSIP and give you the station ID call letters immediately when tuning into the stations. A simple search of the identifying call letters on the Internet and, just like magic, you know where the station is without hassle!

Even if the station doesn't broadcast PSIP information or your DTV receiver doesn't decode the information, there are clues that can make identifying DTV DX easier. Many receivers will "remap" the DTV signal to correspond with the analog station. Here's an example of what I mean. WKYT's analog station is on channel 27, while the digital broadcast is on channel 13. Manufacturers thought this would confuse the average consumer, who thinks of channel 27 as channel 27 no matter what. When tuning into the digital broadcast on channel 13, most receivers will remap the station to channel 27-1.

While this can initially confuse the DTV DXer, it can be a boon to identifying a station. If you're receiving a station on channel 13 that remaps to 27-1, a little online sleuthing reveals WKYT-DT – even if your receiver or the station is not utilizing PSIP.

WTMJ-DT - PSIP Identification Via WinTV-D Computer Card Receiver

The Future for DTV DX

DTV DXing should actually become easier in the future. Not only are there continual advances in the quality of receivers, the number of interfering analog stations will lessen and eventually go away as the transition to digital broadcasting takes hold. Stations will focus more attention on their DTV broadcasts, increasing power output and generally improving the quality of their DTV broadcasts. The costs of receiving equipment will continue to decline to the point where just about everyone can afford to purchase.

Because DXing DTV is relatively new, there is plenty of opportunity for you to blaze a trail. But if you'd like to join forces with others who are diving into DTV DX full-throttle, check out the Worldwide TV-FM DX Association at **http://www.anarc.org/wtfda**. Who knows, maybe you'll be the next to break that 1,000 mile barrier!

Glen Hale is the New Media Director for WKYT-TV in Lexington, KY, and WYMT-TV in Hazard, KY. Glen's a two-year "veteran" (by DTV standards) DTV DXer.

Talking To Mars

How Scientists Communicate with the Mars Exploration Rovers

By Laura Quarantiello

What if you took a spacecraft, sent it millions of miles from Earth into deep space, plunged it through a planet's atmosphere at 12,000 miles per hour (heating it to 2,600 degrees F.), bounced it along the surface of the planet for a half mile, and then expected it to send back a radio signal. Fat chance, right?

On January 3, 2004, the Mars Exploration Rover *Spirit* did just that, phoning home from the surface of the Red Planet by sending a radio signal back to Earth. Anxious scientists at the Jet Propulsion Laboratory in Pasadena, California, cheered when they heard that the little rover had survived the harrowing trip and was healthy and ready to begin operations. Twenty-one days later, Spirit's twin rover, *Opportunity*, landed on the opposite side of Mars and sent back its own radio signal.

If you think simply getting a rover to Mars and having it send back a confirmation signal is no big deal, consider this: in order for the Mars Exploration rovers to operate on the surface of Mars, scientists on Earth must send detailed commands each day telling the rovers where to go and what to do. The rovers, in turn, must send back pictures and data of what they've done, where they've been, where they're going, and what they've found.

Without this exchange of radio data, which takes about 10 minutes to travel each way, the rovers are just so much expensive hardware sitting on a distant planet. This was powerfully demonstrated when controllers at JPL temporarily lost communications with *Spirit* just 18 days after it landed, which proves that talking to Mars is a very big deal indeed.

Getting There

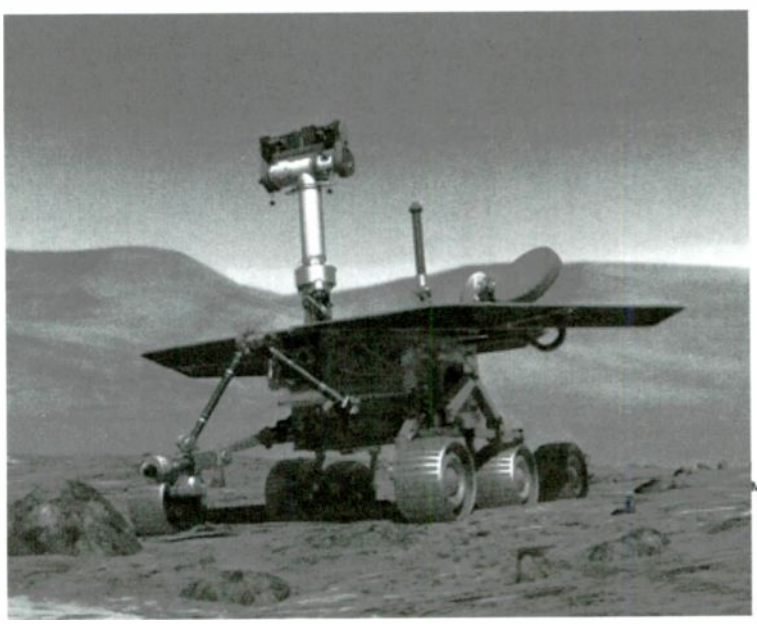
The Mars Exploration Landers – also know as *Spirit* (MER-A) and *Opportunity* (MER-B) – were launched from Cape Canaveral, Florida, on June 10 and July 7, 2003, aboard Boeing Delta II launch vehicles. Each 384 pound rover flew tucked inside a folded-up lander. The lander itself was wrapped in deflated airbags, cocooned within a protective aeroshell and attached to a cruise stage which provided solar panels, antennas and steering. Nestled within their protective spacecraft, the rovers would journey more than 300 million miles each over several months to reach their target, a feat not unlike throwing a dart and trying to hit a distant, moving dartboard.

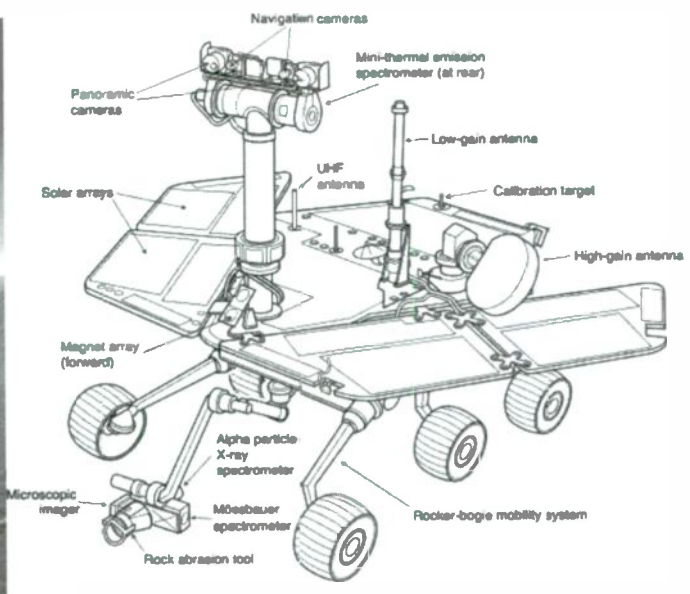
During the trip, it was important that engineers on Earth communicate with the spacecraft, issuing course corrections and checking on the overall health of the equipment. There were two antennas mounted on the cruise stage: a low gain antenna (LGA) and a medium gain antenna (MGA).

Early in its flight, the spacecraft used the low gain antenna, but once it moved far enough away from Earth the more focused beam of the medium gain antenna was used. These Direct-to-Earth communications were via an 8.4 GHz X-band link.

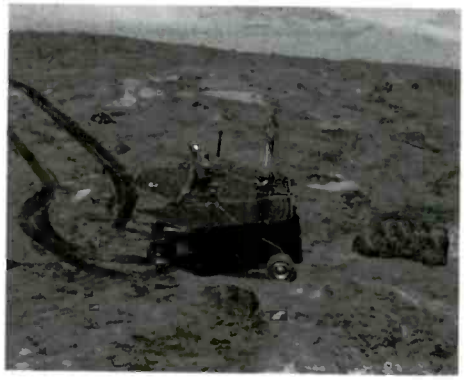
The most harrowing part of the journey, however, wasn't the trip out to Mars, it was the arrival, a short period of time fraught with the possibility of disaster. Each rover had to cast off its cruise stage 15 minutes prior to hitting the top of the Martian atmosphere, an event that happened at a speed of 12,000 miles per hour. Plunging down, the protective aeroshell heated up to a kiln-like 2600 degrees. Communications during this period were spotty, due to atmospheric effects and the motions of the spacecraft. The low gain antenna was used, transmitting about 36 ten-second radio tones during the six minute descent through the atmosphere. These tones were coded to alert controllers to the accomplishment of critical steps in the timeline.

Two minutes before landing, parachutes opened to slow the spacecraft, and twenty seconds later the bottom of the now-unneeded aeroshell was jettisoned to reveal the lander. Lowered on a tether, the lander was cushioned by airbags that deployed in the final six seconds of descent. Rockets fired to slow the horizontal velocity and the tether was cut at 49 feet. The lander then bounced and rolled for over a half-mile before coming to rest. *Spirit* landed in Gusev Crater, south of Mars' equator, while *Opportunity* landed on the opposite side of the planet at Meridiani Planum.





Mars Exploration Rover



Roving Around

Getting to Mars was only half the battle: setting up for extended surface operations was the other half. The most important part of working the rovers on the planet is the ability to communicate with them. Unless commands can be sent to the rovers, they can't be controlled. And unless they can send data back to Earth, no one would know what they were doing and what they had found.

There are two methods for communicating with the rovers: Direct-to-Earth (DTE) or a relay via one of two orbiting spacecraft. The first method uses an onboard 8.4 GHz X-band system to send data directly to the Earth-bound antennas of NASA's Deep Space Network. The second method beams UHF signals in the 400 MHz band up to either *Mars Odyssey* or *Mars Global Surveyor*, who orbit high above and relay the data back to Earth.

Both *Spirit* and *Opportunity* carry three antennas mounted on their equipment decks. A pancake-shaped high gain antenna (HGA) mounted on the top starboard side, a low gain antenna (LGA) mounted near the top center, and a UHF antenna on the top port side. The UHF antenna is used for communicating with the orbiting spacecraft, while the LGA and HGA are for talking directly with Earth.

The LGA is omni-directional and transmits at a low data rate. The HGA is a 0.28 meter diameter high data rate beam antenna, which sits atop a gimbal, allowing it to be steerable. Due to power and thermal constraints the HGA only operates for about three hours per day. It transmits and receives in the X-Band (8-12 GHz) with a throughput of 1850 bits/sec. It is connected to the radio in the rover body by a coax cable with a rotating fitting running from the antenna element through the gimbal.

Much of the data to and from the rovers goes through the UHF link to Mars Odyssey or Mars Global Surveyor. The information data rate to the orbiters is 128,000 bits per second during each eight minute pass. About 60 megabits of data can be transferred. On the Direct-to-Earth link, it would take between 1-1/2 and 5 hours to transmit the same amount of information.

There are four chances each day to transmit to and from the orbiters: two for *Global Surveyor* and two for *Odyssey*. The orbiters themselves can "see" Earth for about 16 hours each day, allowing them ample time to forward the data. The only real drawback to using the orbiter relay is the time lag. Routing data through the spacecraft can delay signals anywhere from 90 minutes to 24 hours.

Direct Mars to Earth communications are much faster, taking only about 10 minutes, but use more of the rovers' limited power. The DTE link through the LGA or HGA is reserved for critical MER mission data such as rover health and engineering data. There are usually three DTE HGA antenna sessions available each day. As the mission progresses, the 10 minute communications time to and from Earth is getting longer and could extend to almost 25 minutes if the rovers continue to operate.

The Mars Exploration rovers rely on NASA's Deep Space Network of ground-based antennas for all communications. The 40-year-old DSN consists of three sites spaced across the world: Goldstone, California; Madrid, Spain; and Canberra, Australia. Each site currently has four antennas: one 34 meter (111-foot) diameter High Efficiency antenna, one 34 meter Beam Waveguide antenna (three are located at Goldstone), one 26 meter (85-foot) antenna, and one 70 meter (230-foot) antenna.

Currently, the DSN is being used to track and communicate with 28 spacecraft, making usage time on the antennas for rover transmissions limited.

A Day In The Life

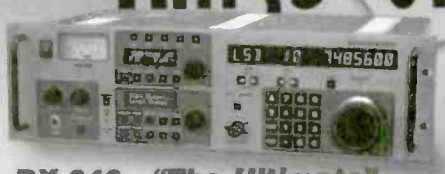
A rover's life is not exactly idyllic. Sure, the Martian explorers sleep all night, but come sunup, it's time to go to work. The rovers work sunrise to sunset, taking advantage of the sun's rays to charge their solar panels. *Spirit* and *Opportunity* reside on opposite sides of the planet, meaning when one rover is awake, the other is asleep, awaiting the return of the sun.

A typical rover day begins with an early morning wake-up from an alarm clock on board, followed by an uplink of the day's command sequence from Earth. These commands form the basis of the day's work plan – everything from which way to drive and which rocks to sample to how many pictures to take. Each afternoon, with Earth still visible in the Martian sky, the rovers downlink data through the HGA. Later, when Earth is below the local horizon, the rovers can use the UHF link to beam information up to *MGS* or *Mars Odyssey* during one of their passes.

The rovers are designed to operate for 90 sols (92 Earth days) after landing, but no one knows exactly how long the little robotic geologists will last. The landings took place at the end of the Martian summer; with the coming of autumn and shorter days, solar radiation reaching the rovers' solar panels will decrease. This, combined with the build-up of windblown dust on the panels will reduce the amount of energy they can collect. These two factors may conspire to be the reason contact is ultimately lost. Everyone has their fingers crossed that the little rovers will remain healthy and scientists can continue talking to Mars for a very long time.

Grateful acknowledgement is given to Ed Marshall for technical assistance with this article.

Kings of Shortwave Radio



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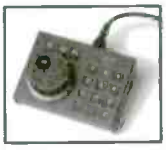

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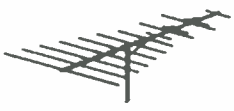
Beginner's Questions: FM to Satellites

The February *Beginner's Corner* on FM reception basics received a lot of response. I'll begin with Morgan Little who writes from New Jersey. "...While living in NJ, just north of Princeton, I put up two turnstile FM omnidirectional antennas, about 31-36 inches apart on the same vertical [mast]. With this in place I was able to get a good steady FM stereo signal from Philadelphia, and some of the stronger ones from New York City. Was this hallucination or was there science behind it...?"

Yes, indeed, what you did was scientifically sound. A turnstile antenna is actually two folded dipoles 90 degrees out of phase so that they receive in a roughly omnidirectional pattern. By putting two on a mast you made an "omnidirectional stacked array." A stacked array is when you put identical antennas one on top of the other and connect them with lead-in cables with a difference in length no more than 1/2-inch (this part is called the "phasing lines").

What happens is that you increase the gain of the antenna by about double. In practice it's been found that the optimum number to stack is four. If you had chosen to stack Yagi antennas (highly directional, multiple element antennas, such as a store bought VHF-TV antenna) you would not only get gain but increased directivity. Mounted on a rotating mast you would have been able to get most NYC and Philly FM stations with pretty good signals.



The classic "turnstile" FM antenna is omnidirectional. You can increase the gain by stacking two. (Courtesy: Winegard)

The critical part, as you had guessed, was to space them at least 1/2 wavelength apart to avoid them interfering with each other. Since the FM band is about 6 meters in wavelength you might have put them more like 10 feet apart for best results.

❖ Speakers for the Sangean 909

Also referring to the February column, Timothy Kuryla of Lexington, KY, relates his quest to add stereo sound to his Sangean 909 portable AM/FM/SW radio by adding a set of Sony SRS-57 active speakers and plugging them into the headphone jack, which provides a stereo output.

Beef up the audio on your portable radio with a set of powered speakers like these which sell for under $30. (Courtesy: Radio Shack)

"...Sometime in 1993, I went to hear a demonstration of the Bose Wave radio. To me, the [Sangean and the SRS-57 Sony speakers] sounded equal to the Bose and did not have the Bose's price!...Although the ATS 505P and the ATS 909 do not have separate treble and bass controls, it is still worth it to use the active speakers. Where to buy the speakers? For battery power...with reasonably good sound, I found a set at Radio Shack in the $20s. Computer add-on speakers use the same jack, thus try Comp USA, Office Depot, or Office Supply..."

Timothy notes that it's possible to get a three-speaker version which would include a sub-woofer and a bigger price tag.

❖ CCRadio Plus Review

A review I wrote about the CCRadioPlus attracted the attention of Ben Wilkie, from NY state who writes about his experiences with the radio.

"...I live in Schenectady, NY, and am 6 miles from the transmitter site of 1540 WDCD. That 50 kW signal (during the day) starts 'bleeding' at about 1490 kHz and continues its assault straight through to 1570 kHz! This happens on NO other radio I own! About 12 miles away, is a 1 kW transmitter on 1490. On every other radio I own, including the pocket-sized Sangean 210, the 1490 signal comes in perfectly. On the CCRadio Plus 1490 is very difficult to receive and the radio has to be in just the right location of the house and pointed in just the right direction to receive 1490 over 1540.

"Even at night 1540 bleeds tremendously and I had a devil of a time trying to get 1520 (50 kW) from Buffalo...I am also within about 3 miles from the 50 kW transmitter of 810 WGY. It also bleeds, but not nearly as bad as 1540...My question to you: didn't you find anything like this when testing the radio as you did...or did I somehow get a lemon?"

Well, Ben, you live in a really rough RF neighborhood! I write reviews based on my own personal experiences with the products I test and I happen to live in a very RF-friendly place where the nearest AM transmitter is 30 miles away so it's not surprising that I didn't have the same separation problem you experienced. If I had, I would certainly have added it to the list of problems this radio has with AM reception which I did note in the review. And, as I concluded "...for AM Dxers [the CCRadioPlus] just doesn't live up to its web billing as 'the best AM radio available.'" My suggestion is that if you are not satisfied with its performance you should send it back and ask for a refund. I certainly would.

❖ DirecWay Risky Business?

A reader who asked not to be named writes asking about DirecWay, the satellite Internet service: "...I read that DirecWay is bankrupt so why is it still available? It would seem risky to order DirecWay due to its high cost and the doubtful future of DirecTV which has had severe long term cash flow problems..."

DirecWay high-speed Internet: No phone lines required, but, how long will it fly? (Courtesy DirecWay)

For those not "up to speed" on this issue, DirecWay is the stand-alone, high speed Internet satellite service which is a division of small dish satellite operator DirecTV and uses a small dish satellite system to access the Web without using phone lines or cable TV. On the surface it's a "can't lose" concept: deliver high speed Internet access to areas of the country which may never see a DSL land-based, high speed data service. But, so was Iridium, the satellite phone system, which, like DirecWay, found itself in Chapter 11 reorganization and yet, again like DirecWay, is still in business today.

If we've learned anything from the dot-com, gee-whiz, hi-tech bust of a few years ago it's that all these services fly at considerable risk. Once you sign up you'll be committed to a year's subscription to the service. If they bail out, you're stuck; if you bail out earlier there'll be a penalty. Keep in mind that high speeds touted in the advertising might be optimum; your speeds will vary and may be substantially lower. To see if it's for you check out their web site: **http://www.surfDIRECWAY.com**. But, also visit their disclaimers at **http://www.legal.DIRECWAY.com.**

There is another satellite based Internet service called Cband.net which uses C and Ku-band satellite equipment to download Internet content and up-link commands via land line. This is a little different, doesn't promise nearly as fast service (though considerably faster than a phone line) and is less expensive. Subscriptions start at $29.95/month and price for the hardware varies from free to $70 depending on whether you use an internal PCI card or external modem and you sign up for a year's subscription.

The other interesting feature with this is that the modem is also an MPEGII receiver and allows you to watch MPEGII Free-to-air satellite transmissions on your computer. For more info on this check out **http://www.Cband.net**. The service is also available from Skyvision at 800-500-9275.

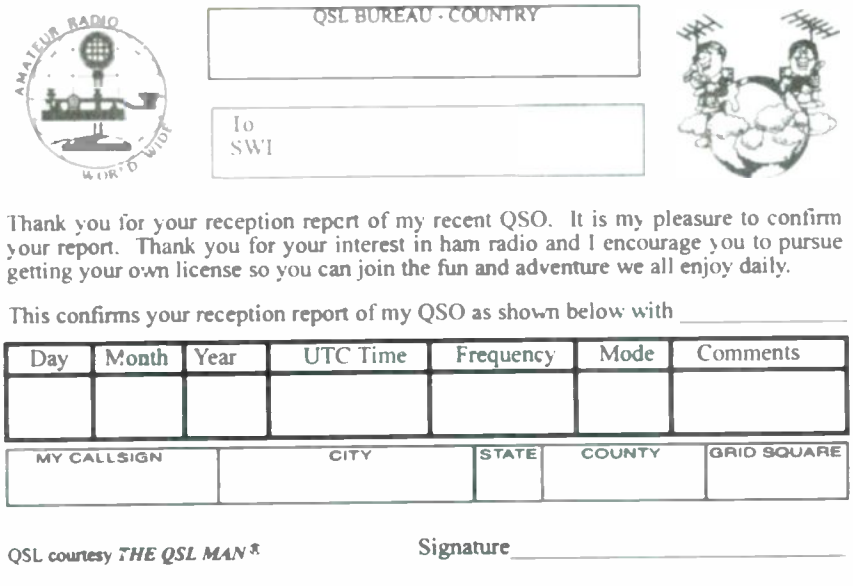
❖ Free DISH Programming

The same *MT* reader also relates this interesting story: "...about a year ago I bought at a flea market a complete two-receiver DISH Network system for $20 cables included. The units both have worked since then though I have not subscribed to any programs. I can receive all programs except the premium channels like PPV, HBO, etc...Why?" The reader says he has not modified the receivers and has not subscribed, yet the programming continues to be available.

It's doubtful that the system was stolen because typically these are shut down or de-authorized shortly after being reported stolen. After that the system won't be reactivated. That's one reason that these small dish systems are not popular targets of theft.

It's possible that the system was sold or given away by the original owner who had paid for a year's basic channel subscription and who may have moved and didn't want to be bothered by dismantling the system and dealing with the paper work to move the system to another location. There's no way to know until you actually install such a system if there is any programming pre-paid on it. It's your luck that you got the system with a year's worth or more of basic programming still activated. I say, enjoy!

One day the programming will run out and when that happens you'll know it. Today both DISH Network and DirecTV have policies about "moving" your subscription if you have to relocate so you can take your subscription with you.



SWL QSL card confirms amateur two-way contact heard by SWLer. (Courtesy W4MPY)

❖ QSL Tips for New Hams and SWLers

A few months ago I wrote in this column about ham QSLs. Lately, I've been seeing more reference to SWL signal reports received by amateur radio operators for two way conversations (QSOs) with other hams. Many hams are now adding an SWL box on their QSL cards to indicate that it was not a two way communication but verifying that the SWLer was able to hear the QSO. The policy on responding to such QSL reports varies with each ham. Some don't verify other hams, let alone SWLers. Others welcome such reports. Here are some ham QSLing pointers:

- When you want a QSL card and are sending it directly to the ham's address as found on QRZ.com always enclose a self-addressed envelope and two IRCs or 2 dollars (often referred to as "green stamps"). This may seem like a lot but remember that the dollar has taken a beating in the last year against the Euro and it'll take two IRCs to get the card to you via the mail. It's best if you don't have the ham's call sign on the outside of the envelope or your call sign (if any). This is sometimes seen as a sign to postal thieves that there may be cash in the envelope and the report will never get there.
- When you look up the address of a ham on QRZ.com you'll often see instructions on how to QSL this particular station. If there are no instruction be sure to click on the field which says "details." Here, a DX station often lists their QSL manager which is the person who handles all the QSL cards for the DX station. Typing that call sign into the search field will take you to the manager's page for the instructions. Since many QSL managers are located in the U.S. this ends up being cheaper and faster than sending requests to the DX station's address or through the bureau.
- Some amateur QSL bureaus will accept SWL QSL cards but there may be restrictions. Read all the rules. To use the ARRL outgoing bureau you do need to be a member. If you're an active DXer it'll be worth it. You can send roughly 10 cards for $1. Remember, too, that there are some countries which have no bureau and you'll just be wasting your card. In this case, the only way to QSL is direct. The bureau is for people with plenty of time to kill. I've received cards from QSOs which happened two years earlier. Some countries' bureaus are more efficient than others and cards come and go much faster than others. A list of countries not served via the ARRL out-going bureau is found on their web site (**http://www.arrl.org/qsl/qslout.html**).

GLENN HAUSER'S WORLD OF RADIO
http://www.worldofradio.com

For the latest DX and programming news, amateur nets, DX program schedules, audio archives and much more!

Getting Started

Ask Bob

Bob Grove, W8JHD
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❖ Correction to Thermocouple Question

In my April column, my answer to the question about thermocouples and gas valves was incorrect. While it is theoretically possible for two bonded metals (a bimetallic strip) to be used as a mechanic valve, they operate much too slowly for safety. Instead, as *MT* reader Rich Line, KC8HMJ pointed out, the thermocouple generates a small electrical current which activates an electromagnetic valve. Thanks, Rich, and let's pretend my original answer was more in line with April 1!

❖ More on the Illinois Tollway

In our April issue we discussed the Illinois Tollway transponder system. Jerry Smith of Carol Stream, IL adds some technical details he discovered on the FCC's Office of Engineering and Technology website.

The Mark IV Industries model FPT 2000 flat pack transponder works on 915 MHz, utilizing a simple, modulated SAW oscillator and employing a Manchester-code data stream. In less than one-tenth of a second, the roadside reader can interrogate up to eight different windshield-mounted transponders as they pass the RF module which can even instantly reprogram transponders when necessary.

Although the roadside RF module continuously transmits, the vehicle transponder only replies with its 10-30 microsecond pulse (500 kb/s) when interrogated as it passes the transmitter. The roadside transmitter is powered by 120 VAC line voltage, while the little flat packs operate at low power from an internal 3.6 volt battery.

Scanner listeners monitoring 915 MHz should easily hear the pulses when driving past the tollway modules.

Thanks, Jerry, for this informative technical addendum.

❖ More on 802.11

A prompt from a colleague, Larry Price, W4RA, was well made. The 802.11 wireless interconnect standard as discussed in my April column was developed by the Institute of Electrical and Electronics Engineers (IEEE), not the FCC which only regulates the emission of such devices. Blue Tooth is a short-range (a few tens of feet) system using the same frequency ranges. Thanks, Larry.

Q. *If I can buy a scanner that decodes digitized communications using the APCO-25 system, why can't I decode other digitized communications like Motorola Astro? (Martin Franko, Yorkton, Sask.).*

A. APCO Project 25 (P-25) utilizes a generic digital system to appeal to a variety of manufacturers; it has several levels of digitization and a 9600 baud trunking control channel. The first level is for communications efficiency, not privacy, and is not entitled to protection from interception. Upper levels, however, are privacy protected. These and virtually all other voice digitization systems on the air are for privacy and are protected by law from uninvited interception (in the U.S. under the 1986 Electronic Communications Privacy Act [ECPA '86]).

Motorola's "Astro" trademark refers to a general product line, not to a specific protocol. Some of the older Astro protocols are not APCO 25 compliant, but newer ones are. Motorola's proprietary ASTRO Digital CAI option is a Project-25 trunking system using a 3600 baud Smartzone control channel. It utilizes a conventional APCO voice encoder (vocoder) combined with Motorola's own Type II Smartzone trunking system. Motorola's IBME protocol also uses the Type II Smartzone control channel, and allows both analog and P-25 radios to operate on the same trunked network with a 3600 baud data rate.

Q. *How do the new walkie-talkie cell phones work? (Patrick Czifro, Sheridan, OR)*

A. This new breed of cell phone has an instant-connect feature allowing preset phone numbers to be paged with a side button that becomes a push-to-talk (PTT) function like a traditional walkie-talkie. But these "walkie-talkies" don't talk to each other directly, they utilize 820 MHz (phone) and 860 MHz (tower) frequencies just below the conventional cellular frequencies and systems, employing digital protocol.

Since the voice is compressed into digitized packets, there is a delay between transmissions of anywhere from a fraction of a second to as much as one and one half seconds. No firm standards are in play yet, and many different technologies are getting into the race.

The dominant player is Nextel, a Motorola division that bought up the old SMR private radio systems in that frequency range.

Q. *Is there a simple formula to calculate the length of an antenna wire or element? (Bill Rickman, email)*

A. If we consider a typical, center-fed, shortwave antenna to be a half-wavelength dipole, the total length in feet is 468 divided by frequency in megahertz. Thus, a 7 MHz dipole would be 67 feet long, tip to tip.

At VHF and UHF, it's better to calculate in inches, so simply multiply the 468 by 12 and the formula becomes 5616 divided by frequency in MHz. Thus, a dipole for the 144-148 MHz ham band would be 5616 divided by 146, or 38 inches. Keep in mind that this is the total length of an antenna, including the vertical element and a ground-plane radial.

If you are trying to figure only the length of the vertical element that is attached to the center conductor of the coax, or mounted on a car roof where the mass of metal becomes the missing lower half, then it's only half as long, so the formula is 2808 divided by frequency in MHz. Therefore, the ham might mount a 19-inch quarter-wave whip on his car roof for the two-meter band. When antennas appear too long for the frequency in use, it's a gain antenna with a phasing coil or impedance-matching transformer.

Q. *I have a radio in my garage and an indoor antenna wire; I'm plagued with nearby fluorescent light noise. Is there any easy fix other than replacing the lights? (Tom Carroll, email)*

A. Fluorescent lights are a major radiator of electrical interference to radio reception, and any antenna placed close them is an invitation to disaster. Get that antenna as far away as possible, preferably outdoors, and feed it with coaxial cable. That will solve the problem.

If you're worried about visible antennas, choose insulated wire with a neutral color like grey. Mount it high and in the clear. You can even bury the coax.

You can try relocating the indoor antenna as far as possible from the fluorescent fixtures, but still feeding it with coax to the radio. If the fixture is metal, make sure it is electrically grounded to the third wire of its cable. Occasionally, the ballast transformer can be defective, internally leaking voltage sparks, or the bulbs themselves may require replacement if they have blackened ends.

Efforts like surrounding the fixture with well-grounded metal screening may have with some success. The ultimate answer, though, is to convert to incandescent lighting.

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

Getting Started

Bright Ideas

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I am devoting the entire column to tips for preparation of another busy season of wildland fires. You don't live or vacation in an area near wildland fires? Well, read on, because there is much to learn about related topics, such as the new narrow band technology for all VHF, and UHF public safety frequency allocations. As I write this in early April, wildfires are already raging in Florida, Colorado, and California. The forecast is for more drought caused from lack of snowfall. Could this year be worse than last year?

From June through November, wildland fires are a big activity out here in the west. Florida and the deep south are also in peril. As the communications officer for the local Red Cross chapter, I am responsible for giving the Emergency Services Director a heads up on all wildland fires. That means monitoring 10am until 8pm most summer days.

Our chapter covers nine counties in eastern Washington state, and two in northern Idaho. We also provide mutual aid for most of central Washington state and the Idaho panhandle. Fire season is both a calling and a volunteer duty. I love it! While some of these bright ideas might be specific to my area, I suspect you can adapt similar strategies for your neighborhood.

What is new for 2004? January 2005 is the deadline for all public safety and federal agencies to get on board with the new narrow band technology. This as the result of a mandate from Congress to "re-farm" the VHF and UHF radio spectrum to double the number of frequencies available. The current VHF spacing of 15 kHz is cut to 7.5 kHz. Example: for fire there is a new allocation of 154.3325 between the current standard frequency allocations of 154.325 and 154.340. This new spacing applies to VHF high band 151-174 MHz. Washington and Oregon have dozens of the new 7.5 kHz step allocations in the "conservation" (forestry) category.

The transition on UHF (450-512MHz) must be completed by January 1, 2008. On UHF, the new spacing is changing from 25 to 12.5 kHz. Thus a new allocation might be 453.5625 between 453.550 and 453.575. While these UHF splinter frequencies have been used before, they were limited, special low power assignments. Now they will be full power and given equal usage. Most scanning radios have had the 12.5 kHz step for several years because of the UHF splinters.

Most agencies will continue to use their same frequency assignments, but their equipment should be able to accommodate the new users on adjacent frequencies. Because of 9-11 and the implementation of Homeland Security, there has been an unexpected, but welcome, flow of federal dollars for new radio equipment on the local and state levels, as well as for federal agencies. So what is the implication for your monitoring?

Well, you can check *Police Call* or other databases for newly issued licenses. I plan on simply doing a lot of searching with the smallest step my radio will accept, which for most of us will be 5, or perhaps 6.5 kHz. Watch for new scanners to have the 7.5 step.

With the feds having all of the 162-174 MHz spectrum, this will mean a lot of time devoted to this search for new active channels. I know that in Idaho, their Department of Lands (DOL-forestry) is working closely with the federal agencies and are completing revamping their radio frequency assignments. I expect that nationwide, there will be many new frequencies in use this summer by all the federal agencies. I love a new challenge!

Do your research. You should do some internet searches to find websites with wildland fire frequencies. There were also many interesting news articles on last summer's fires. You could spend several hours on this. Have your printer ready! Search for key words like "BLM frequencies." Here are a few to get you started:
http://www.scancal.org/cdf/blmnifc.html
http://www.scancolorado.com/how_to_monitor_a_wildland_fire.htm
http://users.snowcrest.net/marnells/natradio.htm

Don't be lazy. You might have to visit 40, or 50 (next) pages from a single search. Try different search engines Several readers emailed me with yet another suggestion for a good search engine. Try **http://www.vivisimo.com.** If you are reading this in your electronic version of *MT* Xpress, you can just click on the url, and you will magically be connected. (Assuming you have your internet connection up and running.)

Update your database and scanner programming. I am already working on my master frequency guide for the 2004 fire season. This is specifically for Red Cross and ARES/RACES members who might need to respond. If you have any info on frequencies for your state, BLM, USFS, NPS, BIA, etc., for Oregon, Washington, Idaho, or Western Montana, please send your frequencies to *MT* editors with a copy to me. California is well documented, but other states are rather limited, especially for the federal agencies. I also appreciate computer files for the RS Pro 92, Pro 95, etc.

Gather some maps of nearby counties and states. You will find it more interesting if you can track developments on a map. I actually prefer the good old paper maps where I can use highlight pens to identify the areas involved.

Strategies for listening. Identify the key channels. I always listen to the various county fire dispatchers. Last year, I noticed that every *wildland* fire was essentially rebroadcast over the main channel for the Washington State Department of Natural Resources. For DNR, the on duty chief ranger (Incident Commander) is Arcadia 100. In north central Washington, it is Columbia 100. DNR takes the lead in all wildland fires regardless of jurisdiction.

I love to hear the dispatcher's voice with "Arcadia 100—FIRE!" followed by the location. No matter what city, or county, the state DNR usually sends engines, and hand crews to free up local resources. For you eastern Washington listeners, that means 159.420, and 159.405. I expect these to remain the same for this summer. But I know that Idaho will be completely different from last summer.

Last summer I kept one scanner going with just five DNR frequencies going. On significant fires they are also going to bring up the air attack plane to coordinate ground and air support. Locally, that is 159.270 simplex. I have another scanner dedicated to this. Once I hear major activity, I move to the radio room with four desktop scanners. I have different scanners for the BLM, BIA, USFS, aircraft etc. Frankly, it gets pretty intense.

Get the best possible antenna. You may be trying to hearing stations that are a long way off. I especially like an antenna for VHF on 162-174. My most treasured antenna is a folded dipole Motorola for this range. This feeds my Stridsberg one to four amplifier. If you are using a telescoping antenna, reduce the length for these higher frequencies.

If you are on vacation, you might pass through an area with fire activity. Be prepared with a scanner that has a couple of preprogrammed banks with the old and the new 151, 154, and 159 MHz frequency allocations. Of course, you need to remain at a safe distance.

Need some motivation, or special ambiance? Want more information, and some great color photos? Subscribe to *Wildland Firefighters* magazine at **http://www.wildlandfirefighter.com** or 1-888-456-5367.

Hope for the best, listen for the rest. See you next month.

Dan Veeneman
danveeneman@monitoringtimes.com

Special Temporary Assignments

In the United States, the Federal Communications Commission (FCC) is the authority for issuing licenses to use radio frequencies not reserved by the federal government. The FCC's Wireless Telecommunications Bureau (WTB) handles the application and licensing process for the radio networks that public safety agencies use. If an application is particularly urgent or unusual, the WTB may issue a Special Temporary Authorization (STA) allowing immediate or temporary use of the requested frequencies. These authorizations can often be very interesting to monitor, since by definition they're not the normal, run-of-the-mill licenses.

❖ Forsyth, Georgia

In April the FCC issued an STA to the State of Georgia for "interoperability testing and training in support of Georgia emergency management and public safety operations." The STA covers five frequencies: 867.6125, 867.6375, 868.1250, 868.3625 and 868.8375 MHz, based at what it describes as a fire station on Indian Springs Road in the town of Forsyth, in Monroe County midway between Atlanta and Macon. The frequency assignments indicate the system should be trunked (because the frequencies are in the Public Safety Trunked pool) and the STA specifies analog voice transmissions (it has an *emission code* of 16K3F3E, meaning the signal is supposed to have a bandwidth of 16.3 kHz and carry FM analog voice).

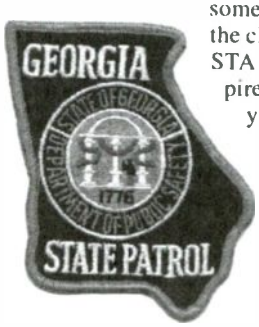
The FCC grants STAs for a variety of reasons, but in this case it appears Georgia's Department of Public Safety (DPS) wants to work out the kinks in a more secure method of communication. They filed an application with the FCC for the STA and included the following explanation:

Due to the extreme public safety circumstances surrounding the requirements for interoperability of first responders, the State of Georgia hereby respectfully requests Special Temporary Authority for the use of five 821 MHz frequencies ... in support of Georgia Emergency Management Agency and Department of Public Safety training operations in Monroe County at the Georgia Public Safety Training Center (GPSTC).

This is considered an emergency operation. Existing public safety communications on all bands is extremely congested with normal and routine traffic. The existing radio communications in the state is not secure, anyone with a scanner can monitor what activity is going on in the area. DPS desires to provide dedicated radio communications with digital encryption on a trunked system.

The GPSTC provides training in a variety of public safety-related areas for state and local agencies in Georgia, everything from criminal investigation to fire fighting. It houses the facility on Indian Springs Road mentioned in the STA.

Anyone close by Forsyth with a trunk-tracking scanner and an urge to do some detective work might log some unique traffic, but the clock is ticking – the STA is scheduled to expire in October of this year. I don't know whether you would hear analog traffic, as the license indicates, or encrypted digital traffic as the application suggests. If anyone does manage to snag some of these transmissions, please drop me a line!



❖ Indiana SAFE-T

Since we're discussing FCC licenses, earlier this year the State of Indiana received renewals for many of their statewide trunked radio system frequency allocations.

Indiana operates a mixed analog and digital 800-MHz radio system called *Project Hoosier SAFE-T* (Safety Acting For Everyone-Together). SAFE-T operates on a Motorola 4.1 Astro Smartzone OmniLink 800 MHz trunked voice and data system, supporting both analog and digital radios. The project began in the late 1990's and the first local department came on-line in 2002.

Out of 126 planned repeater sites, about 30 are working now in the following counties: Clinton, Fountain, Franklin, Jasper, Jefferson, Johnson, Kosciusko, Lake, LaPorte, Madison, Marion, Marshall, Miami, Montgomery, Morgan, Elkhart, Noble, Parke, Porter, Putnam, Ripley, Switzerland, Tippecanoe, Whitley, Vermillion and Vigo. Another 40 or so sites are expected to be operational by July, providing geographic coverage for about two-thirds of the state. The entire system is scheduled for completion in 2006.

SAFE-T is governed by the Integrated Public Safety Commission (IPSC), made up of private, local, state and federal representatives. Their plan is to build the "backbone" of the network – the repeater sites, controllers, and the T1 and microwave links between them – and make it available to public safety agencies across the state. Local agencies have to purchase their own radios but do not have to pay a fee to use the system.

Interestingly, the IPSC chose not to require Project 25, based on the higher cost and lower level of interoperability of Project 25 equipment. They felt that the flexibility of analog operation would allow a greater variety of less expensive equipment to use the system, leading to better participation by small, under-funded departments. Indiana is largely a rural state, and most local jurisdictions don't have the money to purchase multi-thousand dollar digital radios for every person who would need one. The IPSC was also concerned that there would be no competition for repeater equipment, since at the time there was only one manufacturer of such hardware.

The license renewal specifically men-

tions the State Police, Department of Transportation, and Department of Natural Forestry and Conservation as using the system. In addition, many other agencies are part of SAFE-T, including local, state and federal safety and law enforcement departments.

Northwest Indiana

La Porte, St. Joseph and Elkhart counties:

Analog and Digital
855.7375, 855.9875, 856.7125,
856.7625, 856.9375, 857.7125,
857.7625, 857.9625, 858.7125,
858.7625, 858.9625, 859.7125,
859.7625, 860.7125, 860.7625,
860.9625, 866.9750, 867.4250,
868.4500

Analog Only
866.0125, 866.5125, 867.0125,
867.5125 868.0125

Lake County
(bordered by Illinois to the west and Lake Michigan to the north), home to the city of Gary:

Analog and Digital
860.4625, 866.8750, 866.9750,
867.3750, 867.4750, 867.8625,
867.8750, 867.9750, 868.3750.

Analog Only
866.0125, 866.5125, 867.0125,
867.5125, 868.0125

Northern Indiana

Pulaski, Marshall, Porter and Jasper counties:

Analog and Digital
855.2375, 856.2625, 856.9625,
857.2125, 857.9625, 858.9625,
859.9625, 860.2125, 860.9625,
866.4250, 866.4500, 866.4750,
866.9000, 866.9250, 866.9500,
867.4500, 867.9250, 867.9500,
868.4250, 868.8625, 868.9250,
868.9500, 868.4750 868.9750

Analog Only
866.0125, 866.5125, 867.0125,
867.5125, 868.0125

For those readers who have a Radio Shack PRO-96 scanner, these and other frequencies are pre-loaded as Virtual Scanner number 8. In order to load this into memory perform the following steps:

Press [PGM], [FUNC], then [PGM] to get into V-Scanner mode.
Press [2] (Load).
Press [8] (Illinois, Indiana and Michigan area) then press [ENTER].
Make sure you have the right number in the display, then press [ENTER] again.
The scanner display will indicate that it is loading.
When it's done, press [ENTER].

The scanner will reboot and afterward you will have the frequencies loaded into memory. Project Hoosier is Bank 3.

Richmond, Indiana

Despite the advantages of SAFE-T, some communities aren't waiting for the state to help them out. In Wayne County on the eastern border of Indiana, the city of Richmond has a new repeater for on-scene fire and rescue operations. They operate a low band conventional analog system on 154.010, 154.280, 154.400 and 155.535 MHz. The new repeater is expected to reduce the amount of traffic on the main frequency when they're handling an emergency. This is a good example of a low cost, simple solution to a specific problem this rural county was experiencing.

❖ Imperial County, California

Out in the southern California desert, a $14 million 800 MHz radio project in Imperial County is nearing the end of its first phase. Three local police departments from the cities of El Centro, Holtville, and Imperial are now operating on a new Motorola system. A number of additional cities and agencies, including the Sheriff's Office, are expected to join the network over the next year. However, some communities are balking at the high price tag to join the system – several hundred thousand dollars in user fees to be paid each year.

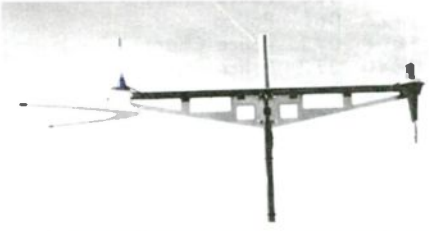
Headed by the Imperial Valley Emergency Communications Authority (IVECA), the new system is scaled down from a $28 million proposal floated in 2000, which voters rejected in a referendum. It will replace a patchwork of old VHF systems, many of which experience severe interference from

nearby Mexico. It is funded through payments and fees from the communities that it serves.

The new system is linked to the San Diego County Regional Communications System (RCS), which performed well during a series of wildfires last fall. RCS currently serves 16,000 users from more than 200 agencies, averaging 3 million user transmissions per month. Its geographic range covers 9,000 square miles across two counties. Just to give you an idea of how large this really is, the city of Imperial is more than 100 miles from San Diego, more than 200 miles from Los Angeles and about 250 miles from Phoenix. It's about a dozen miles from the Mexican border. The two counties stretch from the Arizona border to the Pacific Ocean.

RCS is facing growing pains and coverage shortfalls of its own, and is completing work on a plan to upgrade parts of the San Diego County system. New repeater sites and additional radio channels in the plan are expected to cost $22.9 million but will close the gaps and capacity problems identified last

MORE BOOM FOR YOUR BUCK!



Antenna Crossarm Boom (Design 1)

With 4-ft. or 2M (78-3/4") lengths, and designed for mast or tower, static or marine mountings, this boom fits the bill! Unique structural platform mounts four magnetic-base mount antennas **OUT AND AWAY from mast or tower.**

Four Foot Steel with four different antennas *pictured above*. Other uses include a versatile Meteorological sensor platform, surveillance cameras and supports for Photographic and studio lighting. Stacked arrays have multiple Military applications: amphibious operation voice and code communications plus RDF.

1. Four Foot Steel/Gold Zinc (small 4" pads) 9.4# $129.00
2. Four Foot Steel/Gold Zinc (large 5" pads) 9.6# $149.00
3. Four Foot Aluminum/Grey (large thin 5" pads) 4.7# $199.00
4. Two Meter Al (78-3/4") Grey (large thin 5" pads) 7.5# $349.00
5. Two Meter Al (78-3/4") Grey (large thick 5" pads) 9.8# $369.00
6. Two Meter Stainless Steel (small thick 4" pads) 20.3# $599.00

The advantage of flush pads is they can accommodate larger base amounts without blocking ground plane mounting holes. Flush bases are more desirable when two extra pounds are not critical. 12- and 24-foot designs available direct from factory. Special Stainless or Rubber coated U-bolts available at additional charge.

Shipping and handling in the USA is a flat $15.00 for the first unit and $10.00 for each additional unit for four-foot units. Two meter units are $20.00 for the first unit and $15.00 for each additional unit via standard ground or USPS. Payment may be made by Visa, Mastercard, check or money order to Talon Creative Inc.

P.O. Box 1111 · Chino Valley, AZ 86323
Phone/Fax (928) 777-8839
www.antennacrossarmmount.com

U.S. Patent # 6,348,899 B1
Talon Creative Inc.
Patented Technological Inventions

fall.

In Imperial County, a tower in Brawley transmits on 856.4250, 861.2500, 862.2500 and 863.2500 MHz. Four additional towers in the county, located in Brawley, Calexico, Calipatria, and Imperial, simulcast on 856.0750, 857.0750, 858.0500, 858.0750, 859.0500, 859.0750, 863.1000, 864.2500 and 865.2500 MHz.

In addition, two repeaters in Palo Verde operate on 856.2000, 857.2000, 858.2000, 861.0500, 861.1000 and 862.0500 MHz. Another tower in Salton City transmits on 856.2250, 856.4250, 857.2250 and 858.2250 MHz. Finally, a repeater located in Yuma County, Arizona, covers the eastern edge of Imperial County on 856.1750, 858.1750, 859.2000 and 860.2000 MHz.

❖ Aurora, Illinois

The city of Aurora, Illinois, a western suburb of Chicago, currently operates a seven-channel Motorola type II SmartNet system. Motorola has informed the city that the system, installed in 1995, is outdated and that they cannot guarantee support or replacement parts should anything go wrong. Motorola is urging them to transition to a new digital system that could cost as much as $14 million.

Aurora's Police, Fire and Public Works Departments share the existing system with the nearby village of North Aurora. The city had planned to eventually switch to digital, in part to be compatible with the Illinois State Police system, but hadn't budgeted for a new radio system this soon. Aurora was also hoping to build a new police headquarters in the not too distant future, and they don't want to install new equipment in an old building, then have to de-install and move it after a new headquarters facility is built.

Until Aurora finds the money and installs a new system, you can monitor their four analog repeater sites using these frequencies: 866.0375, 866.0625, 867.2500, 867.6250, 868.1750, 868.2000 and 868.5375 MHz.

Dec	Hex	Description
16	001	Aurora Public Works
48	003	Aurora Public Works
80	005	Aurora Public Works
112	007	Animal Control
1648	067	Aurora Police Dispatch
1776	06F	Aurora Police Operations (1)
1808	071	Aurora Police Operations (2)
1840	073	Aurora Police Channel 5
1872	075	Aurora Police Channel 6
1904	077	Aurora Police Tactical 1
1936	079	Aurora Police Tactical 2
1968	07B	Aurora Police Tactical 3
3248	0CB	Aurora Fire Dispatch
3280	0CD	Aurora Fire Fireground 1
3312	0CF	Aurora Fire Fireground 2
3696	0E7	North Aurora Fire
4816	12D	Aurora Emergency Management
8016	1F5	North Aurora Police
8048	1F7	North Aurora Police
9616	259	North Aurora Fire Dispatch

❖ Elgin, Illinois

Just up the Fox River from Aurora is Elgin, Illinois, another suburb of Chicago. Some technical folks might recognize this town as the home of Simpson Electric, maker of electronic test equipment and panel meters. Elgin is facing a similar decision to Aurora, whether to upgrade their Motorola Type II trunked system to digital operation. Interstate 90 runs through the north side of this city of 95,000 people, with major state routes 20 and 31 carrying commuters and truck traffic throughout the day. A State Police post on Route 31, just south of downtown, even houses a repeater site for the state radio system. Interoperability is a necessity, but is a brand new digital system the answer?

Elgin's analog system currently uses five frequencies: 855.2125, 859.9875, 866.3250, 866.6625 and 868.6250 MHz. Some Elgin talkgroups:

Dec	Hex	Description
48	003	Fire Dispatch
80	005	Fire Operations, Channel 2
112	007	Fire Operations, Channel 3
144	009	Fire Operations, Channel 4
1648	067	Police Channel 1
1680	069	Police Channel 2
1712	06b	Police Channel 3
1744	06d	Police Channel 7
1776	06f	Police
1808	071	Police Channel 5
1840	073	Police Channel 4
1872	075	Radio Service
3248	0cb	Public Works
3280	0cd	Public Works
3312	0cf	Public Works
3344	0d1	Park District
14416	385	Citywide

❖ Richland County, South Carolina

Hi Dan,

I am trying to find frequencies to put in my scanner for the Richland County Sheriff in Columbia, South Carolina (North Richland County). The three different sets that I could find, including the listings in the Radio Shack guide that comes with scanners, work; but the Richland County listing with 15 frequencies, 856-860.2125, 856-860.4375, and 856-860.4825 won't ever stop scanning. Any information, please?

Thank You,

Michael in South Carolina

P.S. Do you have any other frequencies for RCSD?

The trunked radio system in Richland County has a total of fifteen frequencies, eight broadcasting from Columbia and seven transmitted from a repeater site in the town of Elgin in Lexington County. The complete list of frequencies is: 856.2125, 856.4375, 856.4875, 857.2125, 857.4375, 857.4875, 858.2125, 858.4375, 858.4875, 859.2125, 859.4375, 859.4875, 860.2125, 860.4375 and 860.4875 MHz. These are active frequencies with traffic you should be able to monitor. Double-check your programming to confirm whether you can hear any of these Sheriff Department talkgroups:

Dec	Hex	Description
15952	3E5	Dispatch 3
16016	3E9	Special Response
16176	3F3	Dispatch 4
16208	3F5	Car to Car
16368	3FF	Car to Car
16432	403	Dispatch 2
16496	407	Warrants
16528	409	Dispatch 1

I did find four conventional frequencies assigned to the Sheriff's Department. A repeater site on Campground Road is licensed for operation on 460.075, 460.375, 460.500 and 460.550 MHz. North and East Patrols are supposed to be on 460.375 MHz and the South and West Patrols are on 460.500 MHz. In your area you may also hear activity on state frequencies of 155.64, 452.125 and 457.125 MHz.

Palmetto Richland Memorial Hospital in Columbia is licensed for 463.65, 451.700 and 456.700 MHz, as well as a number of telemetry channels. Also, you might want to include 463.750 and 468.750 MHz, which are assigned to Richland County School District 1.

❖ Pawtucket, Rhode Island

The Police Department in Pawtucket, Rhode Island, recently started using new digital radios and repeaters after receiving a $400,000 grant from the federal government last year. They made the switch in April, leaving their old primary low band frequency of 154.830 MHz. They now have three new UHF frequencies, namely 470.7250, 471.0750 and 472.7250 MHz. Although the new system uses APCO Project 25 standards it is not trunked, so any of the digital scanners on the market will decode the audio transmissions. Several readers are having good success with Uniden models 250D and 785D, and indicate that 470.7250 MHz is the busiest of the new channels.

The Pawtucket Fire Department is still listed as using 154.445 and 154.280 MHz, and they have an additional frequency license for digital data transmission at 72.22 MHz. Do any readers local to the area know if that frequency is actually in use?

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

Scanning Canada

John David Corby, VA3KOT
johncorby@monitoringtimes.com

One Busy Megahertz

Reader Mark Cobbledick from Virginia wrote to *Scanning Canada*:

I am a VHF-lowband skip listener, and have been for decades. One of the band segments of interest is the 29.700 to 30.600 MHz area. In the USA, just above the 10-Meter amateur band lies five frequencies traditionally used by timber and paper companies: 29.710, 29.730, 29.750, 29.770 & 29.790 MHz. Between these channels and the 30.600 MHz beginning of the civilian FCC allocations is a small chunk of spectrum allocated to the US Government. Mostly used by wildlife tracking devices (collars, etc.) and some limited military communications.

I was curious what Industry Canada had authorized within this frequency range? I hear pagers I assume originating from Ontario on 30.490 MHz during band openings, and some random voice traffic.

Any information you can offer would be greatly appreciated."

- Mark Cobbeldick, KB4CVN Monroe, VA USA

ScanCan sprang into action to investigate the use of this band segment in Canada. The frequency range of interest lies right in the basement of the VHF-Low band. Frequencies in this range, as Mark suggests in his mail, sometimes carry a long way. It is a popular band for drive-through fast food restaurants, although the low power levels used rarely sneak past a restaurant's own immediate vicinity.

Licencees in this frequency slice fall into just a few main categories: fishing vessels, helicopters, healthcare facilities, restaurants and general commercial. This month's frequency list shows the most interesting monitoring targets from all across Canada. Most of the general commercial licencees have been deleted from the list because, frankly, they are not particularly interesting to listen to. Okay, so you won't find much excitement listening to your local retirement residence, either, but the listing for these establishments may assist in identifying sources of transmissions. If you crave excitement, check out the helicopters.

Our monitoring station is located in southern Ontario, a long way from Canada's sea fishing industry. If you are fortunate enough to live near the BC coast and you can identify what use the fishermen make of the VHF low band, please send me an e-mail at the address at the top of the page. Transmissions further up the spectrum on the VHF marine band would be more customary, so here is a little puzzle for readers to answer. A *ScanCan*, full-color thank you card awaits all readers responding to the challenge (include your snail mail address in your e-mail).

ScanCan's Sorted Basement Band Frequency List

Aviation
30.000 Alpine Helicopters Ltd, Kelowna BC
30.000 Bighorn Helicopters Inc, Cranbrook BC
30.000 Boeing 727 Kelowna Fightcraft Air Charter Ltd, Kelowna BC
30.000 CFB Suffield, Calgary AB
30.000 Conair Aviation, Abbotsford BC
30.000 Gouv. Quebec, Service Aerien, Ste-foy QC
30.000 Heli-inter Inc, Malartic QC
30.000 Heli-lift International Inc. Yorktor, SK
30.000 Helico Holdings Ltd, Cranbrook BC
30.000 Hicks & Lawrence Ltd (Aircraft), Dryden ON
30.000 Kokanee Helicopters Inc, Kelowna BC
30.000 Med Tech Jet, Cronbrook BC
30.000 Northshore Air, Dryden ON
30.000 Selkirk Mountain Helicopters Ltd, Revelstoke BC
30.000 Skyline Helicopters Ltd., Kelowna BC
30.000 Standard AG Helicopter Inc., Chatham ON
30.000 Sunwest Helicopters Limited, Qualicum Beach BC
30.000 Valhalla Helicopters Inc., Kelowna BC
30.000 Wildcat Helicopters Inc., Kelowna BC
30.000 Yellowhead Helicopters Ltd., Valemount BC
30.150 CFB Suffield, Calgary AB
30.440 Cessna 185 Guy Bilodeau, Senneterre QC
30.560 Arrow Lakes Helicopters Ltd., Okotoks AB
30.560 Venture Helicopters Ltd., Calgary AB

Colleges
30.580 College de Sherbrooke (cegep), Sherbrooke QC
30.580 Okanagan College, Kelowna BC

Fisheries
29.940 Freeport Mcmillan Fisheries Ltd., Prince Rupert BC
29.940 Miss Georgina Menzies Fishing Co Ltd., Bowen Island BC
29.940 Silver Token, Prince Rupert BC
30.320 Camosun Fishing Co Ltd., Cobble Hill BC
30.460 Island Joy, Sooke BC
30.460 Pacific Reword, Comox BC
30.460 Tequila, Terror Point Fishing Co. Ltd., Campbell River, BC
30.460 Viking Queen, Heggelund Fishing Co Ltd., Sooke BC
30.540 Namu, Sea World Fisheries Ltd., Vancouver BC

Restaurants
30.020 Wendys Restaurants (Head Office) Oakville, ON
30.400 Wendys, Country Style Donuts
30.480 McDonalds, KFC
30.580 McDonalds, KFC, Taco Bell, Tim Hortons, Wendys

Selected General Commercial
29.980 Montreal Metropolitain dgtic-administration, univ. de Montreal QC
30.000 Ministry of Forests, Victoria BC
30.020 Hamilton Trade Centre and Arena, Hamilton ON
30.220 Casino Rama, Mnjikaning First Nation, Rama ON
30.240 Province of Ontario GMCO, Mississauga ON
30.420 Province of Ontario (GMCO), South Porcupine, ON
30.580 Alfa Radio Ltd, Edmonton AB (ham radio store)

Healthcare/Retirement Residences
30 020 Southlake Regional Health Centre, Newmarket ON
30 020 Stuart Lake Hospital, Fort St James BC
30 020 Sunnybrook Health Science Centre, North York ON
30.220 Centre Hospitalier Anro Laberge, Chateauguay QC
30.220 Eastern Shore Memorial Hospital, Sheet Harbour NS
30.220 Residence Mance Decary, Montreal QC
30.420 Bloorview Macmillan Centre, Toronto ON
30.420 Bob Rumble Centre for the Deaf, North York ON
30.420 Bow View Manor, Calgary AB
30.420 Central Park Lodges Ltd, Niagara Falls ON
30.420 Coldwater Seniors' Apartment, Coldwater ON
30.420 Greater Edmonton Foundation, Edmonton AB
30.420 Groves Memorial Hospital, Fergus ON
30.420 Hanover District Hospital, Hanover ON
30.420 Kristus Darzs Foundotion Inc., Woodbridge ON
30.420 Lady Dunn Health Centre, Wawa ON
30.420 Lifestyle Retirement Comm. Ltd., Toronto ON
30.420 Lifestyle Retirement Communities, Oakville ON
30.420 London Health Sciences Centre, London ON
30.420 North Renfrew Long Term Care, Deep River ON
30.420 Pleasant Manor Care Services Inc., Virgil ON
30.420 Port Colborne General Hospital, Port Colborne ON
30.420 Simcoe Manor Home for the Aged, Beeton ON
30.420 Trillium Manor Home for the Aged, Midhurst ON
30.420 Wellington Terrace Seniors Apt., Oakville ON
30.420 William Osler Health Centre, Brampton ON
30.420 Winston Hall Nursing Homes, Kitchener ON

When you are monitoring these frequencies, it may be helpful to pull your whip antenna all the way out. If you are using a rubber-ducky antenna, you might get better results if you replace it with a piece of wire. The length of the wire is not really important, although two or three meters should be sufficient. Mount the wire vertically for best results.

Until next month, enjoy the start of summer and write me with your scanning logs from the basement band.

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

ALE and World Events

This month's *Utility Logs* has something interesting lurking right below the noise floor. It's an indication that Automatic Link Establishment may currently be a great way to do what the scanner manufacturers like to call, "Hearing the news before it's news."

Let's briefly review ALE. It's a complex protocol used to establish radio contact, as defined in military standard MIL-STD-188-141A. It can be embedded in advanced equipment, or can stand alone in external controllers.

One hears its gobble-gobble sound all over the high-frequency (HF) band. It's multi-tone phase-shift keying (MPSK). Eight data tones go to a single-sideband radio, usually in the upper sideband (USB). The repeating sound comes from its data structure, using short "words" in a standard sequence. Once contact is made, any subsequent communication is by analog voice or, increasingly, digital modem.

Most new military contracts, and a growing number of civilian ones, specify ALE on HF. It does much of the grunt work for operators, who might not be thoroughly trained in radio. For example, the ALE controllers keep track of who is on the net, and which net frequencies have the best propagation to each station. There are also places to put commands for network optimization, landline phone autoconnect, or even net chatter like "HOW COPY?" on the receiver's terminal.

ALE lends itself to rapid scanning of long lists over comparatively wide frequency ranges, and that's what makes it so audible to shortwave listeners. Every participating unit will either "sound," a propagation check for the whole net, or automatically check signal with specific stations. To do either, it must identify, and that's where we come in.

❖ Listening to ALE

ALE software is easy to come by. An outstanding program for Windows is PC-ALE, available at:
http://www.chbrain.dircon.co.uk/pcale.html.
For the Macintosh, there's MultiMode, at:
http://www.blackcatsystems.com/software/multimode.html.

Scanning can really tie up your radio, but that's not necessarily a bad thing. It's great for times when you're out having a life. It's fun to come back and check the list, to see what your equipment found.

This makes ALE an amazing tool for vacuuming up identifiers in a target country or region, and seeing who's active. Many different nets have been documented by utility hobbyists, making it easy to zoom in on the latest trouble spot.

The standard Army ALE radio

For example, the increase in loggings for the Spanish Guardia Civil (Civil Guard) reflected that nation's disastrous terrorist attacks and subsequent political turmoil. The Moroccan Gendarmes (Police) were also far more active, and they were using a new system of callsigns. The time frame seemed right for the Spanish terrorism, and sure enough, news reports later indicated that several suspects were being sought in Morocco.

The ALE controller in an Army helicopter

Venezuela is another uneasy spot this year. Ron Perron's great military ALE list has already been in the military column, so I needn't repeat it here. It's noteworthy for this discussion, though, that a lot of this deployment is anticipating the anniversary of last year's unsuccessful coup d'etat. Many groups have been attempting various types of destabilization from both sides.

Finally, United States ALE always picks up dramatically in the periodic exercises by federal public safety agencies. These usually also include the Army and the quasi-amateur Military Affiliate Radio System (MARS).

❖ New York Volmet Still Gone

"Volmets" are internationally defined airport weather information broadcasts, with observations and short-term forecasts of interest to pilots in flight over oceanic areas. They use high-frequency radio. The name is a contraction of the French for "flying weather." Volmet transmissions are divided up into meteorological zones roughly similar to the long-range oceanic air traffic control areas. Any time of the day or night, one can turn on the radio and hear a Volmet going somewhere.

Last year, one of the most consistent signals on the entire HF band vanished without a word, when New York Radio suddenly pulled the switch on WSY 70, its rock-solid flight weather transmission from a rhombic farm in New Jersey. It had broadcast the United States Atlantic Volmet for 20 minutes on the hour and half hour, with Gander Radio, Newfoundland, Canada, filling the rest. Frequencies were 3485 (night), 6604, 10051, and 13270 (day), all in kilohertz (kHz). Mode was USB voice.

By the time the normal 2-month lead time of magazine publishing was over and our report was seen by the readers, the Volmet was temporarily back. Therefore, when it went away again last fall, we waited an extra long time to see what would happen.

This time, we knew the powers that be were aware of the situation, because they issued several Notices To Airmen (NOTAMs) for frequencies being out of service until further notice. Many suspected some kind of technical problem, or waiting on shipment of a part. But weeks became months, and months became seasons, and New York was still off-air. A lot of people missed it, and so it became time to check up on the matter again.

Well, here's the whole story. According to Ron Napurano, who is in charge of the facility for the US Federal Aviation Administration (FAA), "Funding for maintenance of the Volmet is currently under review. Until funding has been secured the Volmet is out of service."

Sounds as if the station, or the automated weather system that feeds it, may have fallen victim to the intense budgetary pressures affecting the entire FAA. HF radio services often lose out in such crunches. They simply don't look new or high-tech at funding time, no matter how cheaply and efficiently they put information into the hands of those whose lives depend on it.

It'll be interesting to watch the three East Pacific Volmets (Honolulu, San Francisco, and Anchorage) that are transmitted by KVM 70, Honolulu Radio, on 2863, 6679, 8828, and 13282 kHz USB. These have not been interrupted, and were still on-air at press time. Whatever budget issue is involved here seems limited to New York, at least for now. This story is not over.

We, however, will definitely be back next month.

Utility World

Utility Logs

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ABBREVIATIONS USED IN THIS COLUMN

AFB ..... Air Force Base
ALE ..... Automatic Link Establishment
ARINC ..... Aeronautical Radio, Incorporated
ARQ ..... Automatic Repeat Request teleprinting system
ARQ-E3 ..... French ARQ teleprinting system
CAMSLANT ..... Communication Area Master Station, Atlantic
CAMSPAC ..... Communication Area Master Station, Pacific
Coq-8 ..... Coquelet-8, French teleprinting system
CW ..... Morse code telegraphy ("Continuous Wave")
DEA ..... US Drug Enforcement Administration
DSC ..... Digital Selective Calling
EAM ..... Emergency Action Message
FAX ..... Radiofacsimile
FEC ..... Forward Error Correction teleprinting system
FEMA ..... Federal Emergency Management Agency
HFDL ..... High-Frequency Data Link
HF-GCS ..... High-Frequency Global Communications System
LDOC ..... Long-Distance Operational Control
MARS ..... Military Affiliate Radio System
MCW ..... Modulated Continuous Wave Morse telegraphy
Meteo ..... Meteorological
MFA ..... Ministry of Foreign Affairs
MXC ..... Russian cluster single-letter beacons
NAVTEX ..... Navigational Telex
PACTOR ..... Packet Teleprinting Over Radio
PR ..... Puerto Rico
RSA ..... Republic of South Africa
RTTY ..... Radio Teletype
SIPRNET ..... Secure Internet Protocol Routing Network
SITOR-A ..... Simplex Teleprinting Over Radio, ARQ mode
SITOR-B ..... Simplex Teleprinting Over Radio, FEC mode
UK ..... United Kingdom
Unid ..... Unidentified
US ..... United States

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 (encrypted, usually unidentified, broadcasts thought to be intelligence-related) are identified in () with their ENIGMA station designators, as issued by the European Numbers Intelligence Gathering and Monitoring Association.

326.0 HFA-Nondirectional aero beacon, Haifa, Israel, identifying in MCW at 1126. (Ken Maltz-Israel)

351.0 BOD-Aero beacon, Beirut, Lebanon, MCW at 1131. (Maltz-Israel)

360.0 BT-Aero beacon, probably Beirut, MCW at 1135. (Maltz-Israel)

385.0 HZR-Aero beacon, location unknown, MCW at 1141. (Maltz-Israel)

399.0 MDB-Aero beacon, Queen Alia airport, Amman, Jordan, MCW at 1144. (Maltz-Israel)

413.0 QA-Aero beacon, Queen Alia airport, Amman, MCW at 1150. (Maltz-Israel)

428.0 PU-Aero beacon, MCW at 1153. (Maltz-Israel)

443.0 AL-Aero beacon, MCW at 1158. (Maltz-Israel)

518.0 "G"-US Coast Guard NAVTEX, New Orleans, LA, with Maritime Safety Information broadcast concerning live ordnance exercises in Gulf of Mexico, SITOR-B at 0328. (Glenn Blum-TX) ZSJ-South African Navy, NAVTEX warning bulletins at 1230 and 1620. (Bob Hall-RSA)

3050.0 US Navy tracking net, various single-letter callsigns at 0625. (Jeff Haverlah-TX)

3407.0 Aktyubinsk-Kazakstan Meteo, weather in Russian at 2036. (Patrice Privat-France)

4233.0 CAMSLANT-US Coast Guard, weather FAX at 0407. (Jeff Seale-KY)

4252.0 PWX33-Brazilian Navy, Rio de Janeiro, PACTOR no-traffic message at 2350. (Hall-RSA)

4426.0 CAMSLANT-US Coast Guard, calling sailing training Cutter *Eagle*, then Cutter *Cypress*, at 0328. (Mark Cleary-SC)

4585.0 Sand Lapper 43-SC Civil Air Patrol, checking many stations into the wing net at 0100. (Ron Perron-MD)

4716.6 H7B-US Coast Guard HC-130, calling Group Key West at 0207. (Cleary-SC)

4721.0 Reach 433-US Air Force Air Mobility Command, early in Haiti operation, making an ALE initiated patch with traffic into Port-au-Prince, at 0252. (Cleary-SC)

4739.0 Fiddle-US Navy, working Cardfile 71C, at 0033. (Cleary-SC)

4889.0 TZSU-Spanish Guardia Civil, Ceuta, calling TXXX1, headquarters, in ALE, also on 5871, at 2209. (Day Watson-UK) *[Greatly increased activity was for terrorist attack and elections. -Hugh]*

5100.0 AT6-Israeli Air Force, calling AA3, Ben Gurion, in ALE, at 1800. (Watson-UK)

5117.0 SHQIPON-Albanian Ministry of Public Order, Shqiponja, working DRINI in ALE, at 2156. (Watson-UK)

5379.0 KRI-Albanian Ministry of Public Order, calling DRI, Drini, in ALE at 0550. (Watson-UK)

5422.5 Mooresville Station-Possible US Coast Guard, radio check with Oceana Radio on the Emergency Net, at 0003. (Cleary-SC)

5690.0 Lantarea Command-US Coast Guard, patch from aircraft Coast Guard 1500 at rescue from a disabled sailing vessel by helicopter CG 6001, at 2219. (Cleary-SC)

5696.0 Oceana Radio-US Coast Guard, working 2102 at 0436. (Rick Baker-OH)

5702.0 ADWSPR-US Air Force, Andrews AFB, MD SIPRNET gateway, ALE sounding at 0528. (Watson-UK)

5708.0 ICZ-US Air Force, Sigonella Air Base, Italy, calling IKF, Keflavik, Iceland, at 0026. MPA-US Air Force, Mount Pleasant, Falkland Islands, ALE sounding at 0315 and 0416. (Watson-UK)

5711.0 King 16-US Air Force rescue, Moody AFB, working Angel Ops at 0133. (Cleary-SC)

5717.0 Rescue 311-Canadian Forces, medical traffic for Halifax Military, NS, at 2316. (Cleary-SC)

5720.0 UPS6741-United Parcel Service freighter, working Reykjavik in HFDL, at 2106. (Privat-France)

5732.0 Coast Guard 1720, patch via Service Center (US Customs) to District 7 ops, at 0116. (Cleary-SC)

5785.0 HIM022-Polish Military, calling XUE019, ALE at 0022 and 0033. (Watson-UK)

6449.5 PWZ-Brazilian Navy, Rio de Janeiro, RTTY weather with unusual 425-hertz shift (usually 850), at 0626. (Hall-RSA)

6450.0 Approximate frequency of scrambled Spanish voice, probably Mexican Army, at 0120. (Drew Wilson-KS)

6501.0 CAMSLANT-US Coast Guard, VA, calling vessel Nancy Ann at 2121. (Cleary-SC) CAMSLANT, Atlantic and Gulf weather at 2340. (Seale-KY)

6640.0 New York LDOC, patch from flight 1184 (possibly Delta) to Medlink concerning a difficult-breathing emergency, at 0125. (Wilson-KS)

6694.0 Halifax Military-Canadian Forces, NS, working Rescue 311 at 0129. (Cleary-SC)

6697.0 Five Spot-US military, 28-character EAM simulcast on 8992 and 11244, at 1925. (Haverlah-TX)

6712.0 Andrews-US Air Force, MD, EAM simulcast on 8992 and 11175, at 0952. (Mike Snyder-US)

6739.0 Puerto Rico-US Air Force, PR, EAM simulcast on 8992, at 0121. (Snyder-US)

6761.0 Okie 53-US Air Force tanker, working Maniac Control at 0105. (Baker-OH) Steel 62-US Air Force tanker, calling Palm 91 at 2310. (Cleary-SC)

6767.5 USAIS1012-US Army, VA, calling FCSFEM, FEMA, in ALE, also on 5066.5, at 1707. (Perron-MD)

6770.0 CC1-Rockwell ALE net station, passing message "The slow brown fox never made it to the authouse" to CO2, at 0624. (Perron-MD)

6911.5 EAATS-US Army Eastern Aviation Training Site, PA, ALE sound, also on 8171.5, at 1816. (Perron-MD)

7361.5 T1Z159-US Army, Fort Bragg, NC, ALE sound, also 9295, at 2018. (Perron-MD)

7501.0 "H-6-N"-US Navy, had been "0-K-F" but changed trigraph calls at 0000, broadcasting two EAMs at 0031. "0-K-F"-US Navy, two 28-character EAMs at 2325. (Haverlah-TX)

7527.0 Hammer-US Customs Service, March Air Reserve Base, CA, working 54X (DEA), tracking a go-fast in the Bahamas at 0035. (Cleary-SC) Omaha 62-US Customs Service aircraft on a surveillance, working Hammer at 0114. (Blum-TX) Service Center-US Customs, working 61A (Coast Guard aircraft) at 1611. (Baker-OH)

7621.6 CGD9-US Coast Guard District 9, OH, calling NODW (Cutter Sundew), ALE at 1315. (Perron-MD)
7635.0 1PG-Maroccan Gendarmes, new callsign system, calling 6UL in ALE at 1055. (Watson-UK)
7850.0 Eagle-Possible military exercise, setting radio guard with Pelican, who mentioned a fire in the engine room at 0347. Eagle working Sandpiper at 0358. (Tom Edmonds-NC) *[Frequency has been used by US Coast Guard for police operations in the past, but this is weird. -Hugh]*
8151.0 TXXX-Spanish Guardia Civil headquarters, calling TZSJ, Jaen, ALE at 0757. (Watson-UK)
8240.0 *Eagle*-US Coast Guard sailing ship, position for CAMSLANT at 1522. (Cleary-SC)
8260.0 LL53-US military, came fram 8992 for a patch via Andrews, at 0137. (Haverlah-TX) CO2-Rockwell ALE net, with the same "outhouse" message as on 6770, for DT1 at 1450. (Perron-MD)
8298.1 6WW-French Navy, Dakar, Senegal, RTTY test loop at 0410. (Seale-KY)
8416.5 L2C-Argentine Navy, Buenos Aires, RTTY weather in Spanish at 0210. (Hall-RSA)
8453.2 RFFMEA-French Navy, Saissac, France, RTTY test loop at 0225. (Seale-KY)
8680.0 CAMSPAC-US Caast Guard, weather FAX at 0335. (Seale-KY)
8764.0 CAMSLANT, calling Cutter *Cypress* at 2054. (Cleary-SC)
8834.0 AY1966-Finnair flight calling Jahannesburg in HFDL, at 2116. (Privat-France)
8879.0 SEU050-Star Airlines flight 050, working Shanwick at 1954. (Privat-France)
8912.0 60A-DEA aircraft, with aps-normal for Panther at 2029. (Cleary-SC)
8927.0 "01"-ARINC ground station, San Francisco (Dixon, CA), passing arrival info to Hawaiian Airlines flight HA0024 (N593HA), in HFDL at 0313. (Blum-TX)
8930.0 Reach 766-US Air Force charter, telling Stockholm its company is North American Airlines, at 0648. (Privat-France)
8971.0 Gray Knight 01-US military, going secure for Western Sky, at 0244. (Baker-OH) Fighting Tiger 71G-US Navy, working Fiddle (US Navy, FL), at 2327. (Cleary-SC)
8983.0 Coast Guard 2117, passing traffic for Group Key West to CAMSLANT at 2125. (Cleary-SC)
8992.0 Reach 248-US Air Force Air Mobility Command, patch ta "Caddyshack" at 0129. (Snyder-US) Survival-US military, patch via McClellan to "Maintenance" at 0352. (Haverlah-TX) Reach 341Y-US Air Force, patch via Andrews to Moran Air Base, Spain, at 2232. (Cleary-SC)
9007.0 Canforce 4414-Canadian Forces aircraft, working Trenton Military at 2347. (Cleary-SC)
9025.0 Orca 71-US Air Force KC-10A, ALE initiated patch via Andrews to Travis AFB, at 2326. (Cleary-SC)
9040.7 5YE-Nairobi Meteo, Kenya, coded weather observations at 0019. (Hall-RSA)
9106.0 KNZ26-US National Communicatians System, calling KNR51 in ALE, at 1217. (Perron-MD)
9145.0 814386-US Army helicopter, calling CLS, Fort Campbell, KY, in ALE at 1917. (Perron-MD)
10182.0 TYME-Spanish Guardia Civil, working TZSM, Malaga, in ALE at 1706. (Watson-UK)
10360.0 0000006-Turkish Intelligence, ALE sounding at 1653. (Watson-UK)
10536.0 CFH-Canadian Forces, Halifax, NS, FAX ice chart, simulcast 4271, at 0009. (Hall-RSA)
10588.0 VC8FEM-FEMA, calling FC8FEM and UT8FEM in ALE, also 11108 and 14776, starting at 1727. (Perron-MD)
10945.0 1PG-Moroccan Gendarmes, calling 5EE in ALE at 1003, 1154, and 1200. 9PY calling 5EE, at 1006 and 1019. (Watson-UK)
11039.0 DDH8-Hamburg Meteo, Armenian and Kazakstan weather in RTTY, at 1948. (Perron-MD)
11175.0 Sigonella-US Air Force, Italy, working Reach 1147 at 0120. (Snyder-US) Spur 82-US Air Force B-52H, patch to Barksdale via Andrews, at 2016. (Cleary-SC)
11205.0 Shark H2-US Air Farce, warking Smasher, Key West, FL, at 2323. (Cleary-SC)
11232.0 King 21-US Air Force rescue HC-130P, declaring in-flight emergency far bad engine in patch via Trenton to Angel Ops, at 1636. (Cleary-SC)
11244.0 Offutt-US Air Farce HF-GCS, calling Bernadine, then twa EAMs, at 2143. (Haverlah-TX)
11345.0 North American 921-Flight telling Stockholm they had been Reach 815, a US Air Force charter, at 0640. (Privat-France)
11407.0 AFA3AD-US Air Farce MARS, patches from Reach 707, at 0050. (Baker-OH)
12022.0 RUH959-US Army helicopter working SKYWAT, US Army Skywatch flight following center, Sato Cano Air Base, Handuras, in ALE at 1623. (Perron-MD)
12068.5 CLS-US Army, Fort Campbell, KY, ALE sound at 1803. (Perron-MD)
13155.0 Out Curve-US military, with EAM simulcast on 6697, 8992, and 11244, at 0037. (Haverlah-TX)
13200.0 Reach 9014-US Air Farce, unsuccessful patch attempt with unheard ground station, at 2306. (Snyder-US)
13508.0 CFH-Canadian Forces, Halifax, NS, with RTTY ice warnings, then weather FAX, all starting at 1437. (Seale-KY)
13907.0 Coast Guard 1502, patch via Service Center ta Elizabeth City, at 0027. (Cleary-SC)
13927.0 Jambo 28-US Air Force B-52H, MARS morale patch at 2300. (Cleary-SC)
14569.0 SCLC501-Venezuelan Army, calling PCRC5 in ALE, also on 9906, at 1325. (Perron-MD)
14731.7 RFFIC-French Navy, Paris, with ARQ-E3 messages to the fleet in French plaintext and 5-figure groups, then navigatian warnings in English, at 1609. (Hall-RSA)
16144.5 RUH962-US Army helicopter, calling SKYWAT, Handuras, in ALE at 2006. (Perron-MD)
16804.0 Pwael Kutahow-Probably Russian vessel *Pavel Koutakhov*, working Murmansk in third-shift Cyrillic RTTY, at 1036. (Watson-UK)
16804.5 Unid-Unknown vessel calling Bern Radio on wrong frequency (the DSC alert channel), in SITOR-A at 1454. (Watson-UK)
16898.5 XSG-Shanghai Radio, China, with a possible coded broadcast of 4-figure groups in SITOR-B, at 0655. (Hall-RSA)
16979.9 PWZ33-Brazilian Navy, Ria De Janeiro, noisy weather FAX at 1735. (Watson-UK)
17146.4 NMG-US Coast Guard, New Orleans, weather FAX at 1851. (Watson-UK)
17982.0 7002-Brazilian Air Farce, warking Tripu in Portuguese, at 2007. (Perron-MD)
18183.4 7RQ20-Algerian MFA, Algiers, with Caq-8 relay of a message from Addis Ababa, Ethiopia to several embassies, at 0710. (Hall-RSA)
18257.0 1202-Egyptian Border Guards, working 1204 in ALE at 1312. (Watson-UK)
18594.0 Coast Guard 1707, patch via unknown station at 2145. (Cleary-SC)
19036.5 Unid-Algerian Embassy, Addis Ababa, Ethiopia, with Caq-8 traffic in French, at 1500. (Watson-UK) Algerian Embassy, Accra, Ghana, with a lang Coq-8 diplomatic message in French to all African embassies, at 1558. (Hall-RSA)
19231.7 Unid-Egyptian Embassy, Algiers, with mixed 5-character code groups for "71," in SITOR-A at 1222. (Watson-UK)
20036.7 Unid-Egyptian Embassy, Dakar, Senegal, Arabic traffic in SITOR-A at 1037. (Watson-UK)
20047.9 "S"-Russian Navy, Arkhangelsk, single-letter CW beacon (MXC), at 1608. (Watson-UK)
20268.0 RDL-Russian Navy, Moscow, CW messages at 1525. (Watson-UK)
20452.0 MAE-Algerian MFA, Algiers, calling BKO, Bamako, in ALE at 1418. (Watson-UK)
20678.0 R26297-US Army helicapter, calling T2Z82 in ALE, at 1209. (Privat-France)
21949.0 SA0205-South African Airways, HDFL link test with Johannesburg at 1351. (Watson-UK)
21982.0 "15"-ARINC ground station, Bahrain, passing airport weather in HFDL to aircraft G-VMEG, at 1144. (Watsan-UK)
22387.5 SVO7-Olympia Radio, Greece, with CW channel marker, at 0947. (Watson-UK)
22447.0 FUV-French Navy, Djibouti, with RTTY test loop at 1442. (Watson-UK)
22542.0 JJC-Tokyo Radio, clear Kyodo newspaper FAX in English, simulcast 12745.5 and 17069.7, at 0725 and 1215. (Hall-RSA)

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Globe Wireless Idle Signals Revealed

This month we outline some recent work with Globe listeners Ben Mesander and others to confirm the presence of unique identifiers embedded in the idle or "channel free" signals of the worldwide network of Globe Wireless stations.

Globe Wireless: Communications for ships at sea

Many months ago we profiled the growing network of stations operated by Globe Wireless, a privately owned company dedicated to providing communications services for the shipping industry and individuals at sea.

At present, the company serves more than 4000 ships from about 300 companies, including Anglo-Eastern, K-Line, Laskaridis, Lauritzen, NSB, NYK Shipmanagement, Overseas Shipholding Group and Zodiac.

Currently the network of stations is as follows:

VCT	Tors Cove, Newfoundland, Canada
VCS	Halifax, Nova Scotia, Canada
WNU	Slidell, LA, USA
BPO	Barbados
CPK	Santa Cruz, Bolivia
LSD836	Buenos Aires, Argentina
KFS/KPH	San Francisco, CA, USA
KEJ	Molokai, HI, USA
ZSC	Capetown, South Africa
HEC	Berne, Switzerland
LFI	Rogaland, Norway
SAB	Goteborg, Sweden
A9M	Bahrain
9MG	Penang, Malaysia
VJS	Perth, Australia
VIE	Darwin, Australia
ZLA	Awanui, New Zealand
KHF	Guam
HLF	Seoul, South Korea
XSV	Tianjin, China
9HD	Valletta, Malta
	Varna, Bulgaria (planned)
	Istanbul,Turkey (planned)
	Guangzhou, China (planned)
	Shanghai, China (planned)

Altogether, the stations operate on more than 300 frequencies.

Uncovering the Idle Signals

A few years ago, about the time that the GW network transitioned to its proprietary, adaptive ARQ "Globedata" network, we were told that the channel-free signals sent by all GW stations when not engaged in communications with a ship did not contain any useful information.

A few months ago, we revisited the subject when finding a few new frequencies for new GW station 9HD. Coincidentally, during an IRC chat on the utility listener's #monitor channel, we met Ben Mesander who was also working on the same subject and was convinced, too, that the advice we had originally heard was incorrect.

The ensuing investigation provides a great tutorial example of how to use the sophisticated and very flexible signal analysis tools provided on many decoder systems these days. In our case, we use the names that Hoka uses for its various signal analysis modules.

First, the basics. Using the Speed/Shift Measurement module, which measures both the speed and tone shift of the signal, we are able to verify that each GW shore station sends a regular idle or channel free signal which is a short burst of 100bd, 200Hz shift FSK as shown in Figure 1 below.

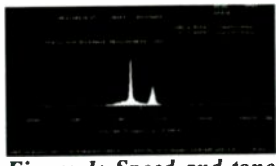

Figure 1: Speed and tone shift measurement

Next we need to establish whether there is any regularity or correlation in the signal. For this, we use the Autocorrelation analysis module. This module will show a "spike" at various bit counts if it detects some regular bit patterns in the underlying signal. Encrypted signals will not show any distinct spike.

Feeding the GW idle signal into the autocorrelation module (see Figure 2) shows an ACF (Autocorrelation function) of 231 bits and a smaller peak at 8 bits. From this we can deduce that the burst is likely to be composed of 8 bit "bytes" with a total repetition cycle length of 231 bits, plus we now know that the idle signal appears not to be scrambled at the bit level.

Figure 2: ACF of the idle signal

Next we need to check whether the signal is synchronous or asynchronous. Asynchronous signals, like standard Baudot-coded RTTY, carry extra bits of information (the stop bits) in each "character" that provide enough information for a decoder to synchronize the signal. To determine this with Hoka equipment, we use the Speed Measurement Mark-Space analysis module.

After presetting the module with the correct speed and shift, this module counts the number of bit transitions (1s to 0s and 0s to 1s) occurring in a certain time period and plots them using asterisks in a format something akin to a bar chart. Synchronous signals will always have an equal number of transitions in a time period and will therefore stack an equal number of asterisks above and below a reference line at integer multiples of the bit time. Asynchronous signals with half bits will show as one line occurring at half the period of the other transitions.

We can see easily from Figure 3 that our GW idle signal appears to be synchronous.

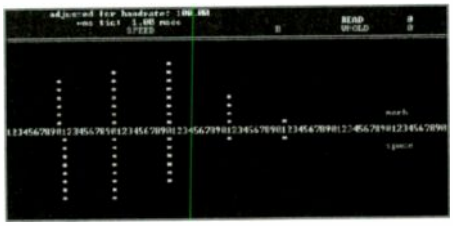

Figure 3: Asynch Analysis

So, we now know the following about the composition of the idle signal:

Speed:	100bd (or 10ms per bit)
Shift:	200Hz
ACF:	B, 231 (rarely 462)
Synchronous:	Yes

These are what we could call the "external" features of the signal. They tell us quite a lot, but relatively little about its internal make-up.

Before we can begin to analyze the internal bit structure of the signal, we first need to understand roughly how each burst is made up. To determine this, the Hoka decoders have a variety of tools, probably the most useful of which is the Speed-Bit Analysis module. This incredibly useful module operates much like a fax machine, printing a line across the screen in a certain time period. If a "1" is present, the line fills as it proceeds across the screen; if it's a "0" it leaves a blank behind, and if there's no signal (i.e., noise), one generally sees neither solid white nor blank.

Next month we'll take a closer look Figure 4 and see what it can tell us about the insides of our signal and reveal what we believe to be the station-specific identifier. In the meantime, Ben has put the results of his work to discover the GW station ID on the web for all to enjoy. Feel free to visit his webpage (See Resources) and also hear an example of the idle signal.

Figure 4: Speed-Bit Analysis

Until next month, good digital DX.

Resources

Globe Wireless
http://www.globewireless.com
Hoka Elektronik
http://www.hoka.com, www.hoka.net
Ben's Globe Page
http://www.hungry.com/~ben/radio/gw.html
GW Idle Signal
http://neurosis.hungry.com/~ben/radio/GW_CH_free.wav

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www.worldofradio.com

Goodbye to Israel, Slovakia, Switzerland

Termination of Kol Israel's shortwave broadcast has been threatened many times, but salvaged, sometimes at the last minute. However, the April 18 edition of the Hebrew Newspaper *Yediot Achronot*, via Mike Brand, via Mike Terry, reported:

"The Voice of Israel's overseas broadcasts on shortwave will cease in the near future. In the framework of the Israel Broadcasting Authorities financial cuts, it was decided to relay the broadcasts through the Internet only. This will create a saving of both frequencies and transmitters, etc., which will come to around about 20 million Shekels (just under $4,500,000) a year. The IBA Internet site relays Israel TV's Channel 1, Reshet Bet (Network 2), Reshet Daled (in Arabic) and foreign news broadcasts."

Like many such stories, we don't know at press time whether it will actually have come true by the time you read this. XERMX, subject of last month's lead, was still on the air on 9705, as of April 19, opening before 1200 UT.

Andy Sennitt replied: "The logic of broadcasting only on the Internet escapes me. There are two huge cost centers in international broadcasting: program production and program delivery. At Radio Netherlands, we have tried to spread our cost savings across the whole range of what we do. But the ratio of production costs versus delivery is probably about the same as it was before – there's just less of each.

"Putting all your cost savings into one area – delivery – seems illogical to me, since the number of people who will listen on the Internet is a small fraction of the numbers who listen on shortwave. The result is that you have an enormous increase in the cost per listener, which – when examined by the bean counters in government – will provide the perfect excuse for stopping the service altogether. That being the case, why not just call it a day now and have done with it?"

Radio SLOVAKIA International should be another doomed shortwave broadcaster. In early April, listeners to several language services began to hear pleas from the announcers for letters to the head of Slovak Radio, opposing his plan to close down the SW service on May 1; first reported in Spanish by Hugo Longhi, Argentina, *Conexión Digital*. Protests were to go to Director General Jaroslav Reznik, reznik@slovakradio.sk

The transmitter site at Rimavská Sobota had already lost all its other customers, Kai Ludwig says, apparently due to prohibitive charges.

Jean-Michel Aubier thought perhaps the French section were pulling an April fool joke; Bill Westenhaver could find nothing about this on their website in French or English; Kai Ludwig noted that the close-down announcements were heard on shortwave but not on the internet audio files.

Andy Sennitt said, "As far as I can ascertain, English-speaking listeners who don't read *DX LISTENING DIGEST* or other international news sources remain blissfully unaware of what is being proposed. I can find no substantive evidence, only rumors that have been circulating amongst the staff."

On RVi *Radio World*, Frans Vossen said, "Pending more info from people I know in Bratislava, I will refrain from speculation on the future of Radio Slovakia International. Maybe they're closing down their transmissions on shortwave from Slovakia and move to transmitters abroad, just like we did. Who knows? It would be a strange coincidence that Slovakia would stop or reduce its international service on the day the country joins the European Union on May 1."

Meanwhile, his French-speaking colleagues at RVi had already broadcast an interview with Ladislaw Kubig, chief editor at RSI, as reported by Jean-Michel Aubier. Kubig said the problems began in 2003 with the arrival of a Slovak TV director who said there would be no further need for a state subsidy for the public TV service; the two networks could be supported by adding a bit of advertising. So when the 2004 budget came out, Slovak Radio had only a small fraction of its appropriation in previous years. The five domestic networks and RSI previously split 8 megaeuros per year. In 2004 this was reduced to 2.5, and of that nothing was specifically designated for RSI. So the radio director proposed to turn off the expensive transmitters and rely on satellite and internet instead; financial matters are far more important than propagating the image of Slovakia abroad.

Christoph Ratzer in Austria, who runs a German-speaking DX group, offered an easy way to file protests against the closure of RSI at **http://www.ratzer.at/slovak.php**

Finally, in mid-April, Andy Sennitt reported this from Pete Miller at Radio Slovakia International: "Sadly, the rumor is true – Radio Slovakia International is ceasing all shortwave broadcasting from May 1. An absolute tragedy as Slovakia has such a poor profile worldwide, and our programs bring in many tourists to the country. As you can imagine we are not a happy bunch."

RSI had taken step-by-step cost-saving measures over the past year, reducing power from 250 to 200 to 150 kW, and turning off one transmitter so there would be only two frequencies at a time, as Jean-Michel Aubier points out. The A-04 English schedule, which you may want to check in case there was a reprieve, as Dave Kenny, BDXC-UK heard announced: 0100 on 5930, 9440 to Americas; 0700 on 7440, 15460 to Australia/Pacific; 1630 on 5920, 7345 to Europe; 1830 on 5920, 6055 to Europe.

Thanks to three years of advance warning, we were expecting the final phaseout of SW from SWITZERLAND at the end of October after 70 years of service. However, upon short notice in early April, SRI announced that English broadcasts would end on April 12, to be replaced by music. Why bother with that for another six months? There were supposed to be special historical restrospectives leading up to that, but those who tuned in for the grand finale April 12 at 2330 on 9885, 11905 were disappointed, as SRI was already playing music, with just a few announcements. This followed a decision in March to fire 26 employees of Swissinfo, due to a loss of 15 megafrancs Swiss in state subsidies, as Kai Ludwig reported.

There may be a glimmer of hope. At *Media Network*, Andy Sennitt pointed out that Edward Girardet of Media Action in Geneva, said in an assessment of media provision for Afghanistan: "A further option worth exploring would be to request from the Swiss Foreign Ministry the use of airwaves formerly used by SRI. These could be used to rebroadcast programming (humanitarian news, health, educational, children's etc.) produced by specialized media organizations in Pakistan, Tajikistan, or inside Afghanistan itself."

Steven Luce in Houston informed us that the final English broadcast, rather lackluster, was actually three days earlier on April 9. SRI director Nicolas Lombard explained the reasons for the end of shortwave from SRI (budget, technological change) and expressed his personal regret at the change, but also acknowledged the need to go in a different direction. Also held out the faint hope that if DRM catches on, SRI might make a return via that medium. "All rather sad – I remember hearing SRI for the first time in 1966 as the then 'Switzerland Calling' with 75 minutes (!!!) of English to North America, 0115-0230 GMT on 9535 kHz. Another one bites the dust, and I'm afraid, more to follow."

BUT – not all the news is negative. See below new or reactivated stations, services, already or planned, for example under ALASKA, BRAZIL, CANADA, COLOMBIA, MADAGASCAR, PAPUA NEW GUINEA, PERU, THAILAND, VENEZUELA...

ALASKA The second 100 kW transmitter for KNLS, as of March, was boxed and waiting in Dallas for us to make one half of the last payment, in order to ship it on. Hope to have it on air by fall 2004 with second antenna (Andy Baker, VP of WCBC = KNLS, interviewed by Jeff White at SWL WinterFest, PA, on *Voice of the NASB*) more under MADAGASCAR

BRAZIL R. Guarujá Paulista added a new frequency, 5930, testing at first, including DX program *Nas Ondas Curtas da Guarujá* UT Sun 0030-0100 (Sarmento F. Campos, Rio de Janeiro, *@tividade DX*) In addition to previous 3235 and 5045 (Célio Romais, *ibid.*) Heard on 5930.44 (Björn Malm, Quito, Ecuador, *DXLD*)

On 4900 an unofficial station heard at 2155-2208* announcing 5010, Radio Comunidade das Gerais, from the north of Minas Gerais state in a rural zone; rather poor modulation (Samuel Cássio Martins, São Carlos SP, *DXLD*)

5015, Rádio Pioneira Teresina with an excellent signal 2320-0145+ with religious programming, stronger than 4985 and 4885 though listed for only 1 kW; more like 5 now? (John Sgrulletta, Mahopac, NY, *Cumbredx*) According to their website, now 24h, relaying R. Aparecida overnight (Henrik Klemetz, Sweden, *DXLD*)

BULGARIA R. Varna weekly program *Hello Sea/Zdravei* more in Bulgarian, Sun 2100-0300 Mon on 7400 from Varna, 100 kW, non-directional (Observer, Bulgaria)

CANADA RCI's new Portuguese to Brazil is Friday only 2000-2029 on 15255 & 17765, both via Sackville, both 250 kW on 163° azimuths. Ukrainian got a reprieve, 1530-1559 on 11935 Wertachtal and 15325 Rampisham (Bill Westenhaver, RCI)

CENTRAL AFRICAN REPUBLIC [non] 15470, R. Ndeke Luka, 1830-1930, lots of IDs and great music. Nice to be able to tune in this one again now that they are on 19 mb again from the UK (Hans Johnson, FL, *Cumbre DX*)

CHILE VT Merlin A-04 schedules showed the Voz Cristiana site, Santiago, relaying BBC Portuguese, 1900-2030 on 17605, and something called "China Radio" (Taiwan, Mainland or neither?), 1200-1500 on 17625, 2200-2300 on 11720 – but none of these could be heard. Planned usage later? (gh)

CHINA [non] CRI schedule includes these A-04 relays via Sackville, languages not specified, but both English and Chinese at least:

0000-0100	5960 (2), 9755, 11930, 13710
0100-0200	9790 (2)
0300-0400	6090 (2)
0300-0500	9560
0400-0500	6090
0400-0600	5960
0500-0600	6090 (2)
1000-1200	6040 (2)
1100-1200	11750, 11805
1200-1300	11855 (2)
1300-1400	9650 (2), 15260
1500-1700	15220
2200-2300	13700 (2)
2300-2400	6145 (2), 13680 (2)

That's 24 frequency-hours per day; (2) however, indicates two transmitters at once, adding 11 more for a total of 35! (gh, analyzing a schedule via Wolfgang Büschel, *BC-DX*)

COLOMBIA New on 4916.05 at 1100 was Radio Familiar Cristiana, unknown QTH, but that is the name of a Colombian FM network; a few mornings later heard on 4933.00 instead. Henrik Klemetz says the location announced is Vereda La Puerta (Björn Malm, Quito, Ecuador, *DXLD*)

[non?] Cadena Radial Bolivariana reactivated in April on 10 MHz USB with guerrilla news, IDs also as *"Voz de la Resistencio"*, *"Somos FARC, Ejército del pueblo"*, off at 0019. Also later that same UT day at 2207 *"Estación Viva Bolívar de los Bloques Caribe José María Córdoba y Magdalena medio"* saying they would be using this frequency to broadcast info about the armed struggle (Adán González, Venezuela, *DXLD*) Assume you mean 10000 kHz exactly? Geez, don't the FARC care what time it is? No chance here with WWV dominant (gh)

CROATIA [non] Voice of Croatia, 9925 via Germany, included English at 2215-2230v and 0215-0230v, otherwise in Croatian (Emilio Pedro Povrzenic (Povéryenich), Villa Diego, Provincia de Santa Fe, República Argentina, *DXLD*)

[non non] Croatian Radio 1 is listed on: 6165 04-23, 9830 04-17, 13830 04-23, all for Europe. At 1040, 6165 and 9830 give a strong signal, while 13830 is empty. Several regional stations are relayed! When SW is on, these are:

Radio Daruvar (a city in the East) with news in Czech, Mo-Fr 0800-0810; Radio Knin, *"Od mora do izvora"*, Tu 0603-0700. Radio Rijeka, *"S knopa i s mora"*, Mo 0603-0633, Tu 0830-0900 and *"Zrnce Soli"* Sa 0403-0500; Radio Dubrovnik *"Zlatna jabuka"* Th 0603-0700, *"Moreplovi"* Fr 0403-0500, *"Dubrovacka Bastina"* Fr 0810-0830; Radio Split, *"Doma je najbolje"*, Sa 0903-1000. English news: Daily 2215-2230, 0200-0230 (Eike Bierwirth, Germany)

GERMANY DRM DX catch: 15896.00, "bit eXpress", 2255 2 April. Popular tune with male vocalist. Digital ID using Dream software from this 100 W campus station in Erlangen. Signal was intermittent until this time when it held high enough to hear approximately 2 minutes of sound. Audio quality was excellent in parametric stereo, using high bit rate (27.28 kpbs) with SBR-enhancement. Signal faded back into the dust at 2305. Receiver: JRC NRD-535D; Antenna: 100' longwire with MLB; Software: Dream v1.0.7. (Mark J. Fine, Remington, VA, *DXLD*)

GREECE [and non] Voice of Greece, A-04 English:

0930-1000 daily 9420 Eu, 15630 Eu News in English (except Tue)
1240-1255 Fri 9420 Eu, 9690 NAm, 15630 Eu, 15650 Au/ME/PA
Learn Greek (responses in English)
1600-1700 Sat 7475 Eu, 9520 Eu, 15630 Eu, 17705 NAm
Hellenes Around the World
1800-1900 Sun 7475 Eu, 9420 Eu, 15630 Eu, 17705 NAm
It's All Greek to Me (musical)
1830-1855 Daily 12105 Eu *Orientation* Program in English
Raciophonikos Stathmos Makedonias: 1100-1650 9375, 1700-2350 7450 (From a schedule compiled by John Babbis, Silver Spring, MD, *DX LISTENING DIGEST*)

IRAN [non] R. Pedar, A-04 shifted to M-F 1730-1830 on 17735, not 17660, ex-9740 an hour later (gh) Heard with false starts and audio losses, filled by Merlin interval signal; 1808 ID as "Radio Pedar, Los Angeles" (Hans Jonnson, FL, *Cumbre DX*) It is actually a simulcast from California-based Iranian exile TV Channel One. "Pedar" [father] is presumably Channel One founder Shahram Homayoun – if you check out their live video stream at **http://cotic.persianblog.com/** you'll see him sitting behind his desk delivering a lecture, flanked by the Iranian flag, interrupted around the top of the hour by about 15 minutes of commercials! The webcast is at least a minute behind the shortwave broadcast (Dave Kernick, UK, *DXLD*)

LAOS I've been hearing National Radio on 7145 in English 1330-1400. In mid-March, reception improved during the course of the broadcast; the signal got quite loud at the abrupt ending (Zeke Russell, AZ, *DXLD*)

MADAGASCAR World Christian Broadcasting [continued from ALASKA]: Later, a third antenna in Madagascar will help us reach SW China and European part of Russia, which Alaska can't reach now. And sound like local station in 30 Arabic speaking capitals. We met the president of Madagascar in Washington DC who invited us to pursue further talks about coming to his country to build one or two antennas. We are excited about putting together Arabic speaking staff at international office in Franklin TN. From Madagascar we can cover most of Africa, ME, blanket India, Indonesia – and South America. Maybe Spanish and Portuguese in future (Andy Baker, VP of WCBC = KNLS, interviewed by Jeff White at SWL WinterFest, PA, on Voice of the NASB)

NETHERLANDS [and non] Dutch Inforadio which earlier had announced it would be on air during summer 2004 via DTK Jülich and WRMI now says on its website that these transmissions will not materialize. Also, the station's application to have its own SW transmitter in Holland has not been approved (**http://www.inforadio.nl** via Bernd Trutenau, *WORLD OF RADIO*) I wonder if Holland's existing SW station was opposing this (gh)

Radio Netherlands has stopped carrying news bulletins, but only in our evening English broadcasts to North America. The recent budget cuts by the Dutch government forced us to make some difficult decisions. The overnight live news/continuity shift had to be abolished to save money. Unfortunately, that encompasses our 0000, 0100 and 0400 UT English transmissions to North America. We decided to offer expanded current affairs analysis instead, requested by many of our North American listeners (Andy Sennitt, *Media Network* newsletter) And the 1400 broadcast to Asia remains two hours long.

NIGERIA [non] BBC World Service Africa stream announced that from April 1, the Nigerian Broadcasting Corporation are enforcing the law that FM stations will not be allowed to carry World Service or other foreign content. NBC cite reasons of having no editorial control over news and also this enforcement will encourage growth in broadcasting internally. The BBC stated that now Nigerians will have to resort to "old fashioned" shortwave for news from outside sources. (Phil Attwell, Medium Wave Circle) BBCWS news said as a result they were expanding SW to Nigeria, but in what way? More time, more transmitters, more power? (Glenn Hauser, OK, *DXLD*)

PAKISTAN PBC A-04 English: News 1600-1615 11570 11850 15100 15725; Assamese service in English 0045-0115 9340 11565; Urdu to WEu 0800-1104 on 17835 21465 presumably still opens and closes with a few minutes of news in English (gh)

PAPUA NEW GUINEA A new nationwide FM network has suddenly sprung up, Catholic Radio Network Papua New Guinea (CRN PNG). **http://www.catholicpng.org.pg** reports that the government has also authorized startup of a shortwave transmitter on 4960 at Vanimo, relaying the FM network. That shortwave launch (power unknown) was scheduled for sometime in April. There are also plans for more SW outlets in Rabaul and Alotau (Mike Dorner, *Catholic Radio Update*) Distinct from Wantok Radio Light, Protestant, previously reported, which also planned to be on SW by now (gh)

PERÚ New station on 6329.1, Radio La Voz de el Faique, heard at 0140 until 0235 when it abruptly left the air; pop music and greeting listeners in the northeastern region of Perú; presumably replaces Estación C (Rafael Rodríguez, Colombia, *Conexión Digital*) Also heard at 1853 and at 2353 saying it transmits from "Distrito de Faique, Departamento de Cajamarca", not Moyobamba where C was (Bjorn Malm, Quito, Ecuador, *DXLD*)

R. Santa Rosa, 6047.14, 0859-0955, reactivated after more than a year, religious songs, ads, 0939 ID, sad, doleful ballad (Mark Mohrmann, VT, *WORLD OF RADIO*) 0917 Rosary, 0954 beautiful canned ID, still in at 1108 (Dave Valko, PA, *Cumbre DX*)

R. Victoria heard at 1059 ID, fair

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; A-04=summer season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

until sunrise on Good Friday, ex-9722 (Jim Clar, Rochester, NY, *DXLD*)

SPAIN During the winter, REE's show of classical music from the RTVE label, *Nuestra Sello*, was not scheduled when we could hear it, but for the summer it's back M-F at 1405, best here on 17595, also 15585, 17760, 21570, 21610; and repeated Tue-Sat 0105 on 6020, 6055, 9535, 9620, 11680 and 15160, some via Costa Rica. *"Lenguas Españolas"* have a new politically correct designation, *"Lenguas Cooficiales"*, i.e. Catalan, Galician and Basque, now scheduled M-F 1240 on 21700, 21610, 21570, 21540, 15585, 15170, 13720, 11910-China, 11815, 9765 (gh)

SYRIA Should this country become the next target of Bush's War on Terrorism, you might like to monitor R. Damascus. Good luck. Two consecutive English broadcasts go out at 2000-2210 (the second a repeat?), but reception has been poor (gh) On 13609.99: threshold signal, 2130 somewhat stronger, occasional English news items, to 2210*. Signal had constant adjacent channel splatter, plus low modulation and hum in audio. Overall, just a pretty pathetic signal. Listed \\ 12085 not heard, not even a weak het. On another day, fair-good signal strength but low modulation, slightly distorted audio and hum in audio (Brian Alexander, Mechanicsburg PA, *DXLD*)

TAIWAN Voice of Han, 9745, hours are 0655-0105 UT, and another frequency, 6105 kHz is finally found (Miller Liu, Taipei, *dxing.info*)

THAILAND [and non] The A04 schedule for IBB held a surprise: R. Thailand via transmitters in USA: 0030-0200 via Greenville and 0300-0430 via Delano, both on 5890 (Kai Ludwig, Germany) Yay! I've been urging them to do this for years, instead of using Udorn only, which, nearly transpolar, still has spotty reception in NAm. Now we can hear English from Thailand much, much, better at 0030 and 0300 – though both are aimed southwards. There's hardly ony land south of Delano! Every country that hosts an IBB relay site should insist on using US sites in exchange – or any other sites in the IBB network that would be advantageous. Direct broadcasts from Udorn remain on 15395 for A-04. Also try the morning broadcasts aimed SE from Thailand at 1230 on 9855, 1400 on 9830 (Glenn Hauser, OK, *DXLD*)

U K [non] Alistair Cooke, who had to retire from his *Letters from America* on BBC, died about a month later March 30 at age 95. BBCWS continued broadcasting some of his *Letters:* A *Celebration* for at least another month (gh)

With hardly any notice, BBCWS canceled *East Asia Today*, a regional news magazine, as of March 26. This was the only program worth listening to. It was three editions a day at one time, and talked to East Asia, not through them as the *World Briefing* dumbed-down headlines will. Every person on the team had been in East Asia or regularly visited it for field reports (Dan Say, BC, *DXLD*)

U S A SW output of VOA *News Now* will be 18.5 hours per day Monday through Friday and 17.5 hours per day Saturday and Sunday. Further cuts to VOA *News Now* are planned for the end of October, when it will be reduced to 14 hours per day (Kim Elliott, VOA, *Media Network* blog)

Ray Freeman announced on his *Border Crossings* music program on VOA March 23/04 that he was retiring before the end of the month (Bruce MacGibbon, Gresham, OR, *DXLD*)

A good time to bail out before it sinks. VOA also announced it was closing its Tokyo news bureau due to budget cuts; but the head of the news division gave a glowing sendoff to Amy Bickers, who had run the bureau (gh)

The Broadcasting Board of Governors requested a total budget of $577 million for the 2005 financial year; includes $45 million for the Middle East Television Network, $157 million for VOA, $73 million for RFE/RL, $29 million for Radio Free Asia, $28 million for Radio-TV Martí (BBG)

The chair of the BBG told Congress RFA's Cantonese broadcasts will continue. This comes after intense lobbying of Congress by the Guild. Virginia Republican Congressman Frank Wolf pressured BBG Chair Kenneth Tomlinson to continue the Cantonese broadcasts. Tomlinson agreed they would continue. It isn't clear whether some hours of broadcast and jobs could still be cut (RFA Guild Unit)

BBG/IBB QSL INITIATIVE. Glenn: I very much enjoy your newsletter, and, would like to enlist your wide readership as porticipants in an ongoing project. I have been tasked with installing a compliance and verification system that provides the BBG/IBB with reliable programming and carriage data about its some 1400 worldwide affiliates (VOA [radio and TV], RFE/RL, Radio Free Asia, and soon a new medium wave service in Pakistan called "Radio Aap ki Dunyaa").

My office will happily provide QSL cards for any reception report on an affiliate or other rebroadcaster carrying programming clearly identified as one of the BBG/IBB services listed above. All reception reports should be (e-)mailed or faxed to the address/number listed below. QSL, Room 3666, Cohen Building, 330 Independence Ave., SW, Washington, DC 20237 USA; E-Mail: verify@IBB.GOV; Fax # 1-202-203-4185. Many thanks for your help (Bill Torrey, Office of Marketing and Program Placement, US IBB, DXLD) This would not include IBB's own SW transmissions (gh)

I have taken over the RFA QSL card program. Please spread the news far and wide that all reception reports can now be mailed to Radio Free Asia at this address: Attn: AJ Janitschek, Radio Free Asia, 2025 M Street NW, Washington DC 20036. Reception reports can also be sent via to qsl@rfa.org (EDXC via BDXC-UK)

R. Martí is broadcasting Sunday mass live at 1100 UT on 9805 among others (Célio Romais, *Panorama, @tividade DX*) So that's when they are currently violating separation of church and state, and opening themselves to demands by the Jehovah's Witnesses and countless other sects for equal time, if only they knew (gh)

Here's a handy thing to bookmark: **http://www.zappahead.net/wbcq/anomaly.php** – "latest observations and other unexplained or otherwise unscheduled things observed coming out of Monticello or related to WBCQ" (gh) Our greatest expense and largest drain on funds is our ever-escalating HUGE electric bill. It may mean a large increase in rates. This I would like to avoid as many of our programmers can barely afford our current low fees. So we have a fund drive to "Make WBCQ Green", to raise around $100,000 to purchase and install a large used wind turbine to provide most of the power we need. This would greatly reduce our dependency on the local grid and enable us to keep program rates low. WBCQ would be the only station of its power level in the world to be powered by a windmill. We must do this soon as local electric rates are only going up. More on the website **http://wbcq.us** (Allan Weiner, WBCQ)

As of April, some of WWCR's musical programs: *Old Record Shop*, Mon 0300 3210, Mon 0930 9475, Tue 1730 15825; *Ken's Country Classics*, Sun 0500 5070, Mon 0330 3210; *Rock the Universe*, Sat 1105 5070, Sun 0805 3210, Mon 0405 3210. *Ragam*, Sun 1300 9985; *Latin Catholic Mass*, Sun 1600 15825.

Dave Frantz of WWRB P-mailed a sample certificate now available to Listener Club Members. It's on heavy card stock, with spaces for Gold Seals along the left and right sides – on the left the seals designate transmission mode (AM, SSB, Digital Voice, Teletype text, PSK-31 text, SSTV, Radio Fax), and on the right, transmitter and frequency. You can send them further reports for different frequencies and modes and presumably get back further seals until you fill in all the spaces, if possible (gh) The listener club member certificate qualifies as our QSL card. Reception reports to: WWRB, Box 7, Manchester, TN 37349. We are thinking of taking two of our 100 kW and combining them to 200 kW. It would not be difficult to do this as a combiner is no big deal (Dave Frantz, WWRB)

KVOH, 17775, changed its slogan from *Voz de la Esperanza*, to *La Voz de Restauración*, Los Ángeles, California, heard opening at 1500. The sect's website **http://www.restauracion.com** said nothing about KVOH or SW, although they had a new 24 hour windows media stream. Most of the operations are in southern California (Glenn Hauser, OK, *DX LISTENING DIGEST*)

Ed Evans, Station Manager of WSHB in Cypress Creek, SC, which went silent at the end of March, informs us that Herald Broadcasting has signed a letter of intent with a buyer for the station. Ed himself was leaving the station in mid-April (*Media Network* blog) With whom, for how much, when, and where is C. Ed going? Wouldn't it be great if Brother Scare got his own station nearby to Walterboro? (gh)

Have you heard Brigham Young University Radio, on shortwave? Probably not, since it's in DRM only, via VT Merlin in the UK, subject of a puffy press release in late March (via Mike Terry) which neglected to mention time or frequency! The Current DRM schedule shows: 1500-1600 Sun, 9660, 95 degrees, Europe, 35 kW, BYU Radio, English, Rampisham. However, another Merlin schedule, via Silvain Domen shows two "LDS Church" transmissions, DRM? Via Ascension, Sundays 1000-1200 on 17675 and 21520 to west and central Africa (gh)

UZBEKISTAN R. Tashkent was tardy in putting up its A-04 schedule, except on the Uzbek language page, including Inglizcha: 0100-0130 9715, 7190; 1200-1230 & 1330-1400 17775, 15295, 9715, 7285; 2030-2100 & 2130-2200 11905, 9545, 5025 (via Dave Kenny)

VENEZUELA Habana, which had been relaying R. Nacional de Venezuela on Sunday mornings for several years, began to expand relays in April on other days and times when its own transmitters were available, including, all in Spanish: 1900-2000 on 9550, first reported by Jim Clar, NY; however Clar and I later found this hour on 13740, and at 2000-2100 on 9550, the same recorded program repeated. Adán González, Venezuela, heard 11760 in use during the 2200 hour, but this too did not stick. In the NASWA *Flashsheet*, César Objio in the Dominican Republic reported RNV around 2045 on 17705, when Greece-via-Delano obliterates everything else here. During each hour there are frequent IDs and other features, closing with a 16-note IS identifying RNV, asking for reports to Apartado Postal 3979, Caracas. The casual listener might think these actually emanate from Venezuela, where the last RNV SW transmitter on 9540 conked out years ago. Another: 9820 during the 2300 hour, heard by Harold Frodge, MI, *Cumbre DX* (gh)

The QSL manager for Radio Amazonas, 4939v, asked me to publicize this: Reception reports should be sent to: Sr. Jorge Garcia Rangel, Radio Amazonas, QSL Manager, Calle Roma, Qta: Costa Rica No. A-16, Urbanización Alto Barinas, Barinas 5201, Venezuela; not to the station's own address in Puerto Ayacucho. No replies have been received from there, since someone has been taking the return postage sent in good faith, without replying. That is why JGR has been appointed by the station manager to be the QSL manager. Please include 2 IRC or $2 for return postage. Those who would like to help with the costs for printing more QSLs, please include another dollar. Printing costs are very high in Venezuela. In fact, the present supply of QSL cards had been exhausted, and JGR was ordering 100 more designed by himself; there will be three series highlighting the beautiful jungle landscapes of the Venezuelan Amazon. Reports may be in text, cassette, or CD, and English is fine (gh)

WALES [non] Wales Radio International's weekly *Celtic Notes* program had been transmitted only via Rampisham, England, but the 2030 Friday broadcast to Europe added 7150 via Austria; other airings are UT Sat 0200 9795 to Americas, Sat 1230 17745 to Australia (Dave Kenny, April 16, BDXC-UK)

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

Global Forum

Broadcast Logs

Gayle Van Horn
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0010 UTC on 3205
BRAZIL: Radio Riberao Preto. Portuguese chat, local music during weak music. Brazilian's audible; **Radio Nacional da Amazonia** 0235-0245*, 11780; **Radio Difusora Roraima** 0350-0409*. (Jerry Berg, Jim Edward, UK, Knud Eriksen, Tranbjerg, Denmark, DX Window) **Radio Capixaba** 4935, 0410-0445. (Arnaldo Slaen, Buenos Aires, ARG) **Radio Difusora Macapa** 4915, 0738-0800. (Nicholas Eramo, Buenos Aires, ARG) **Radio Guaiba** 6000, 2250-2300 (Carlos Goncalves, Portugal/HCDX) **Radio Pioneira** 5015.1, 2307. (Slaen, ARG)

0015 UTC on 4965
PERU: Radio Santa Monica. Spanish. "Esta es Santa Monica" identification into messages and greetings to listeners. Peruvian huaynos music into PSA and ID repeat. Peruvians logged; **Radio Horizonte** 5019, 0015; **Radio Frequenia VH** 4485, 0200; **Ondas del Huallaga** 3327.8, 0930; **Radio Orienta** 6189, 0945; **Radio Panorama** 5907, 1015; **La Reina de la Selva** 5486.7, 1030 with huaynos sponsored by El Queral Restaurante to regional time check and identification. **Radio Illucan** 5678, 2330. ID into crillos and station calls program. (Fernando Garcia, Baltimore, MD)

0024 UTC on 15380
CHINA: CPBS. Chinese segments to Asian style music. **China Radio Int'l** 15100, 0053 flute music to CRI features. **CRI** Canadian relay 9570, 1340 //9755, 13675. (Bob Fraser, Belfast, ME)

0055 UTC on 9845
NETHERLANDS ANTILLES: Radio Netherlands Bonaire relay. *Research File* program. (Fraser, ME) 15315, time check to three-pip tone and ID at 1930 // 17725 // 17810 // 11655 **Madagascar** relay. (David Ross, Hamilton, Ontario, Canada) **BBC Antigua** relay 15190, 1515.(Fraser, ME)

0143 UTC on 4796.72
BOLIVIA: Radio Malku. Spanish. Economic report update. (Nicholas Eramo, Buenos Aires, Argentina). Bolivian's audible; **Radio Yua** 4716.71, 0950-1030; **Radio San Miguel** 4901.98, 1000-1030, 1045-1050. Heard again on 4903.5, 1030-1050. **Radio Santa Ana** 4650.28, 1030-1045. **Radio Mineria** 5927.07, 1055-1105. Very week signal, first time observed in a long time.
Radio Perla del Acre 4600.30, 0000-0035. (Robert Wilkner, FL/DX Window) **Radio Television Uncia**. Spanish ID "Radiovision Uncia 1260AM, 4723SW". Bolivian flutes into religious music. Noted on subsequent checks up to 1050. (Garcia, MD)

0347 UTC on 7305
VATICAN: Vatican Radio. Comments plus music interludes to Ids, // 9605. (Stewart MacKenzie, Huntington Beach, CA) 7250, 0610 report on church missionaries. (Howard Moser, Lincolnshire, IL; Frank Hillton, Charleston, SC)

0510 UTC on 6280
ISRAEL: Kol Israel. *Weekend Report* on Israeli news features and weather in English. French identification to 0515*. SIO 4+54. (Harold Frodge, Midland, MI) 11585, 2005 with news on the Gaza Strip settlements. (Fraser, ME)

0550 UTC on 15240
AUSTRALIA: Radio. Report on juvenile commission in Victoria, // 15515, 15160. (Howard Moser, IL) 15240.09, 2203-2210+. Frodge, MI) 9580, 1340. (Fraser, ME) // 152490, 15169. (MacKenzie, CA) Voice Intl 13685, 1134-1202. (Scott Barbour, Intervale, NH)

0550 UTC on 11715
JAPAN: NHK/Radio Japan. English Russian. News to interval signal and ID. Russian service at 0600 // 5975 via UK off by 0559. **Radio Tampa** 9595, 0630. (MacKenzie, CA) **NHK**, 17825, 2104 on Chinese activists on disputed Japanese island. (Moser, IL) 17825, 2135-2143+. (Frodge, MI)

0655 UTC on 5025
CUBA: Radio Rebelde. Castro speech to news at 0700. ID, time pips and Cuban music. (Slaen, ARG) **Radio Hababa** 17750, 1400 with Spanish propaganda program. **Junta Patriotica Cubana** via WRMI 9955, 1115 in Spanish, partially jammed. (Garcia, MD)

1016 UTC on 3976
KALIMANTAN: (Indonsia) RRI-Pontianak. Indonesian. Indo music and talks to presumed ad strings at 1028. Presumed identification at 1030, covered by amateur radio traffic. **Voice of Indonesia** 9525, 1115-1132. Multilingual services in English/Mandarin and Japanese. Ballads at tune-in. English ID, web address info. (Barbour, NH)

1030 UTC on 6090
CHILE: Radio Esperanza. Spanish program Cruzada by Dr. Luis Palau into PSA. Santiago Uiversity time check into Christian pops music. Temuco address for reply. (Garcia, MD)

1031 UTC on 7170
SINGAPORE: Mediacorp Radio. 96.8 FM relay.(per WRTVH) pop music in Tamil between announcers' comments. Presumed ID at 1100, covered by ARO traffic. (Barbour, NH)

1200 UTC on 4760
ANDAMAN & NICOBAR ISLANDS: All India Radio-Port Blair. Brief talks between Hindu musical selections. Fair/poor, fading by tune out. Absent at 1223 recheck. **AIR-Lucknow** 4880, *1213-1223 fair/poor; **AIR-Kuresong** 4895, 1150-1200; **AIR-Chennai** 7270, 1143-1215*. **AIR-Bhopal** 3315, 0034-0047. **AIR-Delhi** 4860, 0103-0114. **AIR-Mumbia** 4840, 0048-0102. (Barbour, NH)

1230 UTC on 9770
SRI LANKA: SLBC. Frequency schedule at tune-in. Several tunes from various Disney movie soundtracks. Poor/week signal deteriorating by tune-out. (Barbour, NH)

1340 UTC on 15385
UAE: AWR. Mandarin/English language lesson in progress. Station ID by lady announcer at 1400 to interval signal and identification. (Ross, CAN)

1345 UTC on 11710
NORTH KOREA: Voice of. Traditional Korea music, with flutter and faint QRM, // 9335. (Fraser, ME)

1430 UTC on 18960
SWEDEN: Radio. *Network Europe*, // 17505. (Fraser, ME) *1258-1321 on 13590. Special transmission of Bandy Championship game by Hammarby and Edsbyn. No ID noted amid poor choppy audio, though improving to fair quality. (Barbour, NH)

1430 UTC on 17620
FRANCE: Radio France Intl. Report on the hunt for Osama Bin Laden. (Fraser, ME) News on Olympic flame tour through Africa.17850, 1630. (Moser, IL; MacKenzie, CA)

1600 UTC on 17570
GERMANY: RTBF Int'l. French. Juelich relay with English identification into French programming. (Ross, CAN)

1640 UTC on 17865
AUSTRIA: Radio Austria. *Report From Austria* with news, views and current affairs. (Fraser, ME)

1935 UTC on 13660
GERMANY: Swiss Radio Intl relay. Commentary on relations between Switzerland and Thailand. (Fraser, ME) **SRI French Guiana** relay 17660, 2013. (Moser, IL)

2110 UTC on 7300
RUSSIA: Voice of Russia. *Science Plus* discussing hydrogen fuel. (Fraser, ME) Russia's **Radio Rossii** 5940, 0510-0540. Russian newscast, regional news. (Tom Banks, Dallas,TX)

2114 UTC on 9575
MOROCCO (Spanish) Radio Medi Un. Middle Eastern music to Arabic and French talks. English pop lyrics to ID at 2200, followed by newscast. Nice jingle ID repeated three times at 2216. (Rich D'Angelo, PA/NASWA Flash Sheet).

2145 UTC on 7450
GREECE: Radio Makedonias. Greek. Instrumentals to "Radiophonicos Stathmos Makedonia" identification. National news. Llisted in PTWBR as 7430 kHz. (Garcia, MD)

2253 UTC on 7345
CZECH REP. Radio Prague. *Inside Central Europe* news feature to ID and French service. (Frodge, MI) One on One interview segment 7345, 2350. (Fraser, ME)

2300 UTC on 7295
MALAYSIA: Radio. (Tent.) Commentary and presumed news with "RM" between items. Poor signal quality with portions of words possible intermittently. (Frodge, MI)

Thanks to our contributors – Have you sent in YOUR logs? Send to Gayle Van Horn, c/o Monitoring Times (or e-mail gaylevanhorn@monitoringtimes.com) ***Please note:*** *paper strips and cassette recordings will no longer be accepted. English broadcast unless otherwise noted.*

The QSL Report

Gayle Van Horn
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Award Chasing - Part 2

If last month's amateur radio award chase piqued your interest, here is one exclusively for the shortwave crowd.

The North American Shortwave Association (NASWA) offers to members an exceptional awards program. The radio country list contains countries that currently broadcast on shortwave, as well as those that are extinct.

In determining a radio county, the *Country List Committee* considers politics, hobby tradition and geography. Their list contains stations that have, or have had shortwave stations on the air some time since the end of World War II. In the ever changing political world of mergers, revolutions or annexations, DXers need not delete those countries that left the shortwave scene, and can choose from over 250 illegible countries.

Awards include, World Wide DXer, African Continental DXer, Asian Continental DXer, South American Continental DXer, Pirate DXer, Antarctica DXer, European DXer, Individual County Awards, All Continent "QRP" DXer and many more awards.

Persons interested in membership information and the *Awards Program*, should contact NASWA at; 45 Wildflower Road, Levittown, PA 19057 USA. You may download the Country List (PDF, 248KB) at; **http://www. anarc.org/naswa/**

Who knows what awards you have hidden in your collection!?

BANGLADESH

Bangladesh Betar, 7185 kHz. Full data verification letter signed by Ahmed Quamruzzaman-Station Engineer, plus schedule. Received in 79 days for an English report and two IRCs. Station address: External Service, Bangladesh, Shahbagh Post Box No. 2204, Dhaka 1000, Bangladesh. (or) Betar Shaban Sher-e Bangla Nagar, Agargaon Road, Dhaka 1207 Bangladesh. (Scott R. Barbour, Interval, NH)

CANADA

Radio Korea International relay, 9560 kHz. Full data card of Koryo Dynasty Celadon. Received in 40 days for an English report. Station address: 18 Yoido-dong, Youngdungpo-gu, Seoul, 150-790 Republic of Korea. Email: **english@kbr.co.kr**. (John Vercellino, Downers Grove, IL)

CLANDESTINE/ PIRATE

Radio Cascadia, 15045 kHz. Full data color studio card unsigned, with special greetings to *Monitoring Times*. Station information sheet and *Five Days Over Seattle* audio CD. Received in five months for an English report, SASE and souvenir postcards. QSL address: P.O. Box 703, Eugene, OR 97440. (Gayle Van Horn, Brasstown, NC; Edward Kusalik, Alberta, Canada/Cumbre DX; Robert Ross, Ontario, Canada/ODXA; Terry Palmerseim KC7LDP, Helena, MT/ HCDX)

The Netherlands-Radio Scotland International, 6270 kHz. Full data card and personal letter signed by "Albert," plus several photos. Received in 30 days for a pirate report, one IRC and two US dollars. Station address: P.O. Box 85, 9410 AB Beilen, The Netherlands. (Wood, TN)

CZECH REP.

Radio Prague, 7345 kHz. Full data *Novelty Piano Solo* QSL card unsigned., plus calendar. Received in 16 days for an email report to; english@radio.cz. (Kraig Krist, Annandale, VA)

GREECE

Makedonias, 7430 kHz. Full data folder picture postcard signed by Tatiana Tsioli, plus sticker. Received in 377 days for an English report and one IRC (returned). Station address: ERT SA, Subdirection of Technical Support, PB 11 312, 541 10 Thessoloniki, Greece. (Joe Wood, Vonore, TN)

GUATEMALA

Radio Verdad, 4052 kHz. Full data card and personal letter from Dr. Edgar Amilcar Madrid, plus station souvenirs. Station noted as 610 watts. Received in 83 days for an English report, one US dollar and a Christmas card. Station address: Apartado 5, Chiquimula, Guatemala. (Wood, TN)

INTERNATIONAL SPACE STATION

RS0ISS, 145.800 MHZ. Full data color card unsigned. Received in 20 days for aN SASE. QSL address for reports from USA to; ARRL, ARISS QSL Expedition-8, 225 Main Street, Newington, CT 06111-1494. (Dave White, Hermitage, TN)

LIBYA

Voice of Africa/Radio Jamahiriya, 15435 kHz. No data letter on station letterhead from Listeners Affairs Dept. Received in 853 days for an English report. Station address: P.O. Box 9333, Soug al Jama, Tripoli, Libya. (Barbour, NH)

MEDIUM WAVE

KCRG, 1600 kHz AM. Full data letter signed by Demetrios Hadjis-Director Sales & Client Relations, plus ESPN *The Zone* cap shipped separately. Received in 10 days for an AM reports and one US dollar (returned). Station address: 501 2nd Ave SE, Cedar Rapids, IA 52401. (Patrick Griffith NONNK, Westminster, CO)

WQMA, 1520 kHz AM. Full data letter signed by Paul Walker Jr.-Asst. Program Director, plus photos of transmitter. Letter is noted as *"QSL # 2"* . Received in 43 days for a DX Test program cassette. Station address: 1820 West Marks Rd., Marks, MS 38646. (Griffith, CO)

SOUTH AFRICA

AWR, 15295 kHz. Full data bible verse *The Message* QSL card, plus station souvenirs and *Listener Mail Newsletter*. Received in six days for an email report to; letter@awr.org. (Krist, VA)

USA

WUG-231, 6826 kHz. Full data prepared card signed by James Pogue, plus a brochure Army Corp of Engineers, *The Mississippi Valley Division*. Received in two years and nine months for a utility report and a SASE (not used). Broadcast from 2001 Armed Forces Day crossband test. Station address: Dept. Of the Army, Memphis District, Corp. Of Engineers, 167 N. Main St., B-202, Memphis, TN 38103-1894. (Bill Wilkins, Springfield, MO)

VATICAN

Vatican Radio, 9660 kHz. Several full data QSL cards and letter signed by Festus Tarawalie, plus station souvenirs. Received in 38 days for an English report. Station address: English Service, Piazza Pia 3, I-00120 Vatican City. (Joe Squashic, Wake Forest, NC)

JUNE HOLIDAY QSLING

Samoa Independence Day, June 1
Italy Republic Day, June 2
Tonga Independence Day, June 4
Denmark National Day, June 5
Norfolk Island Pitcairners Arrival Day, June 8
Portugal Day, June 10
Montserrat Queen Elizabeth II B'Day, June 12
Russia Day, June 12
St. Helena Queen Elizabeth II B'Day, June 12
United Kingdom Queen Elizabeth II B'Day, June 12
Falkland Islands (Islas Malvinas) Liberation Day, June 14
South Georgia & South Sandwich Islands Liberation Day, June 14
Iceland Independence Day, June 17
Seychelles Constitution Day (National Day) June 18
Luxembourg National Day, June 23
Mozambique Independence Day, June 25
Slovenia Independence Day/Statehood Day, 25 June
Madagascar Independence Day, June 26
Djibouti Independence Day, June 27
Congo Democratic Rep. Independence Day, June 30

John Figliozzi
johnfigliozzi@monitoringtimes.com

Relax...It's Summer!

Winter is generally considered *DXing season*. For most of us in the cooler climes, a lot more time is spent indoors, plus the lower atmospheric noise and static levels and longer periods of darkness produce propagation conditions that are prime for hearing those really weak signals.

But does that mean that shortwave radios should be stowed away for the summer months? Far from it! If the DXing cycle of the radio year seems to fit the winter lifestyle, can't summer's more leisurely, outdoor oriented behavior simply fit a different preferred listening pattern? It's just a new radio season, that's all. Let's call it the *easy listening season*!

"Easy listening" *celebrates* not having to strain to hear that weak station. Rather, it means listening as a truly leisure activity, done for pleasure, often whilst doing other pleasurable things – perhaps while barbecuing, gardening, washing the car, sitting by the pool or on the beach. Shhh, let's see what we can hear.

South Pacific Calling

Of course while it's summer here, it's winter in the southern hemisphere and that seasonal synchronicity provides the larger part of North America with its best opportunities to hear the South Pacific's two major broadcasters on a nightly basis.

Radio Australia, which is easily heard every morning on its well known 9580 kHz. frequency, is much harder to hear at night – especially as one moves eastward across our continent. But a window seems to open this time of year. 21740 (2200-0000UT) and 15515 (0200-0700) often provide *armchair listening* (yes, another radio metaphor) levels.

RA's programming is a broad and diverse mix of in-house and various domestic network productions and being able to listen at night makes it possible to hear more of these excellent, world class programs. This unique blend offers the attentive listener insight into many aspects of Australian life and the cultures of the Pacific island peoples – but one would almost expect that. What's perhaps unexpected is the way many **Radio National** (one of the **ABC** domestic networks) programs offer alternative and challenging insights into our own American culture and attitudes.

I've listened to – and still listen to – a lot of radio and I've yet to come across a network as devoted to ideas as **ABC Radio National**. The arts, politics, religion, current events, architecture, education, history, social issues, the law, philosophy, sport, science, the media, cognition, design – all accessibly discussed and debated in a unique critical and celebratory way. Since **RA** draws a major part of its programming from **Radio National**, the North American shortwave radio audience gains an uncommon opportunity that is optimized during our summer months. Refer to *MT*'s monthly *Shortwave Guide* for comprehensive program listings.

A few months ago, I described in this space many summer evenings spent with **Radio New Zealand International**. Here in eastern North America, **RNZI** starts to drift in on 15725 kHz. just after sunset. It's midafternoon the next day in Wellington, and since much of RNZI's programming consists of a relay of the main domestic network **National Radio**, we first get treated during the workweek to an hour of *Wayne's Music* (0105 UT) "Wayne" is Wayne Mowat, National Radio's friendly afternoon host, and he spins tunes organized weekly by decades starting from the '40s. That signal travels a long way and the breeziness of a summer evening seems to match the aural motion of RNZI's radio waves. It's so....well....relaxing! (I'm all for that!) And I just love it.

After the music, Wayne leads two hours of light conversation with people around the North and South islands, keeping you *In Touch with New Zealand*. Those two hours bookend an hour of RNZI-produced programming (0300) that includes *Dateline Pacific*, with reports from and about all of the Pacific island nations, and a nightly feature, one of which is the longrunning popular *Mailbox* that airs fortnightly (T 0330).

Weekends on RNZI are all National Radio-originated and include a wealth of Kiwi music on Saturdays (*Home Grown with Liz Barry*) and a selection of documentary, drama and other features on Sundays. Once again, *MT*'s *Shortwave Guide* has all the details.

Summer Arts Festivals

These are a staple of European summers, which are short but intense. Not intense in terms of temperature, but intense in terms of activity where the daylight hours are more numerous than ours and life is lived to experience them to the fullest. Even if not blessed with traveling there personally this year, we can get a taste of these popular celebrations through our radios.

Barcelona is hosting a five month festival of art, music, theater and debate in the Sant Adria de Besos district on the city's waterfront. Forum Barcelona 2004 continues through September 26 and it is hoped that this will become an annual event to be shared by the world's great cities. Among the events this month is an international music homage to Pablo Neruda on the 14th. Among the summer visitors will be Mikhail Gorbachev, Bill Clinton, Bono, Noam Chomsky, Sting and B.B. King. Just about every museum and theater space in Barcelona will be devoted to the festival and Radio Exterior de Espana undoubtedly will be highlighting it and this beautiful Catalan city continuously in its broadcasts.

Among other big Euro events this summer are a Rubens celebration in Antwerp and other cities and regular major music and opera festivals in Salzburg (July 24-August 31), St. Petersburg ("White Nights Festival" through July 18). Vienna (through June 20), Aix (July), Glyndebourne (through August) and Bayreuth's Wagner Festival (July 25-August 28).

Each of the European broadcasters can be expected to have coverage of the events taking place within their respective borders. Some have regular arts programs. (Consult the *MT Shortwave Guide* program listings.)

However, there also remains one weekly arts survey program that gives regular in-depth coverage to the arts and is likely to cover many if not all of the festivals and events taking place this summer across Europe. *Arts on the Air* is produced and broadcast by **Deutsche Welle**. It airs T **1930**, **2130**, 2330, W **0530**, 0730, 0930, 1030, 1430. **DW** no longer targets its English Service shortwave broadcasts to North America, but broadcast times in bold print are the most likely to be heard here anyway. The program is also available on-demand from [http://www.dw-world.de/english].

More on enjoyable summer listening next month.

Longwave Resources

✓ **Sounds of Longwave** 60-minute Audio Cassette featuring WWVB, Omega, Whistlers, Beacons, European Broadcasters, and more! **$13.95** postpaid

✓ **The BeaconFinder** A 65-page guide listing Frequency, ID and Location for hundreds of LF beacons and utility stations. Covers 0-530 kHz. **$13.95** postpaid

Kevin Carey
P.O. Box 56, W. Bloomfield, NY 14585

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

Convert your time to UTC.

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

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

Find the station you want to hear.

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

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

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

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

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

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

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

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

Target Areas	
af:	Africa
al:	alternate frequency (occasional use only)
am:	The Americas
as:	Asia
au:	Australia
ca:	Central America
do:	domestic broadcast
eu:	Europe
irr:	irregular (Costa Rica RFPI)
me:	Middle East
na:	North America
om:	omnidirectional
pa:	Pacific
sa:	South America
va:	various

Choose a program or station you want to hear.

Selected programs for prime listening hours appear following the frequencies – space does not permit 24 hour listings nor can every station be listed. However, listings for the most popular stations and selected lesser-known stations illustrate the variety available on shortwave. The format of the listings alternates among three different styles – by station, by genre and by day – month by month. Times listed are approximate and programs are subject to change.

The program listings emphasize broadcasts targeted to North America. In most cases, the stations and programs listed should be readily receivable in North America using a portable radio. Most broadcasters produce one broadcast in English per day that is repeated over a 24 hour period to all areas. If you are able to listen to transmissions to other areas of the world during "non-prime time" hours, referring to the prime time listings for those stations will likely be helpful in determining what programs will be broadcast.

Occasionally, a program or station listing may be followed by a reference to another listing for the same program or station at a different time. This is done to conserve space and make it possible to provide more listings.

MT Monitoring Team

Gayle Van Horn, Frequency Manager — gaylevanhorn@monitoringtimes.com
John Figliozzi, Program Manager — johnfigliozzi@monitoringtimes.com
Mark Fine, VA — markfine@monitoringtimes.com

Program Highlights

John Figliozzi

NEWS & NOTES

DW in NA

After some serious monitoring, it is apparent that several **DW** frequencies and broadcasts targeting other regions are proving to be quite reliably heard this summer at least on the east coast of this continent. Here's what I'm hearing in upstate NY with best frequencies in bold.

0400-0500* 7225, **9630**, 11945 kHz.
0500-0600* **9630**, 9770 kHz.
0600-0700* 6140, **7170** kHz.
1900-2000 **13590**, **15545**, 17770 kHz.
2000-2100 13820, **15205** kHz.
2100-2200* **11865**, **15205** kHz.

The Guide this month includes program listings for the broadcasts marked with an *. The 1900 programming is identical to that of the 2100 broadcast. The 2000 programming is identical to that of the 0400 and 0600 broadcasts, excepting that it airs one day earlier in the 2000 broadcast.

West coast readers are invited to share their experiences with these and other DW broadcasts in English. Consult the frequency section of *The Guide*, check reception for each at your location, and submit your results to the *MT* program manager (johnfigliozzi@monitoringtimes.com).

SRI Cuts and Runs Early

Swiss Radio International ended its broadcasts in English on April 12 with barely a nod to its 70 years of prominence in the field of international broadcasting. A closing program of sorts, which ran for several successive days and sounded like it was hastily slapped together with little thought or effort, was hardly a fitting tribute to this station's fine history. And once again we were treated to the crocodile tears of another general manager lamenting the supposed "reluctant" necessity for the decision to shut down. But the hollow emptiness of those words were underscored by that embarrassing exit program. If you hadn't witnessed the many "glory years" of **SRI** itself, you would be hard pressed to recognize that this was once one of the world's premier broadcasters. Perhaps its current management did not want to remind us about how poor its stewardship had really been.

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

0000	0007		Sierra Leone, SLBS	3316do		
0000	0015	vl	Cambodia, National Radio Of	11940as		
0000	0027		Czech Rep, Radio Prague Intl	7345na	9440na	
0000	0030		Egypt, Radio Cairo	11725na		
0000	0030		Japan, Radio	13650as	17810as	
0000	0030		Netherlands, Radio	9845na		
0000	0030		Thailand, Radio	5890va	9570va	
0000	0030		UK, BBC World Service	3915as	5970as	
			6195as 9410as	9740as	11945as	11995as
			15280as	15360as	17655va	17790as
0000	0030		USA, Voice of America	7215va	15185va	
			17820va			
0000	0045		India, All India Radio	9705as	9950as	
			11620as	11645as	13605as	
0000	0057		Canada, Radio Canada Intl	9640as	15205as	
0000	0059		Germany, Deutsche Welle	7130as	9505as	
			9825as			
0000	0059		Spain, Radio Exterior Espana	15385na		
0000	0100		Anguilla, Caribbean Beacon	6090am		
0000	0100		Australia, ABC NT Alice Springs	2310irr	4835da	
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek	4910do		
0000	0100		Australia, Radio	9660pa	12080va	13630pa
			15240pa	17750pa	17775as	17795as
			21725as			
0000	0100		Canada, CBC Northern Service	9625do		
0000	0100		Canada, CFRX Toronto ON	6070do		
0000	0100		Canada, CFVP Calgary AB	6030do		
0000	0100		Canada, CKZN St John's NF	6160do		
0000	0100		Canada, CKZU Vancouver BC	6160do		
0000	0100		Costa Rica, University Network	5030am	6150am	
			7375am	9725sa		
0000	0100		Croatia, Croatian Radio	9925ca		
0000	0100		Guyana, Voice of	3290do		
0000	0100		Japan, Radio	6145ca		
0000	0100		Malaysia, Radio Malaysia	7295do		
0000	0100		Namibia, Namibian BC Corp	3270af	3290ai	
			6060af			
0000	0100		New Zealand, Radio NZ Intl	15720pa		
0000	0100		Sierra Leone, Radio UNAMSIL	6139af		
0000	0100		Singapore, Mediacorp Radio	6150do		
0000	0100	vl	Solomon Islands, SIBC	5020do	9545da	
0000	0100		UK, BBC World Service	5975ca	7545af	
			9825ca	11835ca	12095ca	
0000	0100		Ukraine, Radio Ukraine Intl	7545na		
0000	0100		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
0000	0100		USA, KAIJ Dallas TX	13815va		
0000	0100		USA, KTBN Salt Lake City UT	7505na	15590na	
0000	0100		USA, KWHR Naalehu HI	17510as		
0000	0100		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na			
0000	0100		USA, WBOH Newport NC	5920am		
0000	0100		USA, WEWN Birmingham AL	5825na	7425na	
			13615va			
0000	0100		USA, WHRA Greenbush ME	7580va		
0000	0100		USA, WHRI Noblesville IN	5745am	7315am	
0000	0100		USA, WINB Red Lion PA	9320am		
0000	0100		USA, WJIE Louisville KY	13595am		
0000	0100		USA, WRMI Miami FL	7385am	9955am	
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WWCR Nashville TN	3210na	5070na	
			7465na	13845na		
0000	0100		USA, WWRB Manchester TN	5050na	5085na	
			6890na			
0000	0100		USA, WYFR Okeechobee FL	6065na	9505na	
			15130sa			
0000	0100		Zambia, Radio Christian Voice	4965af		
0015	0030	twhfa	Austria, Radio Austria Intl	13730sa		
0015	0100	va/mtwhf	Germany, Bible Voice Broadcasting			7210as
0030	0100		Australia, Radio	9660pa	12080va	13630pa
			15240pa	15415as	17750pa	17775as
			17795as	21725as		
0030	0100		Iran, Voice of the Islamic Rep	9905sa		
0030	0100		Lithuania, Radio Vilnius	11690na		
0030	0100		Sri Lanka, SLBC	6005as	11905as	15745as
0030	0100		Thailand, Radio	5890na	15395na	
0030	0100		UK, BBC World Service	6195as	9410as	
			9740as 11955as	15280as	15310as	15360as
			17655as	17790as		
0030	0100		USA, Voice of America	7215va	11760va	
			15185va	15290va	17740va	17820va
0045	0100	twhfa	Austria, Radio Austria Intl	13730sa		
0045	0100		Germany, Pan American BC	9740eu		
0045	0100		Pakistan, Radio	9340as	11565as	
0055	0100		Italy, RAI Intl	12005na		

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

0100	0115		Italy, RAI Intl	12005na		
0100	0115		Pakistan, Radio	9340as	11565as	
0100	0127		Czech Rep, Radio Prague Intl	6200na	7345na	
0100	0128		Vietnam, Voice of	6175na		
0100	0130	s	Germany, Universal Life	9485as		
0100	0130		Hungary, Radio Budapest	9590na		
0100	0130	mtwhfa	Serbia & Montenegro, Intl Radio	9580na		
0100	0130		Uzbekistan, Radio Tashkent Intl	5975as	6165as	
			7160as			
0100	0156		Romania, Radio Romania Intl	9690na	11940na	
			15430na	17760na		
0100	0159		Canada, Radio Canada Intl	9755am	11990am	
			13710am			
0100	0159	DRM	China, China Radio Intl	6140na		
0100	0200		Anguilla, Caribbean Beacon	6090am		
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek	4910do		
0100	0200		Australia, HCJB	15560pa		
0100	0200		Canada, CBC Northern Service	9625do		
0100	0200		Canada, CFRX Toronto ON	6070do		
0100	0200		Canada, CFVP Calgary AB	6030do		
0100	0200		Canada, CKZN St John's NF	6160do		
0100	0200		Canada, CKZU Vancouver BC	6160do		
0100	0200		China, China Radio Intl	9580am	9790am	
0100	0200		Costa Rica, University Network	5030am	6150am	
			7375am	9725sa		
0100	0200		Croatia, Croatian Radio	9925na		
0100	0200		Cuba, Radio Havana	6000na	9820na	
0100	0200		Guyana, Voice of	3290do		
0100	0200		Indonesia, Voice of	9525as	11785as	15150al
0100	0200		Iran, Voice of the Islamic Rep	9905sa		
0100	0200		Japan, Radio	6025va	11860as	15325as
			17560va	17685pa	17810as	17835am
			17845sa			
0100	0200		Malaysia, Radio Malaysia	7295do		
0100	0200		Namibia, Namibian BC Corp	3270af	3290af	
			6060af			
0100	0200	DRM	Netherlands, Radio	15525na		
0100	0200		New Zealand, Radio NZ Intl	15720pa		
0100	0200		North Korea, Voice of	3560as	6195as	
			7140am	9345as	9520am	11735as
0100	0200		Russia, Voice of	5945me	9665na	15595na
			17660na			
0100	0200		Sierra Leone, Radio UNAMSIL	6139af		
0100	0200		Singapore, Mediacorp Radio	6150do		
0100	0200	vl	Solomon Islands, SIBC	5020do	9545do	
0100	0200		Sri Lanka, SLBC	6005as	11905as	15745as
0100	0200		UK, BBC World Service	5975ca	6195as	
			9410as 9525ca	9825ca	11835ca	12095ca
			15280as	15310as	15360as	17790as
0100	0200		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
0100	0200		USA, KAIJ Dallas TX	5755va		
0100	0200		USA, KJES Vado NM	7555na		
0100	0200		USA, KTBN Salt Lake City UT	7505na		
0100	0200		USA, KWHR Naalehu HI	17510as		
0100	0200	mtwhf	USA, Voice of America	7115va	9885va	
			11705va	11725va		
0100	0200		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na			
0100	0200		USA, WBOH Newport NC	5920am		
0100	0200		USA, WEWN Birmingham AL	5825na	7425na	
			13615va			
0100	0200		USA, WHRA Greenbush ME	7580va		
0100	0200		USA, WHRI Noblesville IN	5745am	7315am	
0100	0200		USA, WINB Red Lion PA	9320am		
0100	0200		USA, WJIE Louisville KY	13595am		
0100	0200		USA, WRMI Miami FL	7385am	9955am	
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WWCR Nashville TN	3210na	5070na	
			5935na	7465na		
0100	0200		USA, WWRB Manchester TN	5050na	5085na	
			6890na			
0100	0200		USA, WYFR Okeechobee FL	6065na	9505na	
			15060va			
0100	0200		Zambia, Radio Christian Voice	4965af		
0105	0120	sm	Austria, Radio Austria Intl	7325am	9870am	
0115	0120	mtwhf	Kyrgystan, Radio Kyrghyz	4010irr	4795irr	
0115	0130		Austria, Radio Austria Intl	7325am	9870am	

SELECTED PROGRAMMING BEGINS ON PAGE 57

0130	0145		Germany, Pan American BC	9495eu		
0130	0200		Australia, Radio	9660pa	12080va	13630pa
			15240pa	15415as	17750as	17775as
			17795as	21725as		
0130	0200		Sweden, Radio	6010na	9435va	
0130	0200		USA, Voice of America		9775am	13740am
0135	0150	sm	Austria, Radio Austria Intl		7325am	9870am
0140	0200		Vatican City, Vatican Radio		9650as	12055as
0145	0200		Albania, Radio Tirana Intl		6115eu	7160eu
0145	0200		Austria, Radio Austria Intl		7325am	9870am

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

0200	0230		Austria, AWR Europe	9820as		
0200	0230	fmw	Belarus, Radio Belarus Intl	9650eu	12055eu	
0200	0230		Croatia, Croatian Radio	9925na		
0200	0230		Iran, Voice of the Islamic Rep	9905sa		
0200	0230	a	UK, Wales Radio Intl	9795na		
0200	0230		USA, KJES Vado NM	7555na		
0200	0256		North Korea, Voice of	4405as	9325as	
			11335as			
0200	0257		Canada, Radio Canada Intl	15510as	17860as	
0200	0300		Anguilla, Caribbean Beacon	6090am		
0200	0300	twhfa	Argentina, RAE	11710na		
0200	0300		Australia, ABC NT Alice Springs	2310irr	4835do	
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek	4910do		
0200	0300		Australia, HCJB	15560pa		
0200	0300		Australia, Radia	9660pa	12080va	13630pa
			15240pa	15415as	17750as	17750as
			21725as			
0200	0300		Bulgaria, Radia	9700na	11700na	
0200	0300		Canada, CBC Northern Service	9625do		
0200	0300		Canada, CFRX Toronto ON	6070do		
0200	0300		Canada, CFVP Calgary AB	6030do		
0200	0300		Canada, CKZN St John's NF	6160do		
0200	0300		Canada, CKZU Vancouver BC	6160do		
0200	0300		Costa Rica, University Network	5030am	6150am	
			7375am	9725sa		
0200	0300		Cuba, Radio Havana	6000na	9820na	
0200	0300		Egypt, Radio Cairo	11855na		
0200	0300		Guyana, Voice of	3290do		
0200	0300		Malaysia, Radio Malaysia	7295do		
0200	0300		Myanmar, Radio	7185do		
0200	0300		Namibia, Namibian BC Corp	3270af	3290af	
			6090af			
0200	0300		New Zealand, Radio NZ Intl	15720pa		
0200	0300	as	Philippines, Radio Pilipinas	11885me	15120me	
			15270me			
0200	0300		Russia, Voice of	5945me	9665na	9860na
			15595na	17660na		
0200	0300		Sierra Leone, Radio UNAMSIL	6139af		
0200	0300		Singapore, Mediacorp Radio	6150do		
0200	0300	vl	Solomon Islands, SIBC	5020do	9545do	
0200	0300		South Korea, Radio Korea Intl	9560na	11810na	
			15575na			
0200	0300		Sri Lanka, SLBC	6005as	11905as	15745as
0200	0300		Taiwan, Radio Taiwan Intl	5950na	9680na	
			11875as	15320as	15465as	
0200	0300		UK, BBC World Service	5975ca	6195me	
			9410va	9750af	9825ca	11760me
			11835ca	11955as	12095ca	15280as
			15310as	15360as	17790as	
0200	0300		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
0200	0300		USA, KAIJ Dallas TX	5755va		
0200	0300		USA, KTBN Salt Lake City UT	7505na		
0200	0300		USA, KWHR Naalehu HI	17510as		
0200	0300	mtwhf	USA, Voice of America	7115va	9885va	
			11705va	11725va		
0200	0300		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na			
0200	0300		USA, WBOH Newport NC	5920am		
0200	0300		USA, WEWN Birmingham AL	5825na	7425na	
			13615va			
0200	0300		USA, WHRA Greenbush ME	7580va		
0200	0300		USA, WHRI Noblesville IN	5745am	7315am	
0200	0300		USA, WINB Red Lion PA	9320am		
0200	0300		USA, WJIE Louisville KY	13595am		
0200	0300		USA, WRMI Miami FL	7385am	9955am	
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WWCR Nashville TN	3210na	5070na	
			5935na	7465na		
0200	0300		USA, WWRB Manchester TN	5050na	5085na	
			6890na			
0200	0300		USA, WYFR Okeechobee FL	5985na	6065na	
			9505na	11855ca	15255ca	
0200	0300		Zambia, Radio Christian Voice	4965af		
0215	0230		Nepal, Radio	3230as	5005as	6100as
			7165as			
0230	0258		Vietnam, Voice of	6175na		
0230	0300		Albania, Radio Tirana Intl	6115eu	7160eu	
0230	0300		Hungary, Radio Budapest	9790na		
0230	0300		Sweden, Radio	6010na		
0250	0300		Vatican City, Vatican Radio	7305am	9605am	
0250	0300		Zambia, Radio	4910da		

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

0300	0320		Vatican City, Vatican Radio	17590va		
0300	0327		Czech Rep, Radio Prague Intl	7345na	9870na	
0300	0330		Egypt, Radio Cairo	11855na		
0300	0330	as	Philippines, Radio Pilipinas	11885me	15120me	
			15270me			
0300	0330		Thailand, Radio	15395na		
0300	0330		Vatican City, Vatican Radio	9660af		
0300	0350		Turkey, Voice of	6020va	6140va	7270me
0300	0355		South Africa, Channel Africa	3345af	9770af	
0300	0356		North Korea, Voice of	3560as	6195as	
			7140as	9345as		
0300	0400		Anguilla, Caribbean Beacon	6090am		
0300	0400		Australia, ABC NT Alice Springs	2310irr	4835da	
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek	4910do		
0300	0400		Australia, Radio	9660pa	12080va	13630pa
			15240pa	15415as	17750as	17750as
			21725as			
0300	0400		Canada, CBC Northern Service	9625da		
0300	0400		Canada, CFRX Toronto ON	6070da		
0300	0400		Canada, CFVP Calgary AB	6030do		
0300	0400		Canada, CKZN St John's NF	6160da		
0300	0400		Canada, CKZU Vancouver BC	6160do		
0300	0400		China, China Radio Intl	9690am	9790am	
0300	0400		Costa Rica, University Network	5030am	6150am	
			7375am	9725sa		
0300	0400		Cuba, Radio Havana	6000na	9820na	
0300	0400		Guyana, Voice of	3290do		
0300	0400		Japan, Radio	21610pa		
0300	0400		Malaysia, Radio Malaysia	7295do		
0300	0400		Malaysia, Voice of	6175as	9750as	15925as
0300	0400		Namibia, Namibian BC Corp	3270af	3290af	
			6090af			
0300	0400		New Zealand, Radio NZ Intl	15720pa		
0300	0400		Oman, Radio	15355af		
0300	0400		Russia, Voice of	7300na	9665na	9860na
			15595na	17660na		
0300	0400		Sierra Leone, Radio UNAMSIL	6139af		
0300	0400		Singapore, Mediacorp Radio	6150do		
0300	0400	vl	Solomon Islands, SIBC	5020do	9545do	
0300	0400		Sri Lanka, SLBC	6005as	11905as	15745as
0300	0400		Taiwan, Radio Taiwan Intl	5950na	15215na	
			15320as			
0300	0400		Uganda, Radio	4976do	5026do	7196do
0300	0400		UK, BBC World Service	5975ca	6195eu	
			9410va	11760me	11835ca	12095va
			15280as	15310as	15360as	15575me
			17760as	17790as	21660as	
0300	0400		Ukraine, Radio Ukraine Intl	7545na		
0300	0400		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
0300	0400		USA, KAIJ Dallas TX	5755va		
0300	0400		USA, KTBN Salt Lake City UT	7505na		
0300	0400		USA, KWHR Naalehu HI	17510as		
0300	0400	mtwhf	USA, Voice of America	6080af	7105af	
			7290af	7340af	9885af	12080af
0300	0400		USA, Voice of America	9620va	11695va	17895af
0300	0400		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na			
0300	0400		USA, WBOH Newport NC	5920am		
0300	0400		USA, WEWN Birmingham AL	5825na	7425na	
			13615va			
0300	0400		USA, WHRA Greenbush ME	7580va		
0300	0400		USA, WHRI Noblesville IN	5745am	7315am	
0300	0400		USA, WINB Red Lion PA	9320am		
0300	0400		USA, WJIE Louisville KY	13595am		
0300	0400		USA, WMLK Bethel PA	9465eu	9955al	
0300	0400		USA, WRMI Miami FL	7385am	9955am	
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WWCR Nashville TN	3210na	5070na	
			5770na	5935na		
0300	0400		USA, WWRB Manchester TN	5050na	5085na	
			6890na			
0300	0400		USA, WYFR Okeechobee FL	6065na	9505va	
			11740na			
0300	0400		Zambia, Radio	4910do		
0300	0400		Zambia, Radia Christian Voice	4965af		

0300	0400	vl	Zimbabwe, ZBC Corp	5975do		
0330	0357		Czech Rep, Radio Prague Intl	11600va	15600va	
0330	0358		Vietnam, Voice of	6175ca		
0330	0400		UAE, Radio Dubai	12005na	13675na	15400na
0330	0400		UK, BBC World Service	3255af	6005af	
			6190af 7120af	7160af	12035af	15420af
0330	0400	mtwhf	USA, Voice of America	6080af	7105af	
			7290af 9885af	12080af	17895af	
0345	0400		Tajikistan, Radio	7245irr		

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

0400	0415		Israel, Kol Israel	9435eu	11590eu	15640eu
			17600va			
0400	0430		Belgium, Radio Vlaanderen Intl	11635na		
0400	0430		France, Radio France Intl	9550af	9805af	
			11955af	13610af		
0400	0430		Sri Lanka, SLBC	6005as	11905as	15745as
0400	0430	mtwhf	USA, Voice of America	4960af	6080af	
			7290af 9575af	9885af	12080af	17895af
0400	0456		Ramania, Radio Romania Intl	11820na	15140na	
			15235na	17860na		
0400	0458		New Zealand, Radio NZ Intl	15720pa		
0400	0459		Germany, Deutsche Welle	7225af	9630af	
			9710af 11945af			
0400	0500		Anguilla, Caribbean Beacon	6090am		
0400	0500		Australia, ABC NT Alice Springs	2310irr	4835do	
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek	4910do		
0400	0500		Australia, Radio	9660pa	12080va	13630pa
			15240pa	15515va	17750as	21725as
0400	0500		Canada, CBC Northern Service	9625do		
0400	0500		Canada, CFRX Toronto ON	6070do		
0400	0500		Canada, CKZN St John's NF	6160do		
0400	0500		Canada, CKZU Vancouver BC	6160do		
0400	0500		China, China Radio Intl	6190am	9560am	
			9755am			
0400	0500		Costa Rica, University Network	5030am	6150am	
			7375am	9725sa		
0400	0500		Cuba, Radio Havana	6000na	9820na	
0400	0500		Germany, Overcomer Ministries	9770au		
0400	0500		Germany, Radio Africa Intl	13810af		
0400	0500		Guyana, Voice of	3290do		
0400	0500		Malaysia, Radio Malaysia	7295do		
0400	0500		Malaysia, Voice of	6175as	9750as	15295as
0400	0500		Namibia, Namibian BC Corp	3270af	3290af	
			6090af			
0400	0500		Netherlands, Radio	6165na	9590na	
0400	0500	DRM/as	Netherlands, Radio	15400au		
0400	0500		Russia, Voice of	7300na	9665na	15595na
			17660na			
0400	0500		Sierra Leone, Radio UNAMSIL	6139af		
0400	0500		Singapore, Mediacorp Radio	6150do		
0400	0500	vl	Solomon Islands, SIBC	5020do	9545do	
0400	0500		Uganda, Radio	4976do	5026do	7196do
0400	0500		UK, BBC World Service	3255af	5975ca	
			6005af 6190af	6195eu	7120af	7160af
			9410va	11760me	11835ca	12035af
			12095va	15280as	15310as	15360as
			15420af	15575me	17760as	17790as
			21660as			
0400	0500		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
0400	0500		USA, KAIJ Dallas TX	5755va		
0400	0500		USA, KTBN Salt Lake City UT	7505na		
0400	0500		USA, KWHR Naalehu HI	17780as		
0400	0500		USA, Voice of America	9620va	11695va	
0400	0500		USA, WBCQ Kennebunk ME	5105na	7415na	
			9330na			
0400	0500		USA, WBOH Newport NC	5920am		
0400	0500		USA, WEWN Birmingham AL	5825na	7425na	
			13615va			
0400	0500		USA, WHRA Greenbush ME	7580va		
0400	0500		USA, WHRI Noblesville IN	5745am	7315am	
0400	0500		USA, WJIE Louisville KY	7490am	13595am	
0400	0500		USA, WRMI Miami FL	7385am	9955am	
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WWCR Nashville TN	3210na	5070na	
			5770na	5935na		
0400	0500		USA, WWRB Manchester TN	5050na	5085na	
			6890na			
0400	0500		USA, WYFR Okeechobee FL	6855va	7355va	
			9715na			
0400	0500		Zambia, Radio	4910do		
0400	0500		Zambia, Radio Christian Voice	4965af		
0400	0500	vl	Zimbabwe, ZBC Corp	5975do		
0415	0420	mtwhf	Kyrgystan, Radio Kyrghyz	4010irr	4795irr	
0430	0500		Nigeria, Radio/Enugu	6025do		
0430	0500		Nigeria, Radio/Ibadan	6050do		
0430	0500		Nigeria, Radio/Kaduna	4770do	6090do	
0430	0500		Nigeria, Radio/Lagos	3326do	4990do	
0430	0500		Serbia & Montenegro, Intl Radio	9580va		
0430	0500		Swaziland, TWR	4775af	6120af	
0430	0500	mtwhf	USA, Voice of America	4960af	6080af	
			7290af 9575af	11835af	12080af	17895af
0445	0500		Italy, RAI 6110af	7235af	9875af	
0459	0500		New Zealand, Radio NZ Intl	9615pa		

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

0500	0530		France, Radio France Intl	11850af	13610af	
			15155af			
0500	0530		UK, BBC World Service	6005af	6190af	
			7160af 11765af	11940af	11955as	15280as
			15310as	15360as	15420af	17640af
			17760me	17790as	17885af	21660as
0500	0530		Vatican City, Vatican Radio	9660af	11625af	
			13765af			
0500	0559		Germany, Deutsche Welle	9630af	9700af	
			12045af	15410af	17860af	
0500	0559		Germany, Radio Africa Intl	13810af		
0500	0600		Anguilla, Caribbean Beacon	6090am		
0500	0600		Australia, ABC NT Alice Springs	2310irr	4835do	
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek	4910do		
0500	0600		Australia, Radio	9660pa	12080vc	13630pa
			15240pa	15415as	15515va	17750as
			21725as			
0500	0600		Canada, CBC Northern Service	9625do		
0500	0600		Canada, CFRX Toronto ON	6070do		
0500	0600		Canada, CKZN St John's NF	6160do		
0500	0600		Canada, CKZU Vancouver BC	6160do		
0500	0600		China, China Radio Intl	9560am		
0500	0600		Costa Rica, University Network	5030am	6150am	
			7375am	9725sa		
0500	0600		Cuba, Radio Havana	9550am	9655na	
			9820na			
0500	0600		Guyana, Voice of	3290do		
0500	0600		Japan, Radio	5975va	6110na	7230va
			15195va	17810va	21755va	
0500	0600		Malaysia, Radio Malaysia	7295do		
0500	0600		Malaysia, Voice of	6175as	9750as	15295as
0500	0600		Namibia, Namibian BC Corp	6060af	6175al	
0500	0600		New Zealand, Radio NZ Intl	9615pa		
0500	0600		Nigeria, Radio/Enugu	6025do		
0500	0600		Nigeria, Radio/Ibadan	6050do		
0500	0600		Nigeria, Radio/Kaduna	4770do	6090do	
0500	0600		Nigeria, Radio/Lagos	3326do	4990do	
0500	0600		Nigeria, Voice of	7255af	17800af	
0500	0600		Russia, Voice of	21790pa		
0500	0600		Sierra Leone, Radio UNAMSIL	6139af		
0500	0600		Singapore, Mediacorp Radio	6150do		
0500	0600	vl	Solomon Islands, SIBC	5020do	9545do	
0500	0600		South Africa, Channel Africa	7210af	9770af	
0500	0600		Swaziland, TWR	6120af	7205af	9500af
0500	0600		Uganda, Radio	4976do	5026do	7196do
0500	0600		UK, BBC World Service	9410me	11760me	
			15565me	15575me		
0500	0600		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
0500	0600		USA, KAIJ Dallas TX	5755va		
0500	0600		USA, KTBN Salt Lake City UT	7505na		
0500	0600		USA, KWHR Naalehu HI	11565as	17780as	
0500	0600	mtwhf	USA, Voice of America	6035af	6080af	
			6180af 7290af	12080af		
0500	0600		USA, WBCQ Kennebunk ME	5105na	7415na	
0500	0600		USA, WBOH Newport NC	5920am		
0500	0600		USA, WEWN Birmingham AL	5825na	7425na	
			13615va			
0500	0600		USA, WHRA Greenbush ME	11730na		
0500	0600		USA, WHRI Noblesville IN	5745am	7315am	
0500	0600		USA, WJIE Louisville KY	7490am	13595am	
0500	0600		USA, WMLK Bethel PA	9465eu	9955al	
0500	0600		USA, WRMI Miami FL	7385am	9955am	
0500	0600		USA, WTJC Newport NC	9370nc		
0500	0600		USA, WWCR Nashville TN	3210no	5070na	
			5770na	5935na		
0500	0600		USA, WYFR Okeechobee FL	6855va	9355eu	
0500	0600		Zambia, Radio Christian Voice	9865af		
0500	0600	vl	Zimbabwe, ZBC Corp	5975do		
0515	0525		Rwanda, Radio	6005do		
0525	0600	vl	Ghana, Ghana BC Corp	3366do	4915do	
0530	0600		Georgia, Radio Georgia	11805eu		
0530	0600		Serbia & Montenegro, Intl Radio	9580vc		
0530	0600		Thailand, Radio	21795eu		
0530	0600		UAE, Radio Dubai	15435va	17830va	21700va

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

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

0600	0603		Croatia, Croatian Radio	12110pa		
0600	0620		Vatican City, Vatican Radio	4005eu	5890eu	
			7250eu			
0600	0630		France, Radio France Intl	11665as	11725as	
			15155as	17800as	21620as	
0600	0630		Swaziland, TWR 6120af	7205af	9500af	
0600	0630	mtwhf	USA, Voice of America	6035af	6180af	
			12080af			
0600	0659		Germany, Deutsche Welle	7170af	15275af	
			17860af 21675af			
0600	0700		Anguilla, Caribbean Beacon	6090am		
0600	0700		Australia, ABC NT Alice Springs	2310irr	4835do	
0600	0700		Australia, ABC NT Katherine	5025da		
0600	0700		Australia, ABC NT Tennant Creek	4910da		
0600	0700		Australia, Radio 9660pa	11880pa	12080va	
			13605pa 15240pa	15415as	15515va	
			17750as			
0600	0700		Canada, CFRX Toronto ON	6070do		
0600	0700		Canada, CFVP Calgary AB	6030do		
0600	0700		Canada, CKZN St John's NF	6160da		
0600	0700		Canada, CKZU Vancouver BC	6160do		
0600	0700		Costa Rica, University Network	5030am	6150am	
			7375am 9725sa	11870sa		
0600	0700		Cuba, Radio Havana	9550am	9655na	
			9820na			
0600	0700		Germany, Deutsche Welle	6140eu		
0600	0700		Germany, Radio Africa Intl	15435af		
0600	0700	vl	Ghana, Ghana BC Carp	3366do	4915da	
0600	0700		Guyana, Voice of 3290do			
0600	0700		Japan, Radio 7230va	11715va	11740va	
			11690va 11760va	13630va	15195va	
			17870va 21755va			
0600	0700		Liberia, ELWA 4760do			
0600	0700		Malaysia, Radio Malaysia	7295do		
0600	0700		Malaysia, Voice of 6175as	9750as		
0600	0700		Namibia, Namibian BC Corp	6060af	6175al	
0600	0700		New Zealand, Radio NZ Intl	9615pa		
0600	0700		Nigeria, Radio/Enugu	6025da		
0600	0700		Nigeria, Radio/Ibadan	6050do		
0600	0700		Nigeria, Radio/Kaduna	4770do	6090do	
0600	0700		Nigeria, Radio/Lagos	3326do	4990do	
0600	0700		Nigeria, Voice of 7255af	17800af		
0600	0700		Papua New Guinea, NBC	4890do	9675irr	
0600	0700		Russia, Voice of 21790pa			
0600	0700		Sierra Leone, Radio UNAMSIL	6139af		
0600	0700		Singapore, Mediacorp Radio	6150do		
0600	0700	vl	Solomon Islands, SIBC	5020do	9545do	
0600	0700		South Africa, Channel Africa	7210af	15215af	
0600	0700		UK, BBC World Service	6005af	6190af	
			7160af 9410eu	11760af	11940af	12095eu
			15485eu	15545af	15565me	15575me
			17640af			
0600	0700	as	UK, BBC World Service	17885af		
0600	0700		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb 6350usb	7507usb	10320usb	
			12133usb 12579usb	13362usb	13855usb	
0600	0700		USA, KAIJ Dallas TX 5755va			
0600	0700		USA, KTBN Salt Lake City UT	7505na		
0600	0700		USA, KWHR Naalehu HI	11565as	17780as	
0600	0700		USA, Voice of America	6080af	7290af	
0600	0700		USA, WBCQ Kennebunk ME	5105na	7415na	
0600	0700		USA, WBOH Newport NC	5920am		
0600	0700		USA, WEWN Birmingham AL	5825na	7425na	
			7580va 13615na			
0600	0700		USA, WHRA Greenbush ME	11730na		
0600	0700		USA, WHRI Noblesville IN	5745am	7315am	
0600	0700		USA, WJIE Louisville KY	7490am	13595am	
0600	0700		USA, WMLK Bethel PA	9465eu	9955al	
0600	0700		USA, WRMI Miami FL	7385am	9955am	
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WWCR Nashville TN	3210na	5070na	
			5770na 5935na			
0600	0700		USA, WYFR Okeechobee FL	7355eu	11530eu	
			11580eu			
0600	0700	vl	Vanuatu, Radio 4960da	7260da		
0600	0700		Yemen, Rep of Yemen Radio	9780me		
0600	0700		Zambia, Radio Christian Voice	9865af		
0600	0700	vl	Zimbabwe, ZBC Carp	5975da		
0605	0650	s	Austria, Radio Austria Intl	17870me		
0630	0645		Vatican City, Vatican Radio	5890va	15595va	
0630	0700		Bulgaria, Radio 11600eu	13600eu		
0630	0700		Swaziland, TWR 7205af	9500af		
0630	0700		Vatican City, Vatican Radio	11625af	13765af	
			15570af			
0635	0650	s	Austria, Radio Austria Intl	17870me		
0645	0700	as	Albania, TWR 11865eu			
0645	0700	as	Monaco, TWR 9870eu			

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

0700	0705		New Zealand, Radio NZ Intl	9615pa		
0700	0720		UK, BBC World Service	6190af	11765af	
			11940af 15400af			
0700	0720	as	UK, BBC World Service	17885af		
0700	0726		Romania, Radio Romania Intl	11830na	15150na	
0700	0727		Czech Rep, Radio Prague Intl	9880eu	11600eu	
0700	0730		Belgium, Radio Vlaanderen Intl	5985eu		
0700	0730	a	Tibet, Xizang PBS 9490as	9580as		
0700	0730		UK, BBC World Service	15565me	15575me	
0700	0745	whf	Germany, Bible Voice Broadcasting		5905eu	
0700	0750	as	Albania, TWR 11865eu			
0700	0750	as	Monaco, TWR 9870eu			
0700	0800		Anguilla, Caribbean Beacon	6090am		
0700	0800		Australia, ABC NT Alice Springs	2310irr	4835da	
0700	0800		Australia, ABC NT Katherine	5025da		
0700	0800		Australia, ABC NT Tennant Creek	4910da		
0700	0800		Australia, Radio 9580pa	9660pa	11880pa	
			12080va 15240pa	15415as	15515va	
			17750as			
0700	0800		Canada, CFRX Toronto ON	6070do		
0700	0800		Canada, CFVP Calgary AB	6030da		
0700	0800		Canada, CKZN St John's NF	6160da		
0700	0800		Canada, CKZU Vancouver BC	6160do		
0700	0800		Costa Rica, University Network	5030am	6150am	
			7375am 9725sa	11870sa		
0700	0800		Eqt Guinea, Radio Africa	15184af		
0700	0800		France, Radio France Intl	15605af		
0700	0800	as	Germany, Bible Voice Broadcasting		5905 ey	
0700	0800		Germany, Deutsche Welle	6140eu	21675af	
0700	0800		Germany, Radio Africa Intl	15435af		
0700	0800	vl	Ghana, Ghana BC Carp	3366do	4915do	
0700	0800		Guyana, Voice of 3290do	5950da		
0700	0800	vl/as	Italy, IRRS 13840va			
0700	0800		Liberia, ELWA 4760do			
0700	0800		Malaysia, Radio Malaysia	7295do		
0700	0800		Malaysia, Voice of 6175as	9750as		
0700	0800		Myanmar, Radio 9730da			
0700	0800		Nigeria, Radio Enugu	6025do		
0700	0800		Nigeria, Radio/Ibadan	6050da		
0700	0800		Nigeria, Radio/Kaduna	4770do	6090do	
0700	0800		Nigeria, Radio/Lagos	3326da	4990do	
0700	0800		Nigeria, Voice of 7255af	17800af		
0700	0800		Papua New Guinea, NBC	4890do	9675irr	
0700	0800		Russia, Voice of 17495pa	17525pa	17635pa	
			21790pa			
0700	0800		Sierra Leone, Radio UNAMSIL	6139af		
0700	0800		Singapore, Mediacorp Radio	6150do		
0700	0800	vl	Solomon Islands, SIBC	5020do	9545da	
0700	0800		South Africa, Channel Africa	11825af		
0700	0800		Swaziland, TWR 7205af	9500af		
0700	0800		Taiwan, Radio Taiwan Intl	5950na		
0700	0800		UK, BBC World Service	11955as	15310as	
			15360as 15545af	17760as	17790as	
			21660as			
0700	0800		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb 6350usb	7507usb	10320usb	
			12133usb 12579usb	13362usb	13855usb	
0700	0800		USA, KAIJ Dallas TX 5755va			
0700	0800		USA, KTBN Salt Lake City UT	7505na		
0700	0800		USA, KWHR Naalehu HI	11565as	17780as	
0700	0800		USA, WBCQ Kennebunk ME	5105na	7415na	
0700	0800		USA, WBOH Newport NC	5920am		
0700	0800		USA, WEWN Birmingham AL	5825na	7425na	
			7580na 11875va			
0700	0800		USA, WHRA Greenbush ME	11730na		
0700	0800		USA, WHRI Noblesville IN	5745am	7315am	
0700	0800		USA, WMLK Bethel PA	9465eu	9955al	
0700	0800		USA, WRMI Miami FL	7385am	9955am	
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WWCR Nashville TN	3210na	5070na	
			5770na 5935na			
0700	0800		USA, WYFR Okeechobee FL	9715va	9930va	
0700	0800	vl	Vanuatu, Radio 4960do	7260da		
0700	0800		Zambia, Radio Christian Voice	9865af		
0706	0800		New Zealand, Radio NZ Intl	9885pa		
0715	0800	mtwhf	Albania, TWR 11865eu			
0715	0800	mtwhf	Monaco, TWR 9870eu			
0720	0800		UK, BBC World Service	6190af	11765af	
			11940af 15400af			
0730	0745		Vatican City, Vatican Radio	4005va	5890va	
			6185va 7250va	9645va	11740va	

			15595va		
0730	0800		Georgia, Radio Georgia	11910eu	
0730	0800	as	Guam, TWR/KTWR 15205as		
0730	0800	as	UK, BBC World Service	15575me	17885af
0730	0800		UK, BBC World Service	11760me	15565me
0740	0800	mtwhf	Guam, TWR/KTWR 15205as		
0745	0800	mtwhf	Guam, TWR/KTWR 11840as		
0755	0800	s	Monaco, TWR 9870eu		

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

0800	0820	smtwhf	Albania, TWR 11865eu		
0800	0820	mtwhfs	Monaco, TWR 9870eu		
0800	0830		Australia, ABC NT Katherine	5025do	
0800	0830		Australia, ABC NT Tennant Creek	4910do	
0800	0830		Malaysia, Voice of 6175as	9750as	
0800	0830		Myanmar, Radio 9730do		
0800	0900		Anguilla, Caribbean Beacon	6090am	
0800	0900		Australia, ABC NT Alice Springs	2310irr	4835do
0800	0900		Australia, HCJB 11750pa		
0800	0900		Australia, Radio 5995pa 9710pa 17750as	9580va 12080va	9590as 15415as 15515va
0800	0900		Canada, CFRX Toronto ON	6070do	
0800	0900		Canada, CFVP Calgary AB	6030do	
0800	0900		Canada, CKZN St John's NF	6160do	
0800	0900		Canada, CKZU Vancouver BC	6160do	
0800	0900		Costa Rica, University Network 7375am 9725sa	5030am 11870sa	6150am
0800	0900		Eqt Guinea, Radio Africa	15184af	
0800	0900		Germany, Deutsche Welle	6140eu	21675af
0800	0900	DRM	Germany, Deutsche Welle	15440af	
0800	0900	vl	Ghana, Ghana BC Corp	3366do	4915do
0800	0900		Guam, TWR/KTWR 15205as		
0800	0900	mtwhf	Guam, TWR/KTWR 11840as		
0800	0900		Guyana, Voice of 3290do	5950do	
0800	0900		Indonesia, Voice of 9525as	11785as	15150al
0800	0900	vl/as	Italy, IRRS 13840va		
0800	0900		Liberia, ELWA 4760do		
0800	0900		Malaysia, Radio Malaysia	7295do	
0800	0900		New Zealand, Radio NZ Intl	9885pa	
0800	0900		Nigeria, Radio Enugu	6025do	
0800	0900		Nigeria, Radio/Ibadan	6050do	
0800	0900		Nigeria, Radio/Kaduna	4770do	6090do
0800	0900		Nigeria, Radio/Lagos	3326do	4990do
0800	0900		Nigeria, Voice of 7255af	17800af	
0800	0900	vl	Pakistan, Radio 17835eu	21465eu	
0800	0900		Papua New Guinea, NBC	4890do	9675irr
0800	0900		Russia, Voice of 17495pa 21790pa	17525pa	17635pa
0800	0900		Sierra Leone, Radio UNAMSIL	6139af	
0800	0900		Singapore, Mediacorp Radio	6150do	
0800	0900	vl	Solomon Islands, SIBC	5020do	9545do
0800	0900		South Korea, Radio Korea Intl	13670eu	
0800	0900		Swaziland, TWR 7205af	9500af	
0800	0900		Taiwan, Radio Taiwan Intl	9610au	
0800	0900		UK, BBC World Service 11955as 15400af 17760as 21660as	6190af 12095eu 15485eu 17790as	11760me 15310as 15575me 17830af 15360as 21470af
0800	0900		USA, Armed Forces Radio 5765usb 12133usb	4319usb 6350usb 12579usb	5446usb 7507usb 13362usb 10320usb 13855usb
0800	0900		USA, KAIJ Dallas TX 5755va		
0800	0900		USA, KNLS Anchor Point AK	11765as	
0800	0900		USA, KTBN Salt Lake City UT	7505na	
0800	0900		USA, KWHR Naalehu HI	11565as	17780as
0800	0900		USA, WBCQ Kennebunk ME	5105na	7415na
0800	0900		USA, WBOH Newport NC	5920am	
0800	0900		USA, WEWN Birmingham AL 7580na	5825na 11875va	7425na
0800	0900		USA, WHRI Noblesville IN	5745am	7315am
0800	0900		USA, WJIE Louisville KY	7490am	13595am
0800	0900		USA, WMLK Bethel PA	9465eu	9955al
0800	0900		USA, WRMI Miami FL	7385am	9955am
0800	0900		USA, WTJC Newport NC	9370na	
0800	0900		USA, WWCR Nashville TN 5770na	3210na 5935na	5070na
0800	0900		USA, WYFR Okeechobee FL	5950af	9930af
0800	0900	vl	Vanuatu, Radio 4960do	7260do	
0800	0900		Zambia, Radio Christian Voice	9865af	
0815	0900	as	Guam, TWR/KTWR 15330as		
0830	0850		Bangladesh, Bangla Betar	7185as	9550as
0830	0900		Australia, ABC NT Katherine	2485do	
0830	0900		Australia, ABC NT Tennant Creek	2325do	
0830	0900		Georgia, Radio Georgia	11910me	
0830	0900		Lithuania, Radio Vilnius	9710eu	
0845	0900	DRM	Netherlands, FEBA 9815eu		

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

0900	0915	vl	Ghana, Ghana BC Corp	3366do	4915do
0900	0929		Czech Rep, Radio Prague Intl	21745va	
0900	0930		Guam, TWR/KTWR 11840as		
0900	1000		Anguilla, Caribbean Beacon	6090am	
0900	1000		Australia, ABC NT Alice Springs	2310do	4835irr
0900	1000		Australia, ABC NT Katherine	2485do	
0900	1000		Australia, ABC NT Tennant Creek	2325do	
0900	1000		Australia, HCJB 11750pa		
0900	1000		Australia, Radio 9580va 12080va	9590as 15415as	11880as
0900	1000		Australia, Voice Intl 11955as	13685as	
0900	1000		Canada, CFRX Toronto ON	6070do	
0900	1000		Canada, CFVP Calgary AB	6030do	
0900	1000		Canada, CKZN St John's NF	6160do	
0900	1000		Canada, CKZU Vancouver BC	6160do	
0900	1000		China, China Radio Intl	15210pa	17690pa
0900	1000		Costa Rica, University Network 7375am 9725sa	5030am 11870am	6150am 13750na
0900	1000		Eqt Guinea, Radio Africa	15184af	
0900	1000	DRM/ m-f	Germany, Deutsche Welle	15440af	17700af
0900	1000		Germany, Deutsche Welle	6140eu	21675af
0900	1000		Guyana, Voice of 3290do	5950do	
0900	1000	v./as	Italy, IRRS 13840va		
0900	1000		Malaysia, Radio Malaysia	7295do	
0900	1000		Malaysia, Voice of 15295as		
0900	1000	DRM	Netherlands, Radio 9815eu		
0900	1000		New Zealand, Radio NZ Intl	9885po	
0900	1000		Nigeria, Radio Enugu	6025do	
0900	1000		Nigeria, Radio/Ibadan	6050do	
0900	1000		Nigeria, Radio/Kaduna	4770do	6090do
0900	1000		Nigeria, Radio/Lagos	3326do	4990do
0900	1000		Nigeria, Voice of 7255af	17800af	
0900	1000	vl	Pakistan, Radio 17835eu	21465eu	
0900	1000		Palau, KHBN 15725as		
0900	1000		Papua New Guinea, NBC	4890do	9675irr
0900	1000		Singapore, Mediacorp Radio	6150do	
0900	1000	vl	Solomon Islands, SIBC	5020do	9545do
0900	1000	s	UAE, Radio UNMEE 21460af		
0900	1000		UK, BBC World Service 9740as 11760me 15360as 17760as	6195as 12095eu 15485eu 17790as	9605as 15190ca 15310as 15575me 17640me 21660as
0900	1000		USA, Armed Forces Radio 5765usb 12133usb	4319usb 6350usb 12579usb	5446usb 7507usb 13362usb 10320usb 13855usb
0900	1000		USA, KAIJ Dallas TX 5755va		
0900	1000		USA, KTBN Salt Lake City UT	7505na	
0900	1000		USA, KWHR Naalehu HI	11565as	17780as
0900	1000		USA, WBCQ Kennebunk ME	5105na	7415na
0900	1000		USA, WBOH Newport NC	5920am	
0900	1000		USA, WEWN Birmingham AL 11875na	5825na	7425na
0900	1000		USA, WHRA Greenbush ME	11730na	
0900	1000		USA, WHRI Noblesville IN	5745am	7315am
0900	1000		USA, WJIE Louisville KY	7490am	13595am
0900	1000		USA, WRMI Miami FL	7385am	9955am
0900	1000		USA, WTJC Newport NC	9370na	
0900	1000		USA, WWCR Nashville TN 5935na	5070na 9475na	5770na
0900	1000		USA, WYFR Okeechobee FL	5950na	
0900	1000	vl	Vanuatu, Radio 4960do	7260do	
0900	1000		Zambia, Radio Christian Voice	9865af	
0910	0930	s	Armenia, Voice of 4810eu	15270as	
0930	1000		Greece, Voice of 9420eu	15630eu	

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

1000	1029	Germany, Deutsche Welle 17820as	15190as	15350as
1000	1030	Guam, AWR/KSDA 11560as	11930as	
1000	1030	Mongolia, Voice of 12015as		
1000	1030	UK, BBC World Service 9740as 15310as 17790as	6195as 15360as 21660as	9605as 15360cs 17760as
1000	1056	North Korea, Voice of 9850am	3560as 11710as	9335om 11735as
1000	1059	New Zealand, Radio NZ Intl	9885pa	
1000	1100	Anguilla, Caribbean Beacon	11775am	
1000	1100	Australia, ABC NT Alice Springs	2310do	4835irr
1000	1100	Australia, ABC NT Katherine	2485do	
1000	1100	Australia, ABC NT Tennant Creek	2325do	
1000	1100	Australia, HCJB 11750pa		
1000	1100	Australia, Radio 9475as 9560as 12080as	5995pa 9580va	6020pa 6035va 9590as 11880va
1000	1100	Australia, Voice Intl 11955as	13685as	

1000	1100		Canada, CFRX Toronto ON	6070do		
1000	1100		Canada, CFVP Calgary AB	6030do		
1000	1100		Canada, CKZN St John's NF	6160do		
1000	1100		Canada, CKZU Vancouver BC	6160do		
1000	1100		China, China Radio Intl	6040am		
1000	1100		Costa Rica, University Network	5030am	6150am	
			7375am	9725sa	11870am	13750na
1000	1100		Eqt Guinea, Radio Africa	15184af		
1000	1100	DRM/ m-f	Germany, Deutsche Welle	15440eu	17700eu	
1000	1100		Guyana, Voice of 3290do	5950do		
1000	1100		India, All India Radio	13695as	15020as	
			15260as	15410as	17510au	17800as
			17895as			
1000	1100	vl/as	Italy, IRRS	13840va		
1000	1100		Japan, Radio	6120ca	9695as	11730as
			17585eu	17720va	21755va	
1000	1100		Malaysia, Radio Malaysia	7295do		
1000	1100		Malaysia, Voice of	15295as		
1000	1100	DRM	Netherlands, Radio	9815eu		
1000	1100		Netherlands, Radio	9785au	12065as	13710as
			13820as			
1000	1100		Nigeria, Voice of	7255af	17800af	
1000	1100		Palau, KHBN	15725as		
1000	1100		Papua New Guinea, NBC	4890do	9675irr	
1000	1100		Singapore, Mediacorp Radio	6150do		
1000	1100	vl	Solomon Islands, SIBC	5020do	9545do	
1000	1100		South Africa, Channel Africa	11825af		
1000	1100		UK, BBC World Service	6190af	11940af	
			12095eu	15485eu	17885af	21470af
1000	1100	as	UK, BBC World Service	15190ca	15400af	
			17830af			
1000	1100	DRM/ m	UK, Christian Voice	9760eu		
1000	1100		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1000	1100		USA, KAIJ Dallas TX	5755va		
1000	1100		USA, KTBN Salt Lake City UT	7505na		
1000	1100		USA, KWHR Naalehu HI	9930as	11565as	
1000	1100		USA, WBCQ Kennebunk ME	5105na		
1000	1100		USA, WBOH Newport NC	5920am		
1000	1100		USA, WEWN Birmingham AL	7425na	7520na	
			11875na			
1000	1100		USA, WHRI Noblesville IN	9495am	9850am	
1000	1100		USA, WINB Red Lion PA	9320am		
1000	1100		USA, WJIE Louisville KY	7490am	13595am	
1000	1100		USA, WRMI Miami FL	7385am	9955am	
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WWCR Nashville TN	5070na	5770no	
			5935na	15825na		
1000	1100		USA, WYFR Okeechobee FL	5950na	9755sa	
1000	1100	vl	Vanuatu, Radio	4960do	7260do	
1000	1100		Zambia, Radio Christian Voice	9865af		
1000	1104	vl	Pakistan, Radio	17835eu	21465eu	
1010	1020		Israel, Kol Israel	15640va	17535va	
1015	1100		Guom, TWR/KTWR	9865as		
1030	1045	mtwhf	Ethiopia, Radio	5990do	7110do	9704do
1030	1057		Czech Rep, Radio Prague Intl	9880eu	11615eu	
1030	1100	mt hfa	Guam, AWR/KSDA	11900as		
1030	1100		Iran, Voice of the Islamic Rep	15600as	17660as	
1030	1100		UAE, Radio Dubai	13675va	15370va	15395va
			21605eu			
1030	1100	t	UAE, Radio UNMEE	21550af		
1030	1100		UK, BBC World Service	6195as	9740as	
			15310as	17760as	17790as	
1030	1100		Vatican City, Vatican Radio	5890eu		

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

1100	1115	mtwhfa.vl	Vanuatu, Radio	4960do	7260do	
1100	1128		Vietnam, Voice of	7285as		
1100	1130		Iran, Voice of the Islomic Rep	15600as	17660as	
1100	1130		Tibet, Xizang PBS	4920as	6110as	9490as
1100	1130	t	UAE, Radio UNMEE	21550af		
1100	1130		UK, BBC World Service	6190af	6195ca	
			11940af	15190ca	15400af	17790ca
			17830af	17885af	21470af	
1100	1159		Germany, Deutsche Welle	15105as	17820as	
			21650as	21820as		
1100	1200		Anguilla, Caribbean Beacon	11775am		
1100	1200		Australia, ABC NT Alice Springs	2310do	4835irr	
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek	2325do		
1100	1200		Australia, Radio	5995pa	6020pa	6035va
			9475as	9560as	9590va	9590as	11880va
			12080as			
1100	1200		Australia, Voice Intl	13685as		
1100	1200		Canada, CFRX Toronto ON	6070do		
1100	1200		Canada, CFVP Calgary AB	6030do		
1100	1200		Canada, CKZN St John's NF	6160do		
1100	1200		Canada, CKZU Vancouver BC	6160do		
1100	1200		China, China Radio Intl	6040am	11750am	
1100	1200		Costa Rica, University Network	5030am	6150am	
			7375am	9725sa	11870am	13750na
1100	1200		Ecuador, HCJB	12005va	21455am	
1100	1200	DRM	Germany, Deutsche Welle	15440eu		
1100	1200	s	Germony, Overcomer Ministries	6110eu		
1100	1200	vl/os	Italy, IRRS	13840va		
1100	1200	f	Italy, IRRS	15665af		
1100	1200		Japan, Radio	6120na	9695as	11730as
			17585eu			
1100	1200		Malaysia, Radio Malaysia	7295do		
1100	1200		Malaysia, Voice of	15295as		
1100	1200		Netherlands, Radio	11675na		
1100	1200		New Zealand, Radio NZ Intl	9885pa		
1100	1200		Papua New Guinea, NBC	4890do	9675irr	
1100	1200		Singapore, Radio Singapore Intl	6080as	6150as	
1100	1200		South Africa, Channel Africa	11825af		
1100	1200		Taiwan, Radio Taiwan Intl	7445as		
1100	1200		UK, BBC World Service	6195as	9740as	
			12095eu	15310as	15485eu	17760as
			17790as			
1100	1200		Ukraine, Radio Ukraine Intl	15415eu		
1100	1200		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1100	1200		USA, KAIJ Dallas TX	5755va		
1100	1200		USA, KTBN Salt Lake City UT	7505na		
1100	1200		USA, KWHR Naalehu HI	9930as	11565as	
1100	1200		USA, WBCQ Kennebunk ME	5105na		
1100	1200		USA, WBOH Newport NC	5920am		
1100	1200		USA, WEWN Birmingham AL	7425na	7520na	
			11875na			
1100	1200		USA, WHRI Noblesville IN	9495am	9850am	
1100	1200		USA, WINB Red Lion PA	9320am		
1100	1200		USA, WJIE Louisville KY	7490am	13595am	
1100	1200		USA, WRMI Miami FL	7385am	9955am	
1100	1200		USA, WTJC Newport NC	9370na		
1100	1200		USA, WWCR Nashville TN	5070na	5770na	
			5935na	15825na		
1100	1200		USA, WYFR Okeechobee FL	5850na	5950na	
			6015na	7355na	9755na	11855na
1100	1200		Zambia, Radio Christian Voice	9865af		
1101	1200		Germany, Overcomer Ministries	9485eu	11950eu	
			13650eu	15235me	15265me	17590af
			17735as	21590af	21760af	
1130	1200		Belgium, Radio Vlaanderen Intl	9940as		
1130	1200		Bulgaria, Radio	11700eu	15700eu	
1130	1200	vl/as	Germany, Bible Voice Broodcasting			12065 aas
1130	1200		UK, BBC World Service	6190af	6195ca	
			11940af	15190ca	17830af	17885af
			21470af			
1130	1200	f	Vatican City, Vatican Radio	15595va	17515va	
1145	1155		Rwanda, Radio	6055do		

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

1200	1215	vl	Cambodia, National Radio Of	11940as		
1200	1230		France, Radio France Intl	17815af	25820af	
1200	1230		Malaysia, Voice of	15295as		
1200	1230		UAE, AWR Africa	15135as		
1200	1230		Uzbekistan, Radio Toshkent Intl	5060as	5975as	
			6025as	9715as		
1200	1245	vl/mtwhf	Germany, Bible Voice Broodcasting			12065as
1200	1259		Canada, Radio Canada Intl	9515am	9660as	
			13655am	15190as	17800am	
1200	1259		New Zealand, Radio NZ Intl	9885pa		
1200	1259		Poland, Radio Polonia	9525eu	11820eu	
1200	1300		Anguilla, Caribbean Beacon	11775am		
1200	1300		Australia, ABC NT Alice Springs	2310do	4835irr	
1200	1300		Australia, ABC NT Katherine	2485do		
1200	1300		Australia, ABC NT Tennant Creek	2325do		
1200	1300		Australia, Radio	5995pa	6020pa	6035va
			9475as	9560as	9590as	11880as	
1200	1300		Australia, Voice Intl	13685as		
1200	1300		Canada, CBC Northern Service	9625do		
1200	1300		Canada, CFRX Toronto ON	6070do		
1200	1300		Canada, CFVP Calgary AB	6030do		
1200	1300		Canada, CKZN St John's NF	6160do		
1200	1300		Canada, CKZU Vancouver BC	6160do		
1200	1300		China, China Radio Intl	9730as	11760pa	
			11900pa	11980as	15415pa	
1200	1300		Costa Rico, University Network	9725am	11870am	
			13750am			
1200	1300		Ecuador, HCJB	12005va	21455am	
1200	1300	DRM	Germany, Deutsche Welle	9655eu	15440eu	
1200	1300		Malaysia, Radio Malaysia	7295do		
1200	1300	DRM	Netherlands, Radio	9815eu		
1200	1300		Papua New Guinea, NBC	4890do	9675irr	

Shortwave Guide

1200	1300		Singapore, Radio Singapore Intl	6080as	6150as	
1200	1300		South Korea, Radio Korea Intl	9650ca		
1200	1300		Taiwan, Radio Taiwan Intl	7130as		
1200	1300		UK, BBC World Service	6195va	9740as	
			12095eu	15190ca	15310as	15485eu
			17760as	17790as		
1200	1300		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1200	1300		USA, KAIJ Dallas TX	13815va		
1200	1300		USA, KTBN Salt Lake City UT	7505na		
1200	1300		USA, KWHR Naalehu HI	9930as	11565as	
1200	1300		USA, KWHR Naalehu HI	9930as	11565as	
1200	1300		USA, Voice of America	6160va	9645va	
			9760va	15240va		
1200	1300		USA, WBCQ Kennebunk ME	9330na	17495na	
1200	1300		USA, WBOH Newport NC	5920am		
1200	1300		USA, WEWN Birmingham AL	7425na	7520na	
			9355na	13615na		
1200	1300		USA, WHRI Noblesville IN	9495am	9850am	
1200	1300		USA, WINB Red Lion PA	13570am		
1200	1300		USA, WJIE Louisville KY	7490am	13595am	
1200	1300		USA, WRMI Miami FL	9955am	15725am	
1200	1300		USA, WTJC Newport NC	9370na		
1200	1300		USA, WWCR Nashville TN	7465na	9985na	
			13845na	15825na		
1200	1300		USA, WWRB Manchester TN	9320na	12170na	
1200	1300		USA, WYFR Okeechobee FL	5850na	5950na	
			6015na	13695na	17750na	
1200	1300		Zambia, Radio Christian Voice	9865af		
1215	1230	as	India, TWR	7560as		
1215	1300		Egypt, Radio Cairo	17670as		
1230	1258		Vietnam, Voice of	9840va	12020va	
1230	1300		Australia, HCJB	15405pa		
1230	1300		Sri Lanka, SLBC	6005as	11930as	15745as
1230	1300		Sweden, Radio	13580va	15240na	15735va
1230	1300		Thailand, Radio	9855va		
1230	1300		Turkey, Voice of	15255va	15405eu	
1230	1300	a	UK, Wales Radio Intl	17745au		
1240	1255		Greece, Voice of	9420va	9690va	15630va
			15650va			

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

1300	1320		Turkey, Voice of	15255va	15405eu	
1300	1329		Czech Rep, Radio Prague Intl	13580eu	21745af	
1300	1330		Australia, HCJB	15405pa		
1300	1330	DRM	Canada, Radio Canada Intl	9815eu		
1300	1330		Ecuador, HCJB	12005va	21455am	
1300	1330		Egypt, Radio Cairo	17670as		
1300	1356		North Korea, Voice of	4405as	7505eu	
			9325na	9335eu	11335am	11710am
1300	1356		Romania, Radio Romania Intl	11830eu	15105eu	
1300	1400		Anguillo, Caribbean Beacon	11775am		
1300	1400		Australia, Radio	5995pa	6020pa	9475as
			9560as	9580va	11660as	
1300	1400		Canada, CBC Northern Service	9625do		
1300	1400		Canada, CFRX Toronto ON	6070do		
1300	1400		Canada, CFVP Calgary AB	6030da		
1300	1400		Canada, CKZN St John's NF	6160do		
1300	1400		Canada, CKZU Vancouver BC	6160do		
1300	1400		Canada, Radio Canada Intl	9515am	13655am	
			17800sa			
1300	1400		China, China Rodio Intl	7405am	9570am	
			11980as	13680am	15180as	
1300	1400		Costa Rica, University Network	9725am	11870am	
			13750am			
1300	1400	DRM	Germany, Deutsche Welle	9655eu	15440eu	
1300	1400		Germany, Deutsche Welle	6140eu		
1300	1400		Germany, Overcomer Ministries	6110eu	13810me	
1300	1400		Jordan, Radio	11690eu		
1300	1400		Malaysia, Radio Malaysio	7295do		
1300	1400		New Zealand, Radio NZ Intl	6095pa		
1300	1400		Papuo New Guinea, NBC	4890do	9675irr	
1300	1400		Singopore, Radio Singapore Intl	6080as	6150as	
1300	1400		South Korea, Radio Korea Intl	9570as	9700as	
1300	1400		Sri Lanka, SLBC	6005as	11930as	15745cs
1300	1400		UK, BBC World Service	6190af	6195va	
			9740as	11940af	12095eu	15190af
			15310as	15420af	15485eu	17760as
			17790as	17830af	17885af	21470af
1300	1400		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1300	1400		USA, KJES Vado NM	11715na		
1300	1400		USA, KNLS Anchor Point AK	11870as		
1300	1400		USA, KTBN Salt Lake City UT	7505na		
1300	1400		USA, KWHR Naalehu HI	9930as	11565as	
1300	1400		USA, Voice of America	9645va	9760va	
1300	1400		USA, WBCQ Kennebunk ME	9330na	17495na	
1300	1400		USA, WBOH Newport NC	5920am		
1300	1400		USA, WEWN Birmingham AL	7425na	7520na	
			9355na	13615na		
1300	1400		USA, WHRA Greenbush ME	17560na		
1300	1400		USA, WHRI Noblesville IN	9850am	15105am	
1300	1400		USA, WINB Red Lion PA	13570am		
1300	1400		USA, WJIE Louisville KY	7490am	13595am	
1300	1400		USA, WRMI Miami FL	9955am	15725am	
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WWCR Nashville TN	7465na	9985na	
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	9320na	12170na	
1300	1400		USA, WYFR Okeechobee FL	11560na	11830na	
			11865as	11970as	13695na	17750na
1300	1400		Zambia, Radio Christian Voice	9865af		
1305	1315	mtwhfa	Turkmenistan, Turkmen Radio	5015as		
1305	1330	as	Austria, Radio Austria Intl	6155eu	13730eu	
			17855va			
1315	1320	mtwhf	Austria, Radio Austria Intl	6155as	13730va	
			17855va			
1315	1330	a	Russia, TWR	9485eu		
1330	1400	s	Australia, HCJB	15405as		
1330	1400		Guam, AWR/KSDA	11980as		
1330	1400	mtwhfa	Guam, AWR/KSDA	15275as		
1330	1400		India, All India Radio	9690as	11620as	
			13710as			
1330	1400		Laos, National Radio	7145as		
1330	1400	DRM	Netherlands, Radio	9815eu		
1330	1400		Sweden, Radio	15240na	15735va	
1330	1400		UAE, Radio Dubai	13630eu	13675eu	15395eu
			21605eu			
1330	1400		Uzbekistan, Radio Tashkent Intl	5060as	5975as	
			6025as			
1335	1345	as	Austria, Radio Austria Intl	6155eu	13730eu	
			17855va			
1345	1400	mtwhf	Austria, Radio Austria Intl	17855as		

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

1400	1415		Russia, FEBA	9495as		
1400	1415		Seychelles, FEBA	9495as		
1400	1430		Thailand, Radio	9830as		
1400	1459	as	Canada, Radio Canada Intl	9515as		
1400	1500		Anguilla, Caribbean Beacon	11775am		
1400	1500		Australia, Radio	5995pa	6080pa	7260as
			9475as	9590as	11660as	11750as
1400	1500		Canada, CBC Northern Service	9625do		
1400	1500		Canada, CFRX Toronto ON	6070do		
1400	1500		Canada, CFVP Calgary AB	6030da		
1400	1500		Canada, CKZN St John's NF	6160do		
1400	1500		Canada, CKZU Vancouver BC	6160do		
1400	1500		China, China Radio Intl	7405am	11675as	
			11765as	13685af	13680am	15125af
1400	1500		Costa Rica, University Network	9725am	11870am	
			13750am			
1400	1500		France, Radio France Intl	7175as	9580as	
			11610as	17515as	17620as	
1400	1500	vl/h	Germany, Bible Voice Broadcasting		17485as	
1400	1500		Germany, Deutsche Welle	6140eu		
1400	1500		Germany, Overcomer Ministries	6110eu	13810me	
			17550as	21590sa		
1400	1500		Germany, Pan American BC	15650eu		
1400	1500		India, All India Radio	9690as	11620as	
			13710as			
1400	1500		Japan, Radio	7200as	11730as	11840pa
1400	1500		Jordan, Radio	11690eu		
1400	1500		Netherlands, Radio	9890as	11835as	12075as
1400	1500		New Zealand, Radio NZ Intl	6095pa		
1400	1500		Oman, Radio	15140eu		
1400	1500	DRM	Russia, Voice of	15780vo		
1400	1500		Russia, Voice of	7390as	9745as	12055as
			15780as	17645as		
1400	1500		Singapore, Mediocorp Radio	6150da		
1400	1500		South Africa, Channel Africa	11825af		
1400	1500		Sri Lanka, SLBC	6005as	11930as	15745as
1400	1500		Taiwan, Radio Taiwan Intl	15265as		
1400	1500		UK, BBC World Service	6190af	6195as	
			7105as	9740as	11940af	12095eu
			15190ca	15310as	15485eu	15565me
			15575me	17790as	17830af	17885af
			21470af	21660af		
1400	1500		USA, Armed Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KTBN Salt Lake City UT	7505na	15590na	
1400	1500		USA, KWHR Naalehu HI	9930as	11565as	
1400	1500		USA, Voice of America	6160va	7125va	

			9760va	15160va	15425va	
1400	1500		USA, WBCQ Kennebunk ME 17495na		7415na	9330na
1400	1500		USA, WBOH Newport NC		5920am	
1400	1500		USA, WEWN Birmingham AL 9355na	9955na	7425na	7520na
1400	1500		USA, WHRA Greenbush ME		15745na	
1400	1500		USA, WHRI Noblesville IN		17560na	
1400	1500		USA, WINB Red Lion PA		9850am	15105am
1400	1500		USA, WJIE Louisville KY		13570am	
1400	1500		USA, WRMI Miami FL		7490am	13595am
1400	1500		USA, WTJC Newport NC		7385am	15725am
1400	1500		USA, WWCR Nashville TN 13845na	15825na	9370na	
1400	1500		USA, WWRB Manchester TN		7465na	9985na
1400	1500		USA, WYFR Okeechobee FL 11970na	17750na	9320na	12170na
1400	1500		Zambia, Radio Christian Voice		11560na	11830as
1415	1430		Nepal, Radio 3230as 7165as	5005as	9865af	6100as
1430	1500	vl/a	Germany, Bible Voice Broadcasting			5945as
1430	1500	vl/s	Germany, Bible Voice Broadcasting			17485as
1430	1500		Myanmar, Radio 5040do	5985do		

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

1500	1528		Vietnam, Voice of 7285va	9840va	12020va	
1500	1530	vl/s	Germany, Bible Voice Broadcasting		17485as	
1500	1530		Hungary, Radio Budapest		6025eu	9715eu
1500	1530		Mongolia, Voice of 9720eu			
1500	1530		Sri Lanka, SLBC 6005as	11930as	15745as	
1500	1530		UK, BBC World Service		6190af	11860af
			11940af 15400af	15420af	17830af	
			21470af 21490af	21660af		
1500	1556		North Korea, Voice of		4405eu	7505eu
			9325am 9335eu	11335am	11710am	
1500	1557		Canada, Radio Canada Intl		15455as	17720as
1500	1559		Canada, Radio Canada Intl 17800am		9515am	13655am
1500	1600		Anguilla, Caribbean Beacon		11775am	
1500	1600		Australia, Radio 5995pa	6080pa	7260as	
			9475as 9590as	11660as	11750as	
1500	1600		Canada, CBC Northern Service		9625do	
1500	1600		Canada, CFRX Toronto ON		6070do	
1500	1600		Canada, CFVP Calgary AB		6030do	
1500	1600		Canada, CKZN St John's NF		6160do	
1500	1600		Canada, CKZU Vancouver BC		6160do	
1500	1600		China, China Radio Intl		7160as	9785as
			13685af 13740am		15125af	
1500	1600		Costa Rica, University Network 13750am		9725am	11870am
1500	1600		Germany, Deutsche Welle		6140eu	
1500	1600		Germany, Overcomer Ministries 21590sa		6110eu	13810me
1500	1600		Germany, Pan American BC		15650me	
1500	1600		Guam, TWR/KTWR 12105as			
1500	1600		Japan, Radio 6190as 11730va		7200am	9505as
1500	1600		Jordan, Radio 11690na			
1500	1600		Myanmar, Radio 5040do		5985do	
1500	1600		New Zealand, Radio NZ Intl		6095pa	
1500	1600		Russia, FEBA 7350as			
1500	1600		Russia, Voice of 4940me		4965me	4975me
			7325me 7390as		11500as	11985me
1500	1600		Seychelles, FEBA 7350as			
1500	1600		Singapore, Mediacorp Radio		6150do	
1500	1600		South Africa, Channel Africa		17770af	
1500	1600		UK, BBC World Service		5975as	6195as
			7105as 9740as	12095eu	15190ca	15310as
			15485eu	15565me	17790as	
1500	1600		USA, Armed Forces Radio		4319usb	5446usb
			5765usb 6350usb		7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1500	1600		USA, KJES Vado NM		11715na	
1500	1600		USA, KTBN Salt Lake City UT		15590na	
1500	1600		USA, KWHR Naalehu HI		9930as	11565as
1500	1600		USA, Voice of America		6160af	7125va
			9590af 9760af	9845af	12040af	15550af
1500	1600		USA, WBCQ Kennebunk ME 17495na		7415na	9330na
1500	1600		USA, WBOH Newport NC		5920am	
1500	1600		USA, WEWN Birmingham AL 15745na		9955na	11530na
1500	1600		USA, WHRA Greenbush ME		17650na	
1500	1600		USA, WHRI Noblesville IN		13760am	15105am
1500	1600		USA, WINB Red Lion PA		13570am	
1500	1600		USA, WJIE Louisville KY		7490am	13595am
1500	1600		USA, WRMI Miami FL		7385am	15725am
1500	1600		USA, WTJC Newport NC		9370na	
1500	1600		USA, WWCR Nashville TN 13845na	15825na	9475na	12160na
1500	1600		USA, WWRB Manchester TN		9320na	12170na
1500	1600		USA, WYFR Okeechobee FL 17750na		6280na	11830na
1500	1600		Zambia, Radio Christian Voice		9865af	
1515	1530		Vatican City, Vatican Radio 15235va		12065va	13765va
1515	1600	vl/s	Germany, Bible Voice Broadcasting			15680me
1530	1545		India, All India Radio		9910as	
1530	1550		Vatican City, Vatican Radio 15235va		12065va	13765va
1530	1600		Georgia, Radio Georgia		6180me	
1530	1600		Germany, Bible Voice Broadcasting			17510eu
1530	1600		Iran, Voice of the Islamic Rep		9635as	11650as
1530	1600		UAE, AWR Africa 15225as			
1530	1600		UK, BBC World Service		6190af	11940af
			15400af 17830af		21470af	21660af
1545	1600	vl/mtwhfa	Germany, Bible Voice Broadcasting			15680me

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

1600	1615	vl/mtwf	Germany, Bible Voice Broadcasting			15680me
1600	1615		Pakistan, Radio 11570va 15725va	11850va	15100va	
1600	1627		Czech Rep, Radio Prague Intl		5930eu	17485af
1600	1628		Vietnam, Voice of 7220as 13740va		9550as	11630va
1600	1630		Guam, AWR/KSDA 15235as			
1600	1630		Iran, Voice of the Islamic Rep		9635as	11650as
1600	1630		UK, BBC World Service		6190af	11940af
			15400af	17830af	21470af	21660af
1600	1635		UAE, Radio Dubai 13630am 21605eu		13675eu	15395eu
1600	1645	vl/h	Germany, Bible Voice Broadcasting			15680me
1600	1656		North Korea, Voice of 11735af		3560as	9975af
1600	1659		Germany, Deutsche Welle 17595as		6170as	7225as
1600	1700		Anguilla, Caribbean Beacon		11775am	
1600	1700		Australia, Radio 5995pa	6080pa	7220as	
			7260as 9475as	11660as		
1600	1700		Canada, CBC Northern Service		9625do	
1600	1700		Canada, CFRX Toronto ON		6070do	
1600	1700		Canada, CFVP Calgary AB		6030do	
1600	1700		Canada, CKZN St John's NF		6160do	
1600	1700		Canada, CKZU Vancouver BC		6160do	
1600	1700		China, China Radio Intl		9570af	11900af
1600	1700		Costa Rica, University Network		11870am	13750am
1600	1700		Ethiopia, Radio 5990af		7110af	7165af
			9560af 9704af	11800af		
1600	1700		France, Radio France Intl		6010af	6170af
			9730af 11615af	15160af	15605af	
1600	1700	DRM	Germany, Deutsche Welle		6140eu	
1600	1700	a	Greece, Voice of 7475eu 17705na		9420na	15630na
1600	1700		Jordan, Radio 11690na			
1600	1700		New Zealand, Radio NZ Intl		6095pa	
1600	1700		Russia, Voice of 5945me		7320as	11985af
			11985me	12055va		
1600	1700		South Korea, Radio Korea Intl		5975va	9870va
1600	1700		Taiwan, Radio Taiwan Intl		11550as	
1600	1700		UK, BBC World Service		3915as	5975as
			6195as 7160as	9410va	12095va	15190ca
			15310as	15485eu	15565me	17790as
1600	1700		USA, Armed Forces Radio		4319usb	5446usb
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1600	1700		USA, KTBN Salt Lake City UT		15590na	
1600	1700		USA, KWHR Naalehu HI		9930as	
1600	1700		USA, Voice of America		6160va	7125va
			9700va	9760va	9850af	12080af
			13600af	15205af	15225af	15255va
			15410af	15580af	17895af	
1600	1700		USA, WBCQ Kennebunk ME		9330na	17495na
1600	1700		USA, WBOH Newport NC		5920am	
1600	1700		USA, WEWN Birmingham AL 15745va		11530va	13615va
1600	1700		USA, WHRA Greenbush ME		17650na	
1600	1700		USA, WHRI Noblesville IN		13760am	15105am
1600	1700		USA, WINB Red Lion PA		13570am	
1600	1700		USA, WJIE Louisville KY		7490am	13595am
1600	1700		USA, WMLK Bethel PA		9465eu	15265al
1600	1700		USA, WRMI Miami FL		9955am	15725am
1600	1700		USA, WTJC Newport NC		9370na	
1600	1700		USA, WWCR Nashville TN 13845na	15825na	9475na	12160na
1600	1700		USA, WWRB Manchester TN		9320na	12170na
1600	1700		USA, WYFR Okeechobee FL		6085as	6280na

			11830na	11865na	15130eu	17750eu
			18980eu	21455va	21525va	
1600	1700		Zambia, Radio Christian Voice		4965af	
1605	1620	as	Austria, Radia Austria Intl		17865ca	
1610	1625	mtwhf	Austria, Radia Austria Intl		17865ca	
1615	1630		Vatican City, Vatican Radio		15595va	
1630	1700		Egypt, Radio Cairo	9855af		
1630	1700		Guam, AWR/KSDA	11975as	15235as	
1630	1700		UK, BBC World Service		6190af	11940af
			15400af	15420af	17830af	21470af
			21660af			
1630	1700	as	UK, BBC World Service		11860af	21490af
1635	1650	as	Austria, Radio Austria Intl		17865ca	
1640	1650	mtwhfa	Turkmenistan, Turkmen Radio		4930as	
1640	1655	mtwhf	Austria, Radio Austria Intl		17865ca	
1645	1700		Tajikistan, Radio	7245irr		

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

1700	1715	vl/t	Germany, Bible Voice Broadcasting			15680me
1700	1715		Israel, Kol Israel	11605va	15640va	17535vo
1700	1727		Czech Rep, Radio Prague Intl		5930eu	17485af
1700	1728		Vietnam, Voice of	9725au		
1700	1730		France, Radio France Intl		15605af	17605af
1700	1745		UK, BBC World Service		3255af	6005af
			6190af 9630af	15400af	15420af	17830af
			21470af			
1700	1759		Poland, Radio Polonia		7265eu	7285eu
1700	1800		Anguilla, Coribbean Beocon		11775am	
1700	1800		Australia, Radio	5995pa	6080pa	7220as
			7260as 9475as	11880as		
1700	1800		Canada, CBC Northern Service		9625do	
1700	1800		Canada, CFRX Toronto ON		6070do	
1700	1800		Canada, CFVP Calgary AB		6030do	
1700	1800		Canada, CKZN St John's NF		6160do	
1700	1800		Canada, CKZU Voncouver BC		6160do	
1700	1800		China, China Radio Intl		9570af	11900af
1700	1800		Costa Rica, University Network		11870am	13750am
1700	1800		Egypt, Radio Cairo	9855af		
1700	1800		Eqt Guinea, Radio Africa		7189af	15184al
1700	1800	vl/wfa	Germany, Bible Voice Broadcasting			15680me
1700	1800	as	Germany, Bible Voice Broadcasting			15235me
1700	1800	DRM	Germany, Deutsche Welle		6140eu	
1700	1800		Germany, Radio Africa Intl		13820af	15715af
			17550af			
1700	1800		Japan, Radio	9535am	11970eu	15355af
1700	1800		New Zealand, Radio NZ Intl		6095pa	
1700	1800		Russia, Voice of	7350as	9890eu	11510af
			11675af	11985af		
1700	1800	DRM/as	Russia, Voice of	11675eu		
1700	1800		South Africa, Channel Africa		15245af	
1700	1800	DRM	Sweden, Radio	5955eu		
1700	1800		Taiwan, Radio Taiwan Intl		11550as	
1700	1800		UK, BBC World Service		3915as	5975as
			6195as 7160as	9410eu	9510as	12095vo
			15310as	15485eu	15565me	
1700	1800		USA, Armed Forces Radio		4319usb	5446usb
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1700	1800		USA, KTBN Salt Lake City UT		15590na	
1700	1800		USA, KWHR Naalehu HI		9930as	
1700	1800		USA, Voice of America		6020va	6160va
			7125va	9640va	9700vo	9760va
			9850af 15255va	15410af	15580af	
1700	1800		USA, WBCQ Kennebunk ME		9330na	17495no
1700	1800		USA, WBOH Newport NC		5920am	
1700	1800		USA, WEWN Birmingham AL		11530va	13615va
			15685va	15745va		
1700	1800		USA, WHRA Greenbush ME		17650na	
1700	1800		USA, WHRI Noblesville IN		9495am	13760am
1700	1800		USA, WINB Red Lion PA		13570am	
1700	1800		USA, WJIE Louisville KY		7490am	13595am
1700	1800		USA, WMLK Bethel PA		9465eu	15265al
1700	1800		USA, WRMI Miami FL		9955am	15725am
1700	1800		USA, WTJC Newport NC		9370na	
1700	1800		USA, WWCR Nashville TN		9475no	12160no
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN		9320na	12170no
1700	1800		USA, WYFR Okeechobee FL		17795eu	18980eu
			21455eu			
1700	1800		Zambia, Radio Christion Voice		4965af	
1715	1730		Vaticon City, Vatican Radio		4005va	5890va
			7250va	9645va	15595va	
1730	1740	vl	Libya, Voice of Africa		17635af	17695af
1730	1745	mtwhf	UK, United Nations Radio		7170af	15495me
			17810af			
1730	1800		Belgium, Radio Vlaanderen Intl		9925eu	11640eu
1730	1800		Bulgaria, Radio	9500eu	11500eu	
1730	1800		Georgia, Radio Georgia		11910eu	
1730	1800		Guam, AWR/KSDA	9385me		
1730	1800		Liberia, ELWA	4760do		
1730	1800	vl	Philippines, Radio Pilipinas		11720me	15190me
			17720me			
1730	1800		Swaziland, TWR	3200af	9500af	
1730	1800	mtwhfa	Sweden, Radio	6065eu		
1730	1800	mtwhf	USA, Voice of America		11975af	17895af
1730	1800		Vatican City, Vatican Radio		13765af	15570af
			17515af			
1735	1745	vl/th	Paraguay, Radio Nacional		9739sa	
1745	1755	mtwhfa	Turkmenistan, Turkmen Radio		4930as	
1745	1800		Bangladesh, Bangla Betar		7185eu	9550eu
			15520eu			
1745	1800		India, All India Radio		7410eu	9445af
			9950eu	11620eu	11935af	13605af
			15075af	15155af	17670af	
1745	1800		UK, BBC World Service		3255af	6190af
			15400af	15420af	17830af	21470af

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

1800	1810		Zanzibar, Voice of Tanzania		11734do	
1800	1828		Vietnam, Voice of	11630va	13740va	
1800	1830		Egypt, Radio Cairo	9855af		
1800	1830	s	Germany, Universal Life		15675af	
1800	1830		South Africa, AWR Africa		3215af	3345af
			12130af			
1800	1830		UK, BBC World Service		3255af	5975as
			6190af 6195eu	9410eu	9510as	12095me
			15310me	15400af	15420af	17830af
			21470af			
1800	1845	vl/h	Germany, Bible Voice Broadcasting			13710me
1800	1850		New Zealand, Radio NZ Intl		6095pa	
1800	1856		Romania, Radio Romania Intl		11940eu	15380eu
1800	1859		Canada, Radio Canada Intl		9530af	11770af
			13730af	15255as		
1800	1859		Germany, Radio Africa Intl		13820af	15715af
			17550af			
1800	1900		Anguilla, Caribbean Beacon		11775am	
1800	1900	mtwhf	Argentina, RAE	9690eu	15345eu	
1800	1900		Australia, Radio	6080pa	7220as	7240va
			7260as 9475as	11880as		
1800	1900		Australia, Voice Intl	6115as		
1800	1900		Bangladesh, Bangla Betar		7185eu	9550eu
			15520eu			
1800	1900		Canada, CBC Northern Service		9625do	
1800	1900		Canada, CFRX Toronto ON		6070do	
1800	1900		Canada, CFVP Calgary AB		6030do	
1800	1900		Canada, CKZN St John's NF		6160do	
1800	1900		Canada, CKZU Vancouver BC		6160do	
1800	1900		Costa Rica, University Network		11870am	13750am
1800	1900		Eqt Guinea, Radio Africa		7189af	15184al
1800	1900	vl/os	Germany, Bible Voice Broadcasting			5970eu
			11965as	13710me		
1800	1900	s	Greece, Voice of	7475va	9420va	15630va
			17705va			
1800	1900		India, All India Radio		7410eu	9445af
			9950eu	11620eu	11935af	13605af
			15075af	15155af	17670af	
1800	1900		Latvia, Laser Radio	9290eu		
1800	1900		Liberia, ELWA	4760do		
1800	1900		Netherlands, Radio	6020af	9895af	11655af
1800	1900	v	Philippines, Radio Pilipinas		11720me	15190me
			17720me			
1800	1900		Russia, Voice of	9480af	9745eu	9820eu
			11510eu			
1800	1900		Sierra Leone, Radio UNAMSIL		6139af	
1800	1900		Swaziland, TWR	3200af	9500af	
1800	1900		Taiwan, Radio Taiwan Intl		3965eu	
1800	1900		USA, Armed Forces Radio		4319usb	5446usb
			5765usb	6350usb	7507usb	10320usb
			12133usb	12579usb	13362usb	13855usb
1800	1900		USA, KJES Vado NM		15385na	
1800	1900		USA, KTBN Salt Lake City UT		15590na	
1800	1900		USA, Voice of America		6040va	9760vo
			9770va	9850af	11975af	15410af
			15580af	17895af		
1800	1900		USA, WBCQ Kennebunk ME		9330na	17495na
1800	1900		USA, WBOH Newport NC		5920am	
1800	1900		USA, WEWN Birmingham AL		11530vo	13615va
			15685va	15745va		
1800	1900		USA, WHRA Greenbush ME		17650na	
1800	1900		USA, WHRI Noblesville IN		9495am	13760am
1800	1900		USA, WINB Red Lion PA		13570am	
1800	1900		USA, WJIE Louisville KY		7490am	13595am
1800	1900		USA, WMLK Bethel PA		9465eu	15265al
1800	1900		USA, WRMI Miami FL		9955am	15725am
1800	1900		USA, WTJC Newport NC		9370na	
1800	1900		USA, WWCR Nashville TN		9475na	12160na

			13845na 15825na		
1800	1900		USA, WWRB Manchester TN	9320na	12170na
1800	1900		USA, WYFR Okeechobee FL	17795eu	18980eu
1800	1900		Yemen, Rep of Yemen Radio	9780me	
1800	1900		Zambia, Radio Christian Voice	4965af	
1815	1830	vl/mtwhf	Germany, Bible Voice Broadcasting		5970eu
1820	1830	vl	Libya, Voice of Africa	15205af	15660af
			17635af 17695af		
1830	1845		Germany, IBRA Radio	9520af	
1830	1855		Greece, Voice of 12105eu		
1830	1900		Georgia, Radio Georgia	11760eu	
1830	1900		Serbia & Montenegro, Intl Radio	6100eu	
1830	1900		South Africa, AWR Africa	12130af	
1830	1900		Turkey, Voice of 9785eu		
1830	1900		UK, BBC World Service	3255af	6055af
			6190af 9630af 15400af	15420af	17820af
			21470af		
1845	1900	mtwhfa	Albania, Radio Tirana Intl	7210eu	9520eu
1845	1900		Congo, RTV Congolaise	4765af	5985af
1851	1900		New Zealand, Radio NZ Intl	9845pa	

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

1900	1915		Congo, RTV Congolaise	4765af	5985af
1900	1915	vl/a	Germany, Bible Voice Broadcasting		13710me
1900	1920		Turkey, Voice of 9785eu		
1900	1925		Israel, Kol Israel	11605va	15615af 15640va
			17535va		
1900	1928		Vietnam, Voice of	11630va	13740va
1900	1930	vl/s	Germany, Bible Voice Broadcasting		5970eu
1900	1930	s	Germany, Universal Life	13820me	
1900	1930		Hungary, Radio Budapest	3975eu	6025eu
			11720eu		
1900	1930	vl	Philippines, Radio Pilipinas	11720me	15190me
			17720me		
1900	1945		India, All India Radio	7410eu	9445af
			9950eu 11620eu	11935af	13605af
			15075af 15155af	17670af	
1900	1950		New Zealand, Radio NZ Intl	9845pa	
1900	1956		North Korea, Voice of	4405as	7505eu
			11335eu 11710eu		
1900	1959		Germany, Deutsche Welle	13590af	15545af
			17770af		
1900	2000		Anguilla, Caribbean Beacon	11775am	
1900	2000		Australia, Radio 6080pa	7220as	7240va
			9500as 11650as 11880as		
1900	2000		Australia, Voice Intl 6115as		
1900	2000		Canada, CBC Northern Service	9625da	
1900	2000		Canada, CFRX Toronto ON	6070da	
1900	2000		Canada, CFVP Calgary AB	6030do	
1900	2000		Canada, CKZN St John's NF	6160do	
1900	2000		Canada, CKZU Vancouver BC	6160da	
1900	2000		China, China Radio Intl	7145af	9440af
			9585af		
1900	2000		Costa Rica, University Network	11870am	13750am
1900	2000		Eqt Guinea, Radio Africa	7189af	15184al
1900	2000	as	Germany, Bible Voice Broadcasting		9425af
1900	2000	vl	Ghana, Ghana BC Corp	3366da	4915do
1900	2000	vl/asmtwh	Italy, IRRS 5755va		
1900	2000		Latvia, Laser Radio 9290eu		
1900	2000		Liberia, ELWA 4760do		
1900	2000		Malaysia, Radio Malaysia	7295da	
1900	2000		Namibia, Namibian BC Corp	3270af	3290af
			6060af		
1900	2000		Netherlands, Radio 7120af	9895af	11655af
			17810af		
1900	2000	as	Netherlands, Radio	15315na	17660na 17735na
1900	2000		Nigeria, Radio/Enugu	6025do	
1900	2000		Nigeria, Radio/Ibadan	6050da	
1900	2000		Nigeria, Radio/Kaduna	4770do	6090do
1900	2000		Nigeria, Radio/Lagos	3326da	4990do
1900	2000		Russia, Voice of 7310eu	7440eu	9890eu
1900	2000		Sierra Leone, Radio UNAMSIL	6139af	
1900	2000		Sierra Leone, SLBS 3316do		
1900	2000	vl	Solomon Islands, SIBC	5020da	9545do
1900	2000		South Africa, Channel Africa	3345af	
1900	2000		South Korea, Radio Korea Intl	5975va	7275eu
1900	2000	a	Sri Lanka, SLBC 6010eu		
1900	2000		Swaziland, TWR 3200af		
1900	2000		Thailand, Radio 7155eu		
1900	2000		Uganda, Radio 4976do	5026da	7196da
1900	2000		UK, BBC World Service	3255af	6005af
			6190af 6195eu 9410eu	9630af	12095af
			15310me 15400af	17830af	
1900	2000		USA, Armed Forces Radio	4319usb	5446usb
			5765usb 6350usb	7507usb	10320usb
			12133usb 12579usb	13362usb	13855usb
1900	2000		USA, KAIJ Dallas TX 13815va		
1900	2000		USA, KJES Vado NM 15385na		
1900	2000		USA, KTBN Salt Lake City UT	15590na	
1900	2000		USA, Voice of America	4950af	6040va
			9760va 9770af	9850af	11975af
			13670af 15410va	15445af	15580af
			17895af		
1900	2000	mtwhf	USA, Voice of America	5965va	9840va
			11720va 11970va	13725va	15205va
1900	2000		USA, WBCQ Kennebunk ME	7415na	9330na
			17495na		
1900	2000		USA, WBOH Newport NC	5920am	
1900	2000		USA, WEWN Birmingham AL	11530va	13615va
			15685va 15745va		
1900	2000		USA, WHRA Greenbush ME	17650na	
1900	2000		USA, WHRI Noblesville IN	9495am	13760am
1900	2000		USA, WINB Red Lian PA	13570am	
1900	2000		USA, WJIE Louisville KY	7490am	13595am
1900	2000		USA, WMLK Bethel PA	9465eu	15265al
1900	2000		USA, WTJC Newport NC	9370na	
1900	2000		USA, WWCR Nashville TN	9475na	12160na
			13845na 15825na		
1900	2000		USA, WYFR Okeechobee FL	6085af	15130eu
			17750eu 17795eu	17845va	18980va
1900	2000	vl	Vanuatu, Radio 4960da	7260da	
1900	2000		Zambia, Radio Christian Voice	4965af	
1900	2000	vl	Zimbabwe, ZBC Corp	5975do	
1915	1925		Rwanda, Radio 6005da		
1915	1945	f	Germany, Bible Voice Broadcasting		9425af
1923	1930	vl	Libya, Voice of Africa	15205af	15315af
1930	2000	t h	Belarus, Radio Belarus Intl	7105eu	7210eu
1930	2000		Belgium, Radio Vlaanderen Intl	9925eu	
1930	2000	mtw	Germany, AWR 15175eu		
1930	2000		Iran, Voice of the Islamic Rep	9800af	11750eu
1930	2000		Nigeria, Voice of 7255af	15120af	17800af
1930	2000		Papua New Guinea, NBC	4890do	9675irr
1930	2000		Sweden, Radio 6065va		
1930	2000		USA, Voice of America	7260me	9680me
			13635me		
1935	1955		Italy, RAI Intl 5970eu	9605eu	
1945	2000	f	Germany, Bible Voice Broadcasting		12050af
1951	2000		New Zealand, Radio NZ Intl	11725pa	

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

2000	2027		Czech Rep, Radio Prague Intl	5930eu	11600va
2000	2028		Vietnam, Voice of 7220as	9550as	
2000	2030	f	Germany, Universal Life	5775va	
2000	2030		Iran, Voice of the Islamic Rep	9800af	11750eu
2000	2030	vl/asmtwh	Italy, IRRS 5775va		
2000	2030		Mongolia, Voice of 9720eu		
2000	2030		USA, Voice of America	4950af	6040va
			6095va 9760va	9770va	9850af
			11855af 11975af	13670af	15410af
			15445af 17745af		
2000	2030		Vatican City, Vatican Radio	9660eu	11625eu
			13765eu		
2000	2045		Swaziland, TWR 3200af		
2000	2050		New Zealand, Radio NZ Intl	11725pa	
2000	2059		Canada, Radio Canada Intl	5850eu	7235eu
			11690af 13700eu	17870eu	
2000	2059		Germany, Deutsche Welle	7130af	13820af
			15205af		
2000	2059	mtwhf	Spain, Radio Exterior Espana	9570va	15290va
2000	2100		Anguilla, Caribbean Beacon	11775am	
2000	2100		Australia, ABC NT Alice Springs	2310da	4835irr
2000	2100		Australia, ABC NT Katherine	2485da	
2000	2100		Australia, ABC NT Tennant Creek	2325do	
2000	2100		Australia, Radio 6080pa	7220as	9500as
			11650as 11880as		
2000	2100		Australia, Voice Intl 6115as		
2000	2100		Canada, CBC Northern Service	9625do	
2000	2100		Canada, CFRX Toronto ON	6070da	
2000	2100		Canada, CFVP Calgary AB	6030da	
2000	2100		Canada, CKZN St John's NF	6160do	
2000	2100		Canada, CKZU Vancouver BC	6160do	
2000	2100		China, China Radio Intl	7190eu	9440af
			9600eu 11640af	11790eu	13630af
2000	2100		Costa Rica, University Network	13750am	
2000	2100		Eqt Guinea, Radio Africa	7189af	15184al
2000	2100		Germnay, Overcomer Ministries	9755af	
2000	2100	vl	Ghana, Ghana BC Corp	3366do	4915do
2000	2100		Indonesia, Voice of 9525as	11785as	15150al
2000	2100		Latvia, Laser Radio 9290eu		
2000	2100		Liberia, ELWA 4760do		
2000	2100		Malaysia, Radio Malaysia	7295do	
2000	2100		Namibia, Namibian BC Corp	3270af	3290af

Shortwave Guide

			6060af			
2000	2100		Netherlands, Radio 17810af	7120af	9895af	11655af
2000	2100	as	Netherlands, Radio	15315na	17660na	17735na
2000	2100		Nigeria, Radio/Enugu		6025do	
2000	2100		Nigeria, Radio/Ibadan		6050do	
2000	2100		Nigeria, Radio/Kaduna		4770do	6090do
2000	2100		Nigeria, Radio/Lagos		3326do	4990do
2000	2100		Nigeria, Voice of	7255af	15120af	17800af
2000	2100		Papua New Guinea, NBC		4890do	9675irr
2000	2100		Russia, Voice of	7310eu	11980eu	
2000	2100		Sierra Leone, Radio UNAMSIL		6139af	
2000	2100		Sierra Leone, SLBS	3316do		
2000	2100	vl	Solomon Islands, SIBC		5020do	9545ao
2000	2100		South Africa, AWR Africa		7170af	
2000	2100		Uganda, Radio	4976do	5026do	7196do
2000	2100		UK, BBC World Service 6190af 6195eu 15400af	9410eu	3255af 9630af 17830af	6005cf 12095af
2000	2100		USA, Armed Forces Radio 5765usb 12133usb	6350usb 12579usb	4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
2000	2100		USA, KAIJ Dallas TX	13815va		
2000	2100		USA, KTBN Salt Lake City UT		15590na	
2000	2100		USA, KWHR Naalehu HI		11565as	
2000	2100		USA, WBCQ Kennebunk ME 17495na		7415na	9330na
2000	2100		USA, WBOH Newport NC		5920am	
2000	2100		USA, WEWN Birminghom AL 15745va	17595va	11530va	13615va
2000	2100		USA, WHRA Greenbush ME		17650na	
2000	2100		USA, WHRI Noblesville IN 13760am		5745am	9495am
2000	2100		USA, WINB Red Lion PA		13570am	
2000	2100		USA, WJIE Louisville KY		7490am	13595am
2000	2100		USA, WMLK Bethel PA		9465eu	15265al
2000	2100		USA, WRMI Miami FL		9955am	15725am
2000	2100		USA, WTJC Newport NC		9370na	
2000	2100		USA, WWCR Nashville TN 13845na	15825na	9475na	12160na
2000	2100		USA, WWRB Manchester TN		9320na	12170na
2000	2100		USA, WYFR Okeechobee FL 17795eu	17845eu	17575sa 18980eu	17750eu
2000	2100	vl	Vanuatu, Radio	4960do	7260do	
2000	2100		Zambia, Radio Christian Voice		4965af	
2000	2100	vl	Zimbabwe, ZBC Corp		5975do	
2005	2100		Syria, Radio Damascus		12085eu	13610eu
2025	2045		Italy, RAI Intl	6185af	9570af	11880af
2030	2045		Thailand, Radio	9680eu		
2030	2058		Vietnam, Voice of 13740va	9725va	11630va	11775va
2030	2100	t h	Belarus, Radio Belarus Intl		7105eu	7210eu
2030	2100		Cuba, Radio Havana		9505eu	11760eu
2030	2100		Egypt, Radio Cairo	15375af		
2030	2100	DRM	Netherlands, Radio	9800na		
2030	2100		Turkey, Voice of	7170as		
2030	2100	f	UK, Wales Radio Intl	7325eu		
2030	2100	as	USA, Voice of America 11975af 17745af	13670af	4950af 15410af	9850af 15445af
2030	2100		Uzbekistan, Radio Tashkent Intl 11905eu		5025eu	7185eu
2040	2100	mtwhfa	Armenia, Voice of	4810eu	9960eu	
2040	2100		Vatican City, Vatican Radio		6185eu	
2045	2100		India, All India Radio 9910au	9950au	7410eu 11620eu	9445eu 11715au
2050	2100		Vatican City, Vatican Radio 5890eu	7250eu	4005eu	5890eu
2051	2100		New Zealand, Radio NZ Intl		15720pa	
2055	2100	DRM	Vatican City, Vatican Radio		9800eu	

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

2100	2120		Turkey, Voice of	7170as		
2100	2130		Australia, ABC NT Katherine		2485do	
2100	2130		Australia, ABC NT Tennant Creek		2325do	
2100	2130		Australia, Radio 11650as	7220as 11880as	9500as 17715pa	9660pa 21740as
2100	2130		China, China Radio Intl		11640af	13630af
2100	2130		Cuba, Radio Havana		9505eu	11760eu
2100	2130		Hungary, Radio Budapest		6025va	11830va
2100	2130		Serbia & Montenegro, Intl Radio		6100eu	
2100	2130		South Korea, Radio Korea Intl		3955eu	
2100	2130	DRM	Vatican City, Vatican Radio		9800eu	
2100	2156		North Korea, Voice of 9325as 11335as		4405as	7505eu
2100	2159	DRM	Canada, Radio Canada Intl		9800na	
2100	2159		Germany, Deutsche Welle 15205af		9440af	11865af
2100	2159	as	Spain, Radio Exterior Espana		9570eu	9640eu
2100	2200		Anguilla, Caribbean Beacon		11775am	
2100	2200		Australia, ABC NT Alice Springs		2310do	4835irr
2100	2200		Austria, AWR Europe		15130af	
2100	2200		Bulgaria, Radio	5800eu	7500eu	
2100	2200		Canada, CBC Northern Service		9625do	
2100	2200		Canada, CFRX Toronto ON		6070do	
2100	2200		Canada, CFVP Calgary AB		6030do	
2100	2200		Canada, CkZN St John's NF		6160do	
2100	2200		Canada, CkZU Vancouver BC		6160do	
2100	2200		China, China Radio Intl 11790eu		7190eu	9600eu
2100	2200		Costa Rica, University Network		13750am	
2100	2200		Egypt, Radio Cairo	15375af		
2100	2200		Eqt Guinea, Radio Africa		7189af	15184al
2100	2200	vl	Ghana, Ghana BC Corp		3366do	4915do
2100	2200		Guyana, Voice of	3290do	5950do	
2100	2200		India, All India Radio 9910au	9950au	7410eu 11620eu	9445eu 11715au
2100	2200		Japan, Radio 11855af	6035pa 17825pa	6055eu 21670po	6180eu
2100	2200		Latvia, Laser Radio	9290eu		
2100	2200		Liberia, ELWA	4760do		
2100	2200		Malaysia, Radio Malaysia		7295do	
2100	2200		Namibia, Namibian BC Corp 6060af		3270af	3290af
2100	2200	DRM	Netherlands, Radio	15150eu		
2100	2200		New Zealand, Radio NZ Intl		15720pa	
2100	2200		Nigeria, Radio/Enugu		6025do	
2100	2200		Nigeria, Radio/Ibadan		6050do	
2100	2200		Nigeria, Radio/Kaduna		4770do	6090do
2100	2200		Nigeria, Radio/Lagos		3326do	4990do
2100	2200		Nigeria, Voice of	7255af	15120af	17800af
2100	2200		Papua New Guinea, NBC		4890do	9675irr
2100	2200		Sierra Leone, Radio UNAMSIL		6139af	
2100	2200		Sierra Leone, SLBS	3316do		
2100	2200		Syria, Radio Damascus		12085eu	13610eu
2100	2200		UK, BBC World Service 5975ca 6195va 17830af	6005af 9410eu	3255af 12095ca	5965as 15400af
2100	2200		Ukraine, Radio Ukraine Intl		7420eu	
2100	2200		USA, Armed Forces Radio 5765usb 12133usb	6350usb 12579usb	4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
2100	2200		USA, KAIJ Dallas TX	13815va		
2100	2200		USA, KTBN Salt Lake City UT		15590na	
2100	2200		USA, KWHR Naalehu HI		11565as	
2100	2200		USA, Voice of America 15410af	15445af	11975cf	13670af
2100	2200		USA, WBCQ Kennebunk ME 9330na	17495na	5105na	7415na
2100	2200		USA, WBOH Newport NC		5920am	
2100	2200		USA, WEWN Birmingham AL 15745va	17595va	11530va	13615va
2100	2200		USA, WHRA Greenbush ME		17650na	
2100	2200		USA, WHRI Noblesville IN 13760am		5745am	9495am
2100	2200		USA, WINB Red Lion PA		13570am	
2100	2200		USA, WJIE Louisville KY		7490am	13595am
2100	2200		USA, WMLK Bethel PA		9465eu	15265al
2100	2200		USA, WRMI Miami FL		9955am	15725am
2100	2200		USA, WTIC Newport NC		9370na	
2100	2200		USA, WWCR Nashville TN 13845na	15825na	9475na	12160na
2100	2200		USA, WWRB Manchester TN		9320na	12170na
2100	2200		USA, WYFR Okeechobee FL 17845sa		17575sa 18930eu	17795eu
2100	2200	vl	Vanuatu, Radio	4960do	7260do	
2100	2200		Zambia, Radio Christian Voice		4965af	
2100	2200	vl	Zimbabwe, ZBC Corp		5975do	
2115	2130		UK, BBC World Service		11675ca	15390ca
2115	2200		Egypt, Radio Cairo	9990eu		
2123	2130	vl	Libya, Voice of Africa		11635af	15315af
2130	2145	tf	UK, BBC World Service		11680ca	
2130	2156		Romania, Radio Romania Intl 15285eu	17735eu	7285eu	9725eu
2130	2200	mtwhfa	Albania, Radio Tirana Intl		7130eu	9540eu
2130	2200		Australia, ABC NT Katherine		5025do	
2130	2200		Australia, ABC NT Tennant Creek		4910do	
2130	2200		Australia, Radio 12080va	9660pa 17715pa	11650as 17585pa	11880va 21740as
2130	2200		Guam, AWR/KSDA	11850as	11980as	
2130	2200		Sweden, Radio	6065va	9880va	
2130	2200		Uzbekistan, Radio Tashkent Intl 11905eu		5025eu	7185eu

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

2200	2205		Syria, Radio Damascus	12085eu	13610eu
2200	2229		Canada, Radio Canada Intl	5960am	13785am
			15170am		
2200	2229		Germany, Deutsche Welle	9800na	
2200	2230		Belgium, Radio Vlaanderen Intl	11635na	
2200	2230		India, All India Radio	7410eu	9445eu
			9910au 9950au	11620eu	11715au
2200	2230		Liberia, ELWA 4760do		
2200	2230	smtwhf	Serbia & Montenegro, Intl Radio	7230pa	
2200	2245		Egypt, Radio Cairo 9990eu		
2200	2250		Turkey, Voice of 9830va		
2200	2259		Germany, Deutsche Welle	7115as	9720as
2200	2300		Anguilla, Caribbean Beacon	6090am	
2200	2300		Australia, ABC NT Alice Springs	2310do	4835irr
2200	2300		Australia, ABC NT Katherine	5025do	
2200	2300		Australia, ABC NT Tennant Creek	4910do	
2200	2300		Australia, Radio 11880va	13620pa	15320pa
			17715pa 17585po	21740as	
2200	2300		Canada, CBC Northern Service	9625do	
2200	2300		Canada, CFRX Toronto ON	6070do	
2200	2300		Canada, CFVP Calgary AB	6030do	
2200	2300		Canada, CKZN St John's NF	6160do	
2200	2300		Canada, CKZU Vancouver BC	6160do	
2200	2300		China, China Radio Intl	9800eu	
2200	2300		Costa Rica, University Network	13750am	
2200	2300		Cuba, Radio Havana	9550am	
2200	2300		Eqt Guinea, Radio Africa	7189af	15184af
2200	2300		Germany, Overcomer Ministries	6045eu	6055na
			9480sa 9695af 9730as	9745as	11935va
			11950va 12020va		
2200	2300	vl	Ghana, Ghana BC Corp	3366do	4915do
2200	2300		Guyana, Voice of 3290do		
2200	2300		Malaysia, Radio Malaysia	7295do	
2200	2300		Namibia, Namibian BC Corp	3270af	3290af
			6060af		
2200	2300	DRM	Netherlands, Radio 15525na		
2200	2300		New Zealand, Radio NZ Intl	15720pa	
2200	2300		Nigeria, Radio/Enugu	6025do	
2200	2300		Nigeria, Radio/Ibadan	6050do	
2200	2300		Nigeria, Radio/Kaduna	4770do	6090do
2200	2300		Nigeria, Radio/Lagos	3326do	4990do
2200	2300		Nigeria, Voice of 7255af	15120af	17800af
2200	2300		Papua New Guinea, NBC	4890do	9675irr
2200	2300		Sierra Leone, Radio UNAMSIL	6139af	
2200	2300		Sierra Leone, SLBS 3316do		
2200	2300	vl	Solomon Islands, SIBC	5020do	9545do
2200	2300		Taiwan, Radio Taiwan Intl	15600eu	
2200	2300		UK, BBC World Service	5965as	6195va
			7105as 9605as 9740as	11955as	15400af
			17830af		
2200	2300		USA, Armed Forces Radio	4319usb	5446usb
			5765usb 6350usb	7507usb	10320usb
			12133usb 12579usb	13362usb	13855usb
2200	2300		USA, KAIJ Dallas TX 13815va		
2200	2300		USA, KTBN Salt Lake City UT	15590na	
2200	2300		USA, KWHR Naalehu HI	17510as	
2200	2300		USA, Voice of America	7215va	15185va
			15290va 15305va	17740va	17820va
2200	2300		USA, Voice of America	7215va	15185va
			15290va 15305va	17740va	17820va
2200	2300		USA, WBCQ Kennebunk ME	5105na	7415na
			9330na 17495na		
2200	2300		USA, WBOH Newport NC	5920am	
2200	2300		USA, WEWN Birmingham AL	9355na	9975af
			13615na 15745na		
2200	2300		USA, WHRA Greenbush ME	17650na	
2200	2300		USA, WHRI Noblesville IN	5745am	9495am
			13760am		
2200	2300		USA, WINB Red Lion PA	13570am	
2200	2300		USA, WJIE Louisville KY	7490am	13595am
2200	2300		USA, WMLK Bethel PA	15265eu	
2200	2300		USA, WRMI Miami FL	9955am	15725am
2200	2300		USA, WTJC Newport NC	9370na	
2200	2300		USA, WWCR Nashville TN	7465na	9475na
			12160na 13845na		
2200	2300		USA, WWRB Manchester TN	5050na	5085na
			6890na		
2200	2300		USA, WYFR Okeechobee FL	11740na	15695na
			15770na		
2200	2300	vl	Vanuatu, Radio 4960do	7260do	
2200	2300		Zambia, Radio Christian Voice	4965af	
2205	2230		Italy, RAI Intl 11895as		
2215	2230		Croatia, Croatian Radio	9925sa	
2230	2257		Czech Rep, Radio Prague Intl	7345na	9415na
2230	2259		Canada, Radio Canada Intl	9525as	11810as
			12035as		
2245	2300		India, All India Radio	9705as	9950as
			11620as 11645as	13605as	

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

2300	0000		Anguilla, Caribbean Beacon	6090am	
2300	0000		Australia, ABC NT Alice Springs	2310do	4835irr
2300	0000		Australia, ABC NT Katherine	5025do	
2300	0000		Australia, ABC NT Tennant Creek	4910do	
2300	0000		Bulgaria, Radio 9700na	11700na	
2300	0000		Canada, CBC Northern Service	9625do	
2300	0000		Canada, CFRX Toronto ON	6070do	
2300	0000		Canada, CFVP Calgary AB	6030do	
2300	0000		Canada, CKZN St John's NF	6160do	
2300	0000		Canada, CKZU Vancouver BC	6160do	
2300	0000		China, China Radio Intl	5990am	6145am
			13680am		
2300	0000		Costa Rica, University Network	13750am	
2300	0000		Egypt, Radio Cairo 11725na		
2300	0000	DRM	Germany, Deutsche Welle	9800as	
2300	0000	vl	Ghana, Ghana BC Corp	3366do	4915do
2300	0000		Guyana, Voice of 3290do		
2300	0000		India, All India Radio	9705as	9950as
			11620as 11645as	13605as	
2300	0000		Malaysia, Radio Malaysia	7295do	
2300	0000		Namibia, Namibian BC Corp	3270af	3290af
			6060af		
2300	0000		New Zealand, Radio NZ Intl	15720pa	
2300	0000		Papua New Guinea, NBC	4890do	9675irr
2300	0000		Sierra Leone, Radio UNAMSIL	6139af	
2300	0000		Sierra Leone, SLBS 3316do		
2300	0000		Singapore, Mediacorp Radio	6150do	
2300	0000	vl	Solomon Islands, SIBC	5020do	9545do
2300	0000		USA, Armed Forces Radio	4319usb	5446usb
			5765usb 6350usb	7507usb	10320usb
			12133usb 12579usb	13362usb	13855usb
2300	0000		USA, KAIJ Dallas TX 13815va		
2300	0000		USA, KTBN Salt Lake City UT	15590na	
2300	0000		USA, KWHR Naalehu HI	17510as	
2300	0000		USA, Voice of America	9725as	11965as
			12055as 13755as	15145as	
2300	0000		USA, WBCQ Kennebunk ME	5105na	7415na
			9330na		
2300	0000		USA, WBOH Newport NC	5920am	
2300	0000		USA, WEWN Birmingham AL	9355na	9975af
			13615na 15745na		
2300	0000		USA, WHRA Greenbush ME	7580va	
2300	0000		USA, WHRI Noblesville IN	5745am	9495am
			13760am		
2300	0000		USA, WINB Red Lion PA	9320am	
2300	0000		USA, WJIE Louisville KY	7490am	13595am
2300	0000		USA, WRMI Miami FL	7385am	9955am
2300	0000		USA, WTJC Newport NC	9370na	
2300	0000		USA, WWCR Nashville TN	5070na	7465na
			9475na 13845na		
2300	0000		USA, WWRB Manchester TN	5050na	5085na
			6890na		
2300	0000		USA, WYFR Okeechobee FL	5985na	11740na
			11855na 15255na	17750na	
2300	0000		USA, WYFR Okeechobee FL	5985sa	11855ca
			17750na		
2300	0000	vl	Vanuatu, Radio 4960do	7260do	
2300	0000		Zambia, Radio Christian Voice	4965af	
2300	2306		Nigeria, Radio/Lagos	3326do	
2300	2330		Australia, Radio 9660pa	12080va	13620as
			15320as 17585pa	17715as	17795va
			21740as		
2300	2330		Cuba, Radio Havana	9550am	
2300	2330		UK, BBC World Service	3915as	5965as
			6195as 9605as 9740as	11945as	11955as
			15280as		
2300	2356		Romania, Radio Romania Intl	7280au	9590au
			9645au 11940au		
2300	2359		Germany, Deutsche Welle	7115as	9890as
			15135as		
2330	0000		Australia, Radio 9660pa	12080va	13620as
			15320as 17585pa	17715pa	17750as
			17795as 21740as		
2330	0000		Lithuania, Radio Vilnius	9875na	
2330	0000		UK, BBC World Service	3915as	5965as
			6035as 6195as 9605as	9740as	11945as
			11955as 15280as		
2330	0000		USA, Voice of America	7225as	7260as
			11805as 11965as	12055as	13725as
			15145as 15205as		
2330	2358		Vietnam, Voice of 9840as	12020as	
2330	2359	DRM	Sweden, Radio 9800na		

0000 UTC/ 8pm E/5pm P - Page 45 Freqs

SUNDAY
0000 R. Netherlands Europe Unzipped (the events of the past week in Europe, some unusual)
WBCQ(7415kHz) A Different Kind of Oldies Show (a unique mix of oldies music with "Big Steve" Cole)
0005 R. Prague Insight Central Europe (a regional magazine jointly produced by the region's broadcasters)
R. Australia Keys to Music (Graham Abbott with how to enjoy and evaluate classical music)
0006 BBCWS(am) Top of the Pops (the British rock & pop charts)
0010 R. Japan Hello from Tokyo (listener letters, music & short features)
0012 R. New Zealand Int. The Week in Parliament (a weekly roundup of NZ political news)
0018 R. Netherlands Insight (Rob Green casts a critical & humarous eye on the past week's headlines)
0030 R. Netherlands Amsterdam Forum (an interactive discussion of topical issues)
0033 R. New Zealand Int. Spectrum (the people, places & events around NZ)
0045 R. Ext. de Espana Radio Waves (a weekly program for radio enthusiasts)

MONDAY-FRIDAY
0000 R. New Zealand Int. Midday Report (news updates & in-depth reports)

MONDAY
0000 R. Netherlands Wide Angle (a single issue examined in-depth)
WBCQ(7415kHz) Radio New York International (Johnny Lightning plays classic rock)
0005 R. Prague Mailbox (refer to 0105 M)
0006 BBCWS(am) Everywoman (a weekly magazine about the world's women)
0010 R. Australia Awaye! (Abariginal arts & culture program)
R. Japan Weekend Japanology (a multifaceted exploration of Japan)
0015 R. Prague Czech Books [or] Encore [or] Magic Carpet (refer to 0115 M)
0018 R. Netherlands Insight (refer to 0018 S)
0022 R. Netherlands The Week Ahead (on RN)
0030 R. Netherlands Vox Humana (stories about the power of the "human voice")
0032 BBCWS(am) Westway Omnibus (the previous two episodes of this radio light drama)
0040 R. Ext. de Espana Radio Club (rebroadcast of A 0035 program)
0054 R. Japan Sights & Sounds of Japan

TUESDAY-SATURDAY
0000 R. Netherlands Newsline (news, analysis & background reports)
0010 R. Japan Songs for Everyone
0015 R. Ext. de Espana Spain Day by Day (daily magazine of reports, music & features)
R. Japan 44 Minutes (daily current affairs magazine about Japan & Asia)

TUESDAY
0006 BBCWS(am) A documentary series
0010 R. Australia The Science Show ("a science program about ideas, not just facts")
0030 R. Netherlands The Research File (a magazine emphasizing the relevance of science to all our lives)
0032 BBCWS(am) The Music Feature (features & documentaries on current musical genres)

WEDNESDAY
0006 BBCWS(am) Masterpiece (exploring major cultural ideas & great artistic endeavors)
0010 R. Australia The National Interest (Terry Lane's round-up of the week's major issues)
0030 R. Netherlands EuroQuest (a magazine placing Europe in context)
0032 BBCWS(am) White Label (forthcoming pop music releases)

THURSDAY
0006 BBCWS(am) All in a Day's Work (ordinary people & their professions)[3rd/10th]
A documentary series [17th/24th]
0010 R. Australia Background Briefing (ABC Radio's award-winning agenda-setting current affairs radio documentary program)
0015 R. Prague Czechs in History [or] Czechs Today [fortnightly]
Spotlight (traveling around the Czech Republic)[fortnightly]
0030 R. Netherlands The Weekly Documentary (RN's award-winning sound essays & in-depth investigations)
0032 BBCWS(am) Charlie Gillett (music from around the globe)

FRIDAY
0006 BBCWS(am) Assignment (BBC correspondents with stories behind the headlines)
0010 R. Australia Hindsight (Australion social history woven from the memories of those who were there)
0030 R. Netherlands Dutch Horizons (Bertine Krol chronicles life in Holland)
0032 BBCWS(am) The Music Biz (the global music industry)

SATURDAY
0000 WBCQ(7415kHz) Allan Weiner Worldwide (the station manager's show)
0005 R. Australia Pacific Review (the week in the Pacific with Bruce Hill)
0006 BBCWS(am) Sports International (the issues & personalities behind the headlines)
0010 R. New Zealand Int. Focus on Politics (a report on government & politics in NZ)
0030 R. Australia Ockham's Razor (a "sharp" commentary on a science-related issue)
R. Netherlands A Good Life (how development affects societies)
R. New Zecland Int. The Sampler (Nick Bollinger casts a critical ear over the latest CDs)
0032 BBCWS(am) John Peel (with his own unique & eclectic mix of new music)
0045 R. Australia Lingua Franca (about language)

0100 UTC/ 9pm E/6pm P - Page 45 Freqs

SUNDAY
0100 R. Netherlands Europe Unzipped [refer to 0000 S]
WBCQ(7415kHz) Marion's Attic (rare & vintage recordings presented by Marion Webster)
0101 BBCWS(am) Play of the Week (classic & contemporary drama for radio)
0105 R. Australia Correspondents Report (the ABC's overseas reporters analyze major events)
R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
R. Canada Int. Business Sense (an in-depth look at Canadian companies in the global economy)
R. New Zealand Int. At the Movies (a weekly report on cinema with Simon Morris)
R. Prague Magazine (Czech news stories you might have missed)
0110 R. Prague Letter from Prague (a personal view of life in & around the Czech capital)
0111 Voice of Russia Moscow Mailbag (Joe Adamov answers listener questions & talks about the latest rumors & jokes sweeping Moscow)
0115 R. Prague One on One (an informal interview with an interesting Czech)
0118 R. Netherlonds Insight (refer to 0018 S)
0120 China R. Int. CRI Roundup
0122 R. Netherlands The Week Ahead (on RN)
0130 China R. Int. In the Spotlight (Chinese arts & cultural magazine)
R. Australia In Conversation (Robyn Williams looks at how science affects our lives)
R. Netherlands Amsterdam Forum (refer to 0030 S)
R. New Zealand Int. Bookmarks (NZ books, literature & writers)
R. Sweden Network Europe (a magazine about Europe) [1st S]
Sweden Today (George Wood presents the voices of Sweden) [2nd S]
Spectrum (Bill Schiller covers the Swedish cultural scene) [3rd S]
Studio 49 (ideas & trends in Sweden & the Nordic region) [4th S]
0132 Voice of Russia Moscow Yesterday & Today (recalling the most interesting events in the history of the city)
0135 R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
R Canada Int. Sci-Tech File (the latest in science & technology developments in Canada)
R. Habana Cuba DXers Unlimited (Arnie Coro presents a program for radio enthusiasts)

MONDAY-FRIDAY
0100 R. Australia Asia-Pacific (RA's flagship current events & business report for & about Asia & the Pacific region)
0105 R. New Zealand Int. Wayne's Music (a nostalgic mix of popular music themed to decades)

MONDAY
0100 R. Habana Cuba Weekly Review (Cuba's perspective on current events)
R. Netherlands Wide Angle [refer to 0000 M]
WBCQ(7415kHz) Radio New York International (cont'd from 0000)
0105 R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
R. Budapest Spotlight (a monthly magazine)
Europe Unlimited (Hungary's relations with the rest of Europe)[monthly]
Heading for Hungary (a monthly travelogue)
And the Gatepost (listener letters)[monthly]
R. Canada Int. The Maple Leaf Mailbag (Ian Jones answers listener mail & hosts the fortnightly CIDX Report for dxers)
R. Prague Mailbox (replying to listener letters)
0106 BBCWS(am) The Ticket (the arts & entertainment around the globe)
0110 Voice of Vietnam Sunday Show (variety magazine with local reports & music)
0111 Voice of Russia Moscow Mailbag (refer to 0111 S)
0115 R. Prague Czech Books (a fortnightly look at Czech writing today)[fortnightly]
Encore (a monthly review of Czech classical music)[monthly]
Magic Carpet (monthly Czech world music program)[monthly]
0122 R. Netherlands The Week Ahead (on RN)
0130 China R. Int. People in the Know (interviews with prominent Chinese who are shaping the nation's future)
R. Australia The Health Report (Dr. Norman Swan's weekly report on health issues)
R. Netherlands Vox Humana [refer to 0030 M]
R. Sweden In Touch with Stockholm (an interactive listener contact program w/Nidia Hagström) [1st S]
Sounds Nordic (R. Sweden's youth music & trends magazine w/Gaby Katz)[exc. 1st S]
0132 Voice of Russia Timelines (Estelle Winters' variety show giving insight into life in Moscow through foreign eyes)
0135 R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
R. Canada Int. Spotlight (magazine of arts & culture in Canada)
0140 R. Habana Cuba The Mailbag Show (listener letters)
0150 R. Habana Cuba Breakthrough (Arnie Coro's weekly science report)

TUESDAY-SATURDAY
0100 R. Canada Int. The World at Six [refer to 2200 M-F]
R. Netherlands Newsline (news, analysis & background reports)
0105 R. Budapest Hungary Today (daily magazine covering current events in Hungary)
Voice of Russia Commonwealth Update (comments on domestic developments & issues)
0115 R. Austria Int. Report from Austria (15 min. magazine focusing on Austria & central & eastern Europe)
0130 R. Sweden Sixty Degrees North (reports,

interviews & analysis on the Nordic region)
0145 R. Austria Int. Report from Austria (repeat of 0115)

TUESDAY
0106 BBCWS(am) Health Matters (reports on the latest research)
0130 BBCWS(am) A panel game or quiz show
China R. Int. Biz China (Chinese business & economic development magazine)
R. Australia The Law Report (Damien Carrick presents breaking legal stories)
R. Netherlands The Research File [refer to 0030 T]
0132 BBCWS(am) Arthur Smith Presents 21 Years of Just for Laughs (from the nated Montreal comedy festival)
Voice of Russia Folk Box (music drawn from the traditions of the hundreds of nationalities that make up Russia & the CIS)
0135 R. Canada Int. Media Zone (Ian Jones hosts a weekly forum with Canadian journalists discussing topical issues facing Canadians)
0145 R. Sweden Sports Scan (a weekly report on sports in the Nordic region)

WEDNESDAY
0106 BBCWS(am) Go Digital (technology journalist Tracey Logan explains the latest in IT)
0130 China R. Int. China Horizons (life in China outside Beijing)
R. Australia The Religion Report (Stephen Crittenden examines the way religion & societies interact)
R. Netherlands EuroQuest [refer to 0030 W]
0132 BBCWS(am) Music Review (personalities, views & issues from the world of music)
Voice of Russia The Jazz Show (recordings from the Russian world of jazz)
0135 R. Canada Int. Spotlight (refer to M 0135)
R. Habana Cuba DXers Unlimited (refer to S 0135)
0145 R. Sweden Close Up (profiles of people in Sweden from all walks of life)[1st W]

THURSDAY
0106 BBCWS(am) Discovery (in-depth exploration of ideas & discoveries in sci/tech)
0115 R. Prague Czechs in History [or] Czechs Today [or] Spotlight (refer to 0015 H)
0130 R. Australia The Media Report (Mick O'Regan takes a critical look at the latest developments in the communications industries)
R. Netherlands The Weekly Documentary [refer to 0030 H]
0132 BBCWS(am) Westway (the week's first episode of this radio light drama)
Voice of Russia Musical Tales of St. Petersburg
0135 R. Canada Int. The Maple Leaf Mailbag (refer to M 0105)
0145 BBCWS(am) New Gods (exploring religious conversion) [3rd/10th]
Heart & Soul (how beliefs, values, religion influence lives) [17th/24th]
0154 Voice of Russia Russia: People & Events (history through events & personalities)

FRIDAY
0106 BBCWS(am) One Planet (the human impact on the natural world)
0130 R. Australia The Sports Factor (Warwick Hadfield presents reports which debate & celebrate the cultural significance of sport)
R. Netherlands Dutch Horizons [refer to 0030 F]
0132 BBCWS(am) The Word (novels, theatre, poetry, journalism, biography, history & anthropology) [exc. 25th]
World Book Club (focus on one book and author) [25th]
Voice of Russia Moscow Calling (popular contemporary Russian music)
0135 R. Canada Int. Business Sense [refer to S 0105]
0145 R. Sweden Nordic Lights (a monthly magazine on Scandinavia) [1st F]
Greenscan (Azariah Kiros highlights Swedish environmental concerns) [2nd F]
Heart Beat (Gaby Katz hosts a monthly health & medical magazine)[3rd F]
The S-Files (Kris Boswell takes you to the Sweden behind the headlines) [4th F]

SATURDAY
0100 WBCQ(7415kHz) Tasha Takes Control (upbeat progressive music)
0105 R. Australia Asia-Pacific Weekend Edition (regional reports)
R. New Zealand Int. Go Digital (refer to 0106 W BBCWS)
0106 BBCWS(am) Science in Actian (current developments in sci/tech)
0120 R. Budapest DX Corner (a report for radio habbyists)
China R. Int. Cutting Edge (science & technology in China)
0130 China R. Int. Listeners Garden (letters, language lesson & other features)
R. Australia The Chat Room (Heather Jarvis converses with Australians)
R. Netherlands A Good Life [refer to 0030 A]
R. New Zealand Int. The Saturday Comedy Zone
0132 BBCWS(am) Westway (the week's second episode of this radio light drama)
Voice of Russia Christian Message from Moscow (the Russian Orthodox Church)
0135 R. Canada Int. Sci-Tech File (refer to S 0135)
0145 BBCWS(am) What's the Problem? (advice about common problems)
VOA Special Eng. American Stories (short stories by American authors)

0200 UTC/ 10pm E/7pm P - Page 46 Freqs

DAILY
0200 BBCWS(am) The World Today (the BBC's agenda-setting flagship global news program)

SUNDAY
0200 WBCQ(7415kHz) Pan Global Wireless (satire, humor, variety)
WRMI(7385kHz) Wavescan (refer to 0230 M)
WWCR(5070kHz) DX Partyline (HCJB's longrunning program for DXers and SWLs hosted by Allen Graham)
0205 R. Australia Margaret Throsby (a guest is interviewed & presents favorite music)
R. New Zealand Int. A music documentary, series or feature
0211 Voice of Russia News & Views (Russia's views on news developments)
0215 R. Korea Int. Worldwide Friendship (a program promoting RKI's interactive contact with listeners)
0230 R. New Zealand Int. Health Matters or Environment Matters
R. Sweden Network Europe [or] Sweden Today [or] Spectrum [or] Studio 49 (refer to 0130 S)
WRMI(7385kHz) Viva Miami (R. Miami Int.'s listener magazine show)
WWCR(5070kHz) World of Radio (Glenn Hauser's comprehensive review of the week in international broadcasting)
0232 BBCWS(am) Global Business (trends & ideas shaping business)
Voice of Russia Songs from Russia (melodies & musical novelties from Russia's past)
0235 R. Habana Cuba The World of Stamps (perhaps the only program on philatelic matters)
R. New Zealand Int. The Band Programme (brass band music)
0246 Voice of Russia You Write to Moscow (listeners comment about VoR)

MONDAY-FRIDAY
0205 R. New Zealand Int. In Touch with NZ (an afternoon variety program w/Wayne Mowat)
0210 R. Australia The World Today (the ABC's lunchtime current affairs program)

MONDAY
0200 WBCQ(7415kHz) Radio New York International (continues from 0000)
0205 R. Habana Cuba From Havana (a showcase of contemporary Cuban music & musicians)
0211 Voice of Russia Sunday Panorama (a magazine focusing on the past week in Russia)
0215 R. Korea Int. Korean Pop Interactive (Korean cutting edge pop music, oldies & artist interviews)
R. Taiwan Int. Jade Bells & Bamboo Pipes (Carson Wong introduces selections of traditional Chinese music)
0230 R. Habana Cuba The Jazz Place (the very best of Cuban jazz) or Top Tens (contemporary Cuban hits)
R. Sweden In Touch with Stockholm [or] Sounds Nordic (refer to 0130 M)
WHRA(7580kHz) DXing with Cumbre (Marie Lamb with the latest DX catches)
WHRI(5745kHz) DXing with Cumbre (see above)
WRMI(7385kHz) Wavescan (Adventist World Radio's program for dxers & shortwave radio enthusiasts)
0232 BBCWS(am) World Business Review (analysis of global business developments)
0235 R. Budapest (refer to M 0105)
0245 BBCWS(am) The Instant Guide (concise explanations of topical subjects)

TUESDAY-SATURDAY
0215 R. Korea Int. Seoul Calling (daily feature magazine of Korean people, places & events)
0211 Voice of Russia News & Views (refer to 0211 S)
0230 R. Sweden Sixty Degrees North (refer to 0130 T-A)
0235 R. Budapest Hungary Today (refer to 0105 T-A)

TUESDAY
0232 BBCWS(am) World Business Report (the main business issues of the day)
Voice of Russia Kaleidoscope (the latest economic, social & cultural events in Russia & the CIS)
0245 BBCWS(am) Analysis (background to the stories in the news)
R. Korea Int. Korea Today & Tomarrow (the latest developments on the Korean peninsula)
R. Sweden Sports Scan (refer to 0145 T)

WEDNESDAY
0232 BBCWS(am) World Business Report (refer to 0232 T)
Voice of Russia Musical Tales of St. Petersburg
0245 BBCWS(am) Analysis (refer to 0245 T)
R. Korea Int. Korean Kaleidoscope (Korean social & economic life)
R. Sweden Close Up (refer to 0145 W) [1st W]
0254 Voice of Russia Russia: People & Events (refer to 0154 H)

THURSDAY
0215 R. Taiwan Int. Discover Taiwan (refer to 0330 F)
0232 BBCWS(am) World Business Report (refer to 0232 T)
Voice of Russia Moscow Yesterday & Today (refer to S 0132)
0245 BBCWS(am) From Our Own Correspondent (the background to international events from BBC correspondents around the world)
0245 R. Korea Int. Wonderful Korea (a travelogue)

FRIDAY
0232 BBCWS(am) World Business Report (the main business issues of the day)
Voice of Russia Russian by Radio (a language lesson)
0245 BBCWS(am) Analysis (refer to 0245 T)
R. Korea Int. Seoul Report (interviews with Koreans & visitors to Korea from all walks of life)
R. Sweden Nordic Lights [or] Greenscan [or] Heart Beat [or] The S-Files (refer to 0145 F)

SATURDAY
0205 R. Australia Background Briefing (refer to 0010 H)
R. New Zealand Int. Eureka! (reports on science in NZ with Vernonika Meduna)
0230 R. New Zealand Int. Health Matters [or] Environment Matters
0232 BBCWS(am) World Business Report (refer to 0232 T)
Voice of Russia Audio Book Club (readings from the best of Russian classic & contemporary literature)
0245 BBCWS(am) Analysis (refer to 0245 T)

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0300 UTC/ 11pm E/8pm P - Page 46 Freqs

SUNDAY
0300 WBCQ(7415kHz) Michael Ketter (satire in the tradition of Firesign Theatre)
WRMI(7385kHz) World Radio Network relay
0305 R. Australia Australian Express (Roger Broadbent with reports on life in Australia)
R. New Zealand Int. RPM (NZ & internatianal acoustic features & documentaries)
R. Prague Magazine (refer to 0105 S)
0306 BBCWS(am) From Our Own Correspondent (background from the BBC's global correspondents)
0310 R. Prague Letter from Prague (refer to 0110 S)
0311 Voice of Russia Music & Musicians (concerts by world famous performers & composers)
0315 R. Prague One on One (refer to 0115 S)
0320 China R. Int. CRI Raundup
0330 China R. Int. In the Spotlight (refer to S 0130)
R. Australia Jazz Notes (with Ivan Lloyd)
0332 BBCWS(am) The Interview (the people, ideas & trends shaping our world)
0335 R. Habana Cuba DXers Unlimited (Arnie Cora presents a program for radio enthusiasts)

MONDAY-FRIDAY
0300 VOA Africa Daybreak Africa (morning news, music & features magazine for Africa)
0308 R. New Zealand Int. Dateline Pacific (news from the Pacific with interviews & features)
0320 R. Australia Life Matters (a daily interview program about social change & day-to-day life)
0345 BBCWS(am) Off the Shelf (abridged serialized readings of novels, stories & other literature)

MONDAY
0300 KWHR(17510kHz) DXing with Cumbre (refer to 0230 S)
R. Habana Cuba Weekly Review (Cuba's perspective on current events)
WBCQ(7415kHz) Radio New York Internatianal (continues from 0000)
WRMI(7385kHz) Old Time Radio (classic shows fram radia's early years)
0305 R. Prague Mailbox (refer to 0105 M)
0306 BBCWS(am) Talking Point (listeners & internet users question guests on current affairs)
0311 Voice of Russia This is Russia
0315 R. Prague Czech Books [or] Encore [or] Magic Carpet (refer to 0115 M)
Radio Taiwan Int. Taiwan Economic Journal
0330 China R. Int. People in the Know (refer to 0130 M)
R. New Zealand Int. New Music Releases
0332 Voice of Russia Moscow Calling (refer to 0132 F)
0335 R. Habana Cuba The Mailbag Show (listener letters)

TUESDAY
0306 BBCWS(am) Outlook (topical magazine of people & places)
0311 Voice of Russia Musical Tales of St. Petersburg
0315 R. Taiwan Int. Jade Bells & Bamboo Pipes (refer to 0215 M)
0330 China R. Int. Biz China (refer to 0130 T)
R. New Zealand Int. RNZI Talk (RNZI staff, developments, projects & programs) [or] Mailbox (letters, DX news, & answers to swl technical questions)
0332 Voice of Russia The River of Time (significant events & prominent personalities)

WEDNESDAY
0306 BBCWS(am) Outlook (topical magazine of people & places)
0311 Voice of Russia Moscow Mailbag (refer to 0111 S)
0330 R. New Zealand Int. Tradewinds (Walter Zweifel with a weekly report on Pacific regional business & economic news)
0335 R. Habana Cuba DXers Unlimited (refer to S 0340)

THURSDAY
0306 BBCWS(am) Outlook (topical magazine of people & places)
0311 Voice of Russia Science Plus
0315 R. Prague Czechs in History [or] Spotlight (refer to 0115 H)
R. Taiwan Int. Instant Noodles (news of "the wacky")
0330 R. New Zealand Int. The World in Sport (Dmitri Edwards presents highlights of the world's sporting week with emphasis on NZ & the Pacific)
0332 Voice of Russia The River of Time (refer to 0332 T)

FRIDAY
0306 BBCWS(am) Outlook (topical magazine of people & places)
0311 Voice of Russia Newmarket (analyses of Russian business, domestic and international)
0330 China R. Int. Life in China (refer to F 0130)
R. New Zealand Int. Pacific Correspondent (RNZI's regional correspondents talk to Don Wiseman about political & social issues in their respective Pacific countries)
0340 R. Australia Jazz Notes (Australian jazz presented by Ivan Lloyd)

SATURDAY
0305 R. Australia Rural Reporter (news & stories from rural & regional Australia)
0306 BBCWS(am) Pick of the World (a revue of the BBC's best)
R. New Zealand Int. Home Grown (Liz Barry plays contemporary Kiwi music)
0311 Voice of Russia Moscow Mailbag (refer to 0111 S)
0330 R. Australia Australian Country Style (Australian country music with John Nutting)
R. New Zealand Int. Musical Chairs (the music & background of a featured NZ musician)
0332 Voice of Russia The River of Time (refer to 0332 T)
0340 R. Taiwan Int Mailbag Time (listener letters to RTI)
0345 BBCWS(am) Write On (Dilly Barlow & Penny Vine read your letters to BBC)

0400 UTC/ 12am E/9pm P - Page 47 Freqs

DAILY
0400 BBCWS(am) World Briefing (a comprehensive report on the latest news)

SUNDAY
0400 R. Netherlands Europe Unzipped (the events of the past week in Europe, some unusual)
R. Vlaanderen Int. Music from Flanders (a half-hour of Flemish music, musicians & musical performances)
WBCQ(7415kHz) Tom & Darryl (discussing satellite TVRO, shortwave, low power FM & the Internet)
WRMI(7385kHz) World Radio Network relay
WWCR(5070kHz) Cyberline (discussion about digital communications)
0405 Deutsche Welle Inside Europe (a weekly hour-long newsmagazine exploring the issues shaping the continent)
R. Australia The Europeans (perspectives on European societies)
R. New Zealand Int. Sunday Drama (classic & contemporary radio drama)
0411 Voice of Russia Musical Tales of St. Petersburg
0418 R. Netherlands Insight (Rob Green casts a critical & humorous eye on the past week's headlines)
0420 China R. Int. CRI Roundup
0430 China R. Int. In the Spotlight (refer to 0120 S)
R. Australia The Chat Room (refer to 0130 A)
R. Netherlands Amsterdam Forum (an interactive discussion of topical issues)
0432 BBCWS(am) Letter from America (the best of Alistair Cooke's weekly essays on life in America)
Voice of Russia Kaleidoscope (refer to 0232 T)
0445 BBCWS(am) The Instant Guide (refer to 0245 M)

MONDAY-FRIDAY
0400 WBCQ(7415kHz) Amos 'n Andy (the classic radio comedy from America's radio past)
0405 Deutsche Welle Mailbag Africa (a listener contact program keying on DW's African audience)
R. New Zealand Int. In Touch with New Zealand (cont'd from 0205)
0410 R. Australia Margaret Throsby (refer to 0205 S)
0430 R. New Zealand Int. What's Going On? (Lynn Freeman looks at NZ's arts & entertainment scene)
0432 BBCWS(am) The World Today (the BBC's agenda-setting flagship news program)

MONDAY
0400 R. Netherlands Wide Angle (a single issue examined in-depth)
R. Vlaanderen Int. Radio World (Frans Vossen's weekly report about international radio)
WRMI(7385kHz) World Radio Network relay
0410 R. Habana Cuba From Havana (refer to M 0210)
0411 Voice of Russia Musical Tales of St. Petersburg
0415 WBCQ(7415kHz) World of Radio (refer to 0230 S WWCR)
0418 R. Netherlands Insight (refer to 0418 S)
0422 R. Netherlands The Week Ahead (on RN)
0430 China R. Int. People in the Know (refer to M 0130)
R. Habana Cuba The Jazz Place or Tap Tens (refer to M 0230)
R. Netherlands Vox Humana (stories about the power of the "human voice")
0432 Voice of Russia Audio Book Club (refer to 0232 A)

TUESDAY-SATURDAY
0400 R. Netherlands Newsline (refer to 0000 T-A)
R. Vlaanderen Int. Flanders Today (various reports from around the country, with a selection from the CD of the Week)
0405 Deutsche Welle Newslink Africa (current affairs magazine with emphasis on Africa)

TUESDAY
0411 Voice of Russia Moscow Mailbag (refer to 0111 S)
0430 China R. Int. Biz China (refer to T 0130)
Deutsche Welle Insight (putting the news in perspective)
R. Netherlands The Research File (refer to 0030 T)
0432 Voice of Russia Music Araund Us (refer to 0132 F)
0445 Deutsche Welle Business German (the German language in the world marketplace)
0447 Voice of Russia Music At Your Request

WEDNESDAY
0411 Voice of Russia Science Plus (refer to 0311 H)
0430 Deutsche Welle World in Progress (a fresh look at development issues)
R. Netherlands EuroQuest (refer to 0030 W)
0432 Voice of Russia Moscow Yesterday & Today (refer to 0132 S)

THURSDAY
0411 Voice of Russia Newmarket (refer to 0311 F)
0430 Deutsche Welle Money Talks (a weekly finance & economics magazine)
R. Netherlands The Weekly Documentary (refer to 0030 H)
0432 Voice of Russia Folk Box (refer to 0132 T)

FRIDAY
0411 Voice of Russia Moscow Mailbag (refer to 0111 S)
0430 China R. Int. Life in China (refer to F 0130)
Deutsche Welle Living Planet (a weekly magazine examining major environmental developments)
R. Netherlands Dutch Horizons (refer to 0030 F)
0432 Voice of Russia Audio Book Club (refer to 0232 A)

SATURDAY
0405 R. Australia Books & Writing (Ramona Koval talks with authors)
R. New Zealand Int. Home Grown (cont'd from 0306)
0411 Voice of Russia This is Russia
0430 Deutsche Welle Spectrum (a weekly look at developments in the fields of science & technology)
R. Netherlands The Good Life (refer to 0030 A)
0432 BBCWS(am) Reporting Religion (Trevor Barnes on religion & the world)
Voice of Russia Timelines (refer to 0132 M)
0434 R. Australia Book Talk (Amanda Smith with reviews & critical discussions)

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0500 UTC/ 1am E/10pm P - Page 47 Freqs

SUNDAY
0500 WBCQ(7415kHz) Juliet's Wild Kingdom (an eclectic show in the pirate radio tradition)
WRMI(7385kHz) World Radio Network relay
0505 Deutsche Welle Religion & Society (insight into religious events throughout the world)
R. Australia All in the Mind (the mind, the brain & behavior with Natasha Mitchell)
0510 R. Japan Pop Joins the World (Asian countries through their popular music)
R. New Zealand Feature on religion & spirituality in NZ
0515 Deutsche Welle German by Radio (a weekly language lesson)
0520 China R. Int. CRI Roundup
0530 China R. Int. In the Spotlight (refer to S 0130)
Deutsche Welle Africa This Week (a weekly comprehensive look at Africa hosted by Carla Gehrmann-Zellen)
R. Australia The Ark (Rachael Kohn examines religious history)
0535 R. Habana Cuba DXers Unlimited (refer to S 0140)
0540 R. New Zealand Int. Jazz Spotlight

MONDAY-FRIDAY
0505 R. New Zealand Int. Checkpoint (RNZ National Radio's flagship evening news program)[repeats at 0705]
0510 R. Australia Pacific Beat (RA's daily current events & features magazine focusing on the Pacific island nations)
0515 R. Japan 44 Minutes (a daily current affairs magazine about Japan & Asia)

MONDAY
0500 R. Habana Cuba Weekly Review (refer to S 0100)
WRMI(7385kHz) World Radio Network relay
0505 Deutsche Welle Hard to Beat (the latest in sports from Germany & the world)
0515 Deutsche Welle Inspired Minds (profiles of & interviews with creative & industrious people)
0530 China R. Int. People in the Know (refer to M 0130)
Deutsche Welle Hits in Germany (with Deborah Friedman)[fortnightly]
Melody Time (light classical favorites with Diane Ericksan) [fortnightly]
0535 R. Habana Cuba The Mailbag Show (listener letters)

TUESDAY-SATURDAY
0505 Deutsche Welle Newslink Africa (refer to T-A 0405)

TUESDAY
0530 China R. Int. Biz China (refer to T 0130)
Deutsche Welle A World of Music (concerts of all types of music)

WEDNESDAY
0530 Deutsche Welle Arts on the Air (an award-winning weekly cultural magazine)
0535 R. Habana Cuba DXers Unlimited (refer to S 0135)

THURSDAY
0530 Deutsche Welle Living in Germany (aspects of life in Germany)
0545 Deutsche Welle Europe in Capitals (profiles of Europe's capital cities)

FRIDAY
0530 China R. Int. Life in China (a weekly magazine focusing on the lives of ordinary people in China)
Deutsche Welle Cool! (the latest in youth culture in Germany & abroad)

SATURDAY
0500 WHRI Dxing with Cumbre (Marie Lamb with the hottest DX catches)
0505 R. Australia Australian Express (refer to 0305 A)
0510 R. Japan Hello from Tokyo (listener letters, music & short features)
R. New Zealand Int. Tagata o te Moana (Anita Purcell presents a weekly Pacific magazine with NZ & regional Pacific news, issues, information & music)
0520 R. Australia Lingua Franca (a program about language & its social, cultural & historical ramifications)
0530 Deutsche Welle Focus on Folk (Angelika Ditscheid with some real German folk music, the places it comes from & the people who make it)
0532 R. Australia All in the Mind (refer to 0505 S)

0600 UTC/ 2am E/11pm P - Page 48 Freqs

SUNDAY
0605 Deutsche Welle Inside Europe (refer to 0405 S)
R. Australia The Buzz (the week's big technology news & issues presented by Richard Aedy)
0607 R. New Zealand Int. Mana Korero (Maori current affairs magazine)
0610 R. Japan Weekend Japanology (a multifaceted exploration of Japan)
0630 R. Australia In Conversation (refer to 0130 S)
WHRI(5745kHz) Dxing with Cumbre (Marie Lamb with the hottest DX catches))
0654 R. Japan Sights & Sounds of Japan

MONDAY-FRIDAY
0607 R. New Zealand Int. Worldwatch (the stories behind international headlines)
0610 R. Japan Sangs for Everyone
0615 R. Japan Asian Tap News (the day's major stories as reported by the region's radio stations)
0622 R. New Zealand Int. Pacific Report (news of the Pacific Region)
0645 R. New Zealand Int. Storytime (children's stories)

MONDAY
0605 Deutsche Welle Mailbag Africa (refer to M 0405)
0610 R. Habana Cuba From Havana (refer to M 0210)
0620 R. Australia Ockham's Razor (refer to 0030 A)
0625 R. Japan Japan Music Treasure Box (classic Japanese popular music)
0630 R. Habana Cuba The Jazz Place or Tap Tens (refer to M 0230)
R. New Zealand Int. Letter from America (refer to 0432 S BBCWS)
0633 R. Australia Hit Mix (refer to 0630 A)

TUESDAY-SATURDAY
0605 Deutsche Welle Newslink Africa (refer to T-A 0405)

TUESDAY
0620 R. Australia In Conversation (refer to 0130 S)
0625 R. Japan Basic Japanese for You (a Japanese language lesson for beginners)
0630 Deutsche Welle Insight (refer to T 0430)
R. New Zealand Int. Today in Parliament
0633 R. Australia Music Deli (Paul Petran with music from around the world)
0645 Deutsche Welle Business German (refer to T 0445)

WEDNESDAY
0620 R. Australia Lingua Franca (refer to 0045 S)
0625 R. Japan Japan Musicscape (life in Japan presented through music & writings on a selected theme)
0630 Deutsche Welle World in Progress (refer to W 0430)
R. New Zealand Int. Today in Parliament
0633 R. Australia Jazz Notes (with Ivan Lloyd)

THURSDAY
0620 R. Australia The Ark (refer to 0530 S)
0625 R. Japan Brush Up Your Japanese (an intermediate course in Japanese)
0630 Deutsche Welle Money Talks (refer to H 0430)
R. New Zealand Int. Today in Parliament
0633 R. Australia Australian Country Style (refer to 0330 A)

FRIDAY
0620 R. Australia Inside Out (the personal views of Pacific communities)
0625 R. Japan Music Beat (contemporary Japanese popular music)
0630 Deutsche Welle Living Planet (refer to F 0430)
R. New Zealand Int. Focus on Politics
0633 R. Australia The Chat Room (refer to 0130 A)

SATURDAY
0600 KWHR(17780kHz) Dxing with Cumbre (refer to 0630 A)
0605 R. Australia Verbatim (oral histories with David Mark)
0607 R. New Zealand Int. The Music Mix (interviews & live recordings from contemporary rock musicians)
0610 R. Japan Pop Joins the World (Asian countries through their popular music)
0630 Deutsche Welle Spectrum (refer to A 0430)
R. Australia Hit Mix (Brendon Telfer with what's new on the Australian music scene)
WWCR(3210kHz) World of Radio (refer to 0230 S)

1000 UTC/6am E/3am P - Page 49 Freqs

SUNDAY
1005 R. Australia Keys to Music (refer to 0005 Sun.)
1006 BBCWS(am) All in a Day's Work (refer to 0006 H)[6th/13th]
A documentary series [20th/27th]
1012 R. New Zealand Int. Mediawatch (analyses of recent media events & trends in NZ)
1032 BBCWS(am) In Praise of God (services of worship)
1038 R. New Zealand Int. Sunday Supplement (the views of New Zealanders)

MONDAY
1030 R. Australia The Health Report (Dr. Norman Swan's weekly report on health & medical issues)

MONDAY-FRIDAY
1000 BBCWS(am) World Briefing (a comprehensive report on the latest news)
R. New Zealand Int. Late Edition (major domestic evening news magazine)
1005 R. Australia Asia-Pacific (refer to 0100 M-F)
1032 BBCWS(am) World Business Report (a guide through the day's business issues)
1045 BBCWS(am) Sports Roundup

TUESDAY
1030 R. Australia The Law Report (Damien Carrick presents breaking legal stories in Australia & overseas)

WEDNESDAY
1030 R. Australia The Religion Report (Stephen Crittenden examines the way religion & societies interact)

THURSDAY
1030 R. Australia The Media Report (Mick O'Regan takes a critical look at the latest developments in the communications industry)

FRIDAY
1030 R. Australia The Sports Factor (presents reports which debate & celebrate the cultural significance of sport)

SATURDAY
1005 R. Australia Background Briefing (refer to 0205 A)
1006 BBCWS(am) Assignment (refer to 0006 F)
1012 R. New Zealand Int. Deep Purple (relaxing, thoughtful & nostalgic music)
1030 WWCR(5070kHz) World of Radio (refer to 0230 S)
1032 BBCWS(am) World Football (Alan Green reports on football around the globe)

1100 UTC/ 7am E/4am P - Page 50 Freqs

DAILY
1100 BBCWS(am) World Briefing (a comprehensive report on the latest news)
China R. Int. Realtime Beijing (daily magazine for English-speaking residents of Beijing)
1120 BBCWS(am) British News

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SUNDAY
1105 R. Australia Sunday Profile (Geraldine Doogue with in depth analysis of the news)
R. New Zealand Int. New Zealand Forces Program (a two hour package of programs designed specifically for NZ military & civilian personnel stationed in East Timor & Papua-New Guinea)
1106 R. Netherlands Wide Angle (a weekly in-depth look at a news topic)
1110 R. Japan Hello from Tokyo (listener letters, music & short features)
1115 China R. Int. China Beat (popular music in China)
1125 R. Netherlands The Week Ahead (on RN)
1130 R. Australia Speaking Out (a program about Aboriginal & Torres Strait Islander people)
R. Netherlands Vox Humana (stories about the power of the "human voice")
R. Sweden In Touch with Stockholm (refer to 0130 M) [1st S]
Sounds Nordic (refer to 0130 M) [exc. 1st S]
1132 BBCWS(am) Letter from America (refer to 0432 S)
1145 BBCWS(am) Sports Round-up (all the daily sporting news worldwide)

MONDAY-FRIDAY
1100 R. Netherlands Newsline (news, analysis & background reports)
1105 BBCWS(am) Caribbean Morning Report (the latest news in the Caribbean)
R. Australia Asia-Pacific (refer to 0100 M-F)
1108 R. New Zealand Int. Dateline Pacific (refer to 0308 M-F)
1110 BBCWS(am) Sports Caribbean
R. Japan Songs for Everyone
1115 BBCWS(am) Caribbean Magazine (a regional current affairs & feature program)
R. Japan Asian Top News (the day's major stories as reported by the region's radio stations)
1130 R. Sweden Sixty Degrees North (refer to 0130 T-A)

MONDAY
1125 R. Japan Japan Music Treasure Box (refer to M 0625)
1130 R. Australia Bush Telegraph (an entertaining look at Australian rural & regional issues)
R. Netherlands The Research File (a magazine emphasizing the relevance of science to all our lives)
R. New Zealand Int. RNZI Talk [or] Mailbox (refer to 0330 T)
1132 BBCWS(am) The Instant Guide (refer to 0445 S)
1145 BBCWS(am) Sports Round-up
R. Sweden Sports Scan (refer to 0145 T)

TUESDAY
1125 R. Japan Basic Japanese for You (refer to T 0625)
1130 R. Australia Bush Telegraph (refer to 1130 M)
R. Netherlands EuroQuest (a magazine placing Europe in context)
R. New Zealand Int. Tradewinds (refer to 0330 W)
1132 BBCWS(am) Analysis (background to stories in the news)
1145 BBCWS(am) Sports Round-up
R. Sweden Close Up (refer to 0145 W)[1st T]

WEDNESDAY
1125 R. Japan Japan Musicscape (refer to W 0625)
1130 R. Australia Bush Telegraph (refer to 1130 M)
R. Netherlands The Weekly Documentary (RN's award-winning sound essays & in-depth investigations)
R. New Zealand Int. The World in Sport (refer to 0330 H)
1132 BBCWS(am) Analysis (refer to 1132 T)
1145 BBCWS(am) Sports Round-up

THURSDAY
1125 R. Japan Brush Up Your Japanese (refer to 0625 H)
1130 R. Australia Bush Telegraph (refer to 1130 M)
R. Netherlands Dutch Horizons (Bertine Krol chronicles life in Holland)
R. New Zealand Int. Pacific Correspondent (refer to 0330 F)
1132 BBCWS(am) From Our Own Correspondent (refer to 0306 S)
1145 BBCWS(am) Sports Round-up
R. Sweden Nordic Lights [or] Greenscan [or] Heart Beat [or] The S-Files (refer to 0145 F)

FRIDAY
1125 R. Japan Music Beat (refer to 0625 F)
1130 R. Australia The Chat Room (refer to 0130 A)
R. Netherlands A Good Life (how development affects societies)
R. New Zealand Int. Sports Story (a sport profile or documentary)
1132 BBCWS(am) Analysis (refer to 1132 T)
1145 BBCWS(am) Football Extra (the main matches of the weekend)

SATURDAY
1105 R. Australia Asia Pacific Weekend Edition (refer to 0105 A)
R. New Zealand Int. New Zealand Forces Program (refer to 1105 S)
1106 R. Netherlands Europe Unzipped (the events of the past week in Europe, some unusual)
1110 R. Japan Pop Joins the World (refer to A 0610)
1115 China R. Int China Roots (traditional Chinese music)
1125 R. Netherlands Insight (Rob Green casts a critical & humorous eye on the past week's headlines)
1130 R. Australia All in the Mind (refer to 0505 S)
R. Netherlands Amsterdam Forum (an interactive discussion of topical issues) ..
R. Sweden Network Europe [or] Sweden Today [or] Spectrum [or] Studio 49 (refer to 0130 S)
1132 BBCWS(am) Analysis (refer to 1132 T)
1145 BBCWS(am) Sports Round-up

1200 UTC 8am E/5am P - Page 50 Freqs

DAILY
1200 BBCWS(am) Newshour (an hour of news & analysis from around the globe)

SUNDAY
1205 R. Australia The Spirit of Things (Dr. Rachael Kohn explores contemporary values & beliefs as expressed through ritual, art, music, & sacred texts)
R. New Zealand Int. Sportsworld (a round-up of the weekend's sporting events in & around NZ)
1210 R. Korea Int. Korean Pop Interactive (Korean cutting edge pop music, oldies & artist interviews)
1230 R. Sweden In Touch with Stockholm (refer to 0130 M) [1st S]
Sounds Nordic (refer to 0130 M) [exc. 1st S]

MONDAY-FRIDAY
1205 BBCWS(am) Caribbean Business (a report on regional commerce & economics)
R. New Zealand Int. Late Edition (repeat of 1005 program)
1210 BBCWS(am) Caribbean Morning Report (the latest news in the Caribbean)
1210 R. Canada Int. The Current (Anna Maria Tremonti with perspectives, ideas & voices)
1215 R. Korea Int. Seoul Calling (daily feature magazine of Korean people, places & events)
1220 BBCWS(am) Caribbean Magazine
1230 R. Sweden Sixty Degrees North (refer to 0130 T-A)

MONDAY
1205 R. Australia Late Night Live (Philip Adams interviews the major newsmakers, philosophers, artists & trendsetters in Australia & around the world)
1245 R. Korea Int. Korea Today & Tomorrow (latest developments on the Korean peninsula)
1245 R. Sweden Sports Scan (refer to 0145 T)

TUESDAY
1205 R Australia Late Night Live (refer to M 1205)
1245 R. Korea Int. Korean Kaleidoscope (a magazine of Korean social & economic life)
R Sweden Close Up (refer to 0145 W)[1st T]

WEDNESDAY
1205 R Australia Late Night Live (refer to M 1205)
1245 R Korea Int. Wonderful Korea (touring Korea)

THURSDAY
1205 R. Australia Late Night Live (refer to M 1205)
1245 R Korea Int. Seoul Report (interviews with Koreans & visitors to Korea from all walks of life)
R. Sweden Nordic Lights [or] Greenscan [or] Heart Beat [or] The S-Files (refer to 0145 F)

FRIDAY
1205 R. Australia Sound Quality (Tim Ritchie seeks out the interesting, the evolutionary, the inaccessible & the wonderful in music)

SATURDAY
1200 WRMI(15725kHz) World Radio Network relay
1205 R. Australia The Music Show (Andrew Ford with music, interviews & information about the latest developments in the music field)
R. New Zealand Int. New Zealand Forces Program (cont'd from 1105)
1210 R. Korea Int. Worldwide Friendship (a program promoting RKI's interactive contact with listeners)
1230 HCJB Ecuador DX Partyline (program for DXers & SWLs hosted by Allen Graham)
R. Sweden Network Europe [or] Sweden Today [or] Spectrum [or] Studio 49 (refer to 0130 S)
WHRI(9495kHz) Dxing with Cumbre (Marie Lamb with the hottest DX catches)

1300 UTC/ 9am E/6am P - Page 51 Freqs

SUNDAY
1305 R. Australia Encounter (connections between religion & life in multicultural Australia)
1306 BBCWS(am) From Our Own Correspodent (refer to 0306 S)
1310 R. Canada Int. The Sunday Edition (a weekly magazine reflecting on politics, society & culture, hosted by Michael Enright)
1320 China R. Int. CRI Roundup
1330 China R. Int. In the Spotlight (Chinese arts & cultural magazine)
1332 BBCWS(am) The Interview (refer to 0332 S)

MONDAY-FRIDAY
1305 R. Australia The Planet (Lucky Oceans with a rich mix of jazz, blues, folk styles, art music & more)
1306 BBCWS(am) Outlook (topical magazine of people, places & events)
1310 R. Canada Int. Sounds Like Canada (a lively mix from all over the country)
1345 BBCWS(am) Off the Shelf (abridged serialized readings of novels, stories & other literature)

MONDAY
1330 China R. Int. People in the Know (interviews with prominent Chinese who are shaping the nation's future)

TUESDAY
1330 China R. Int. Biz China (refer to T 0130)

FRIDAY
1330 China R. Int. Life in China (a weekly magazine focusing on the lives of ordinary people in China)

SATURDAY
1300 WRMI(15725kHz) World Radio Network relay
1305 BBCWS(am) Pick of the World (refer to 0306 A)
R. Australia The Music Show (cont'd from 1205)
1310 R. Canada Int. The House (a review of the week in Canadian national politics)
1345 BBCWS(am) Write On (refer to 0345 A)

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1400 UTC/ 10am E/7am P - Page 51 Freqs

SUNDAY
1400 WRMI(15725kHz) Wavescan (refer to 0230 M)
1405 R. Australia The Science Show (with Robyn Williams)
R. Canada Int. The Sunday Edition (cont'd from 1310)
1406 BBCWS(am) Talking Point (live, global phone-in with expert guests)
1410 R. Japan Pop Joins the World (Asian countries through their popular music)
1420 China R. Int. In the Spotlight (Chinese arts & cultural magazine)

MONDAY-FRIDAY
1405 R. Australia Margaret Throsby (refer to 0205 S)
R. Canada Int. Sounds Like Canada (continues from 1310)
1415 R. Japan 44 Minutes (current affairs magazine about Japan & Asia)

MONDAY
1406 BBCWS(am) A documentary series
1430 China R. Int. People in the Know (interviews with prominent Chinese who are shaping the nation's future)
1432 BBCWS(am) The Music Feature (features & documentaries on current musical genres)

TUESDAY
1406 BBCWS(am) Masterpiece (refer to 0006 W)
1430 China R. Int. Biz China (refer to T 0130)
1432 BBCWS(am) White Label (refer to 0032 W)

WEDNESDAY
1406 BBCWS(am) All in a Day's Work (refer to 0006H) [2nd/9th]
A documentary series [16th/23rd/30th]
1432 BBCWS(am) Charlie Gillett (refer to 0032 H)

THURSDAY
1406 BBCWS(am) Assignment (refer to 0006 F)
1432 BBCWS(am) The Music Biz (refer to 0032 F)

FRIDAY
1406 BBCWS(am) Sports International (refer to 0006 A)
1430 China R. Int. Life in China (a weekly magazine focusing on the lives of ordinary people in China)
1432 BBCWS(am) John Peel (refer to 0032 A)

SATURDAY
1400 WRMI(15725kHz) World Radio Network relay
1405 R. Australia Background Briefing (refer to 0005 H)
R. Canada Int. The Vinyl Cafe (Stuart McLean plays music & weaves tales)
1406 BBCWS(am) Sportsworld (live commentary on major sports events & fixtures)
1410 R. Japan Weekend Japanology (a multifaceted exploration of Japan)

1500 UTC/ 11am E/8am P - Page 52 Freqs

SUNDAY
1500 WRMI(15725kHz) Shortwave Radio Network (refer to 1200 A)
1505 R. Australia The National Interest (refer to 0010 W)
R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
R. Canada Int. The Sunday Edition (continues from 1310)
1506 BBCWS(am) All in a Day's Work (refer to 0006H) [6th/13th]
A documentary series [20th/27th]
1510 R. Japan Hello from Tokyo (refer to S 1110)
1530 WHRI(15105kHz) DXing with Cumbre (refer to 1230 A)
1532 BBCWS(am) In Praise of God (refer to 1032 S)
1535 R. Austria Int. Network Europe (repeat of 1505)

MONDAY-FRIDAY
1505 R. Australia Asia-Pacific (refer to 0100 M-F)
1510 R. Austria Int. Report from Austria (refer to 0115 T-A)
R. Japan Songs for Everyone
1515 R. Japan Asian Top News (the day's major stories as reported by the region's radio stations)
1540 R. Austria Int. Report from Austria (repeat of 1510)

MONDAY
1506 BBCWS(am) Health Matters (refer to 0106 T)
1525 R. Japan Japan Music Treasure Box (classic Japanese popular music)
1530 R. Australia The Health Report (refer to C130 M)
1532 BBCWS(am) Arthur Smith Presents... (refer to 0132 T)
1545 R. Canada Int. Out Front (a place for new ideas, new ways of making radio & new voices from across Canada)

TUESDAY
1506 BBCWS(am) Go Digital (refer to 0106 W)
1525 R. Japan Basic Japanese for You (a language course for beginners)
1530 R. Australia The Law Report (refer to 0130 T)
1532 BBCWS(am) Music Review (refer to 0132 W)
1545 R. Canada Int. Out Front (refer to M 1545)

WEDNESDAY
1506 BBCWS(am) Discovery (refer to 0106 H)
1525 R. Japan Japan Musicscape (life in Japan presented through music & writings on a selected theme)
1530 R. Australia The Religian Report (refer to 0130 W)
1532 BBCWS(am) Westway (refer to 0132 H)
1545 BBCWS(am) New Gods (refer to 0145 H) [5th/12th]
Heart & Soul (refer to 0145 H) [19th/26th]
R. Canada Int. Out Front (refer to M 1545)

THURSDAY
1506 BBCWS(am) One Planet (refer to 0106 F)
1525 R. Japan Brush Up Your Japanese (an intermediate language course)
1530 R. Australia The Media Report (refer to 0130 H)
1532 BBCWS(am) The Word (refer to 0132 F) [3rd/10th/17th]
World Book Club (refer to 0132 F) [24th]
1545 R. Canada Int. Out Front (refer to M 1545)

FRIDAY
1506 BBCWS(am) Science in Action (reports on science & technology)
1525 R. Japan Music Beat (contemporary Japanese hits)
1530 R. Australia The Sports Factor (refer to 0130 F)
R. Canada Int. C'est La Vie (a program about life in Quebec & French-speaking Canada)
1532 BBCWS(am) Westway (refer to 0132 A)
1545 BBCWS(am) What's the Problem? (refer to 0145 A)

SATURDAY
1500 WHRI(13760kHz) Dxing with Cumbre (Marie Lamb with the hottest DX catches)
WRMI(15725kHz) World Radio Network relay
1505 R. Australia An educational series
R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
R. Canada Int. Quirks & Quarks (what's new & next in science)
R. Japan Hello from Tokyo (refer to S 1110)
1506 BBCWS(am) Sportsworld (continues from 1406)
1532 R. Australia Australian Express (refer to 0305 A)
1535 R. Austria Int. Insight Central Europe (repeat of 1505)

1600 UTC/ 12pm E/9am P - Page 52 Freqs

SUNDAY
1600 VOA Africa Nightline Africa (Ted Roberts with news & sports from Africa)
WRMI(15725kHz) Shortwave Radio Network (refer to 1200 A)
1605 R. Australia Books & Writing (refer to 0405 A)
1606 BBCWS(am) Sunday Sportsworld (refer to 1406 A)
1634 R. Australia Book Talk (refer to 0434 A)

MONDAY-FRIDAY
1600 BBCWS(am) Europe Today (news, analysis & comment on issues & events on the continent)
VOA Africa News Now (continuous rolling newscast)
1605 R. Australia Bush Telegraph (refer to 1130 M)
1630 VOA Africa Africa World Tonight (live evening news magazine)

SATURDAY
1600 VOA Africa Nightline Africa [refer to S 1600]
WBCQ(17495kHz) Allan Weiner Worldwide
WRMI(15725kHz) World Radio Network relay
1605 BBCWS(am) Sportsworld (cont'd from 1405)
R. Australia Hindsight (refer to 0005 F)

1700 UTC/ 1pm E/10am P - Page 53 Freqs

DAILY
1700 R. Japan News (a round-up of Asian & world news)

SUNDAY
1705 R. Australia Sound Quality (refer to 1205 F)
VOA Africa Reporters Roundtable (Ashenafi Abedje moderates this lively roundtable of VOA journalists, bringing you analysis of the major news developments in Africa)
1710 R. Japan Pop Joins the World (refer to S 1410)
1730 VOA Africa Music Time in Africa (Rita Rochelle with the best of traditional & modern African music)[two editions; part two at 1930]

MONDAY-FRIDAY
1705 R. Australia Australia Talks Back (a daily countrywide call-in on topical national issues)
VOA Africa Talk to America (a worldwide call-in show featuring American decisionmakers, personalities & experts)
1710 R. Japan Songs for Everyone
1715 R. Japan 44 Minutes (current affairs magazine about Japan & Asia)

SATURDAY
1700 VOA Africa News Now (continuous rolling newscast)
WBCQ(17495kHz) Zombo's Mondo Record Party
WRMI(15725kHz) World Radio Network relay
1705 R. Australia The Spirit of Things (refer to 1205 S)
1710 R. Japan Hello from Tokyo (refer to S 1110)
1733 VOA Africa Press Conference USA (journalists question newsmakers)

2100 UTC/ 5pm E/2pm P - Page 55 Freqs

SUNDAY
2100 WBCQ(7415kHz) Radio Free Euphoria (Captain Ganja's unique form of "variety" show)
WHRI(5745kHz) Dxing with Cumbre (Marie Lamb with the hottest DX catches)
2105 Deutsche Welle Hard to Beat (the latest in sports from Germany & the world)
2106 BBCWS(am) Everywoman (refer to 0006 M)
2110 R. Australia AM (ABC Radio's flagship morning news magazine)
2115 Deutsche Welle Inspired Minds (profiles of & interviews with creative & industrious people)
2130 Deutsche Welle Hits in Germany (with Deborah Friedman)[fortnightly]
Melody Time (light classical favorites with Diane Erickson) [fortnightly]
R. Australia Country Breakfast (Australia beyond the urban fringe)
2132 BBCWS(am) Westway Omnibus (refer to 0032 M)

MONDAY-FRIDAY
2105 Deutsche Welle Newslink Africa (refer to 0405 T-A)

MONDAY
2100 WBCQ(7415kHz) Jean Shepherd (the noted humorist's classic radio programs from the 60s & 70s)

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2106 BBCWS(am) Health Matters (refer to 0106 T)
2110 R. Australia AM (refer to 2100 S)
2130 Deutsche Welle A World of Music (refer to 0530 T)
R. Australia Earthbeat (Alexadra deBlas with how economic development raises environmental issues)
2132 BBCWS(am) Arthur Smith Presents... (refer to 0132 T)

TUESDAY
2106 BBCWS(am) Go Digital (refer to 0106 W)
2110 R. Australia AM (refer to 2100 S)
2130 Deutsche Welle Arts on the Air (refer to 0530 W)
R. Australia Innovations (showcasing Australian invention, enterprise & ingenuity)
2132 BBCWS(am) Music Review (refer to 0132 W)

WEDNESDAY
2106 BBCWS(am) Discovery (refer to 0106 H)
2110 R. Australia AM (ABC Radio's flagship morning news magazine)
2130 Deutsche Welle Living in Germany (refer to 0530 H)
R. Australia An educational series
2132 BBCWS(am) Westway (refer to 0132 H)
2145 BBCWS(am) New Gods (refer to 0145 F) [2nd/9th]
Heart & Soul (refer to 0145 F) [16th/23rd/30th]
Deutsche Welle Europe in Capitals (refer to 0545 H)

THURSDAY
2106 BBCWS(am) One Planet (refer to 0106 F)
2110 R. Australia AM (ABC Radio's flagship morning news magazine)
2130 Deutsche Welle Cool! (refer to 0530 F)
R. Australia All in the Mind (refer to 0505 S)
2132 BBCWS(am) The Word (refer to 0132 F) [3rd/10th/17th]
World Book Club (refer to 0132 F) [24th]

FRIDAY
2100 WHRA(17650kHz) Dxing with Cumbre (Marie Lamb with the hottest DX catches)
2105 R. Australia Verbatim (refer to 0605 A)
2106 BBCWS(am) Science in Action (refer to 0106 A)
2130 Deutsche Welle Focus on Folk (Angelika Ditscheid with some real German folk music, the places it comes from & the people who make it)
R. Australia In Conversation (refer to 0130 S)
WBCQ(7415kHz) Pab Sungenis Project (stand-up comedy & sketches)
2132 BBCWS(am) Westway (refer to 0132 A)
2145 BBCWS(am) What's the Problem? (refer to 0145 A)

SATURDAY
2100 R. Australia Australia All Over (Ian McNamara—aka "Macco"—hosts this celebration of Australiana & Australian values)
WBCQ(9330kHz) Allan Weiner Worldwide (refer to 0000 A)
2101 BBCWS(am) Play of the Week (refer to 0106 S)
2105 Deutsche Welle Religion & Society (refer to 0405 S)
2115 Deutsche Welle German by Radio (refer to 0415 S)
2130 Deutsche Welle Africa This Week (refer to 0430 S)
WHRI(9495kHz) Dxing with Cumbre (refer to 2100 F)

2200 UTC/ 6pm E/3pm P - Page 56 Freqs

DAILY
2200 BBCWS(am) The World Today (the BBC's agenda-setting flagship global news program)

SUNDAY
2200 R. Canada Int. The World This Weekend (CBC weekend news magazine)
R. Vlaanderen Int. Radio World (refer to 0400 M)
2210 R. Australia AM (refer to 2110 S)
2230 R. Canada Int. The Inside Track (anthologies & documentaries about sports)
2235 R. Prague Mailbox (refer to 0105 M)
2240 R. Australia Australia Wide (a roundup of "home" news from ABC Newsradio)
2245 R. Prague Czech Books [or] Encore [or] Magic Carpet (refer to 0015 M)

MONDAY-FRIDAY
2200 R. Canada Int The World at Six (the CBC's flagship evening newscast)
R. Vlaanderen Int. Flanders Today (refer to 0400 T-A)
2230 R. Canada Int. As It Happens (interviews with eyewitnesses to news in the making)

MONDAY
R. Australia AM (refer to 2110 S)
2240 R. Australia Australia Wide (refer to S 2240)

TUESDAY
2210 R. Australia AM (refer to 2110 S)
2240 R. Australia Australia Wide (refer to S 2240)

WEDNESDAY
2210 R. Australia AM (refer to 2110 S)
2230 WBCQ(7415kHz) Think Tank North America (the "bizarre")
2240 R. Australia Australia Wide (refer to S 2240)

THURSDAY
2210 R. Australia AM (refer to 2110 S)
2230 WBCQ(7415kHz) Uncle Ed's Musicol Memories
2240 R. Australia Australia Wide (refer to S 2240)

FRIDAY
2205 R. Australia Asia-Pacific Weekend Edition (regional news & business report)
2230 R. Australia AM Saturday (ABC Radio's weekend morning news magazine)
WBCQ(7415kHz) Wanton Display of Control & Disruption
2232 BBCWS(am) People & Politics (a weekly report on the British Parliament)
2245 R. Prague The Arts (cultural life in the heart of Europe)

SATURDAY
2200 R. Canada Int. The World This Weekend (CBC weekend news magazine)
R. Vlaanderen Int. Music from Flanders (refer to 0400 S)
WBCQ(7415kHz) Radio Timtron Worldwide (comedy, rock music & skits)
2205 R. Australia Correspondents Report (refer to 0105 S)
2230 R. Australia Music Deli (refer to 0640 T)
R. Canada Int. Madly Off in All Directions (satire & comedy)
2232 BBCWS(am) The Interview (refer to 0332 S)
2235 R. Prague Insight Central Europe (refer to 0005 S)

2300 UTC/ 7pm E/4pm P - Page 56 Freqs

SUNDAY
2300 WBCQ(7415kHz) Le Show (Harry Shearer with a tour-de-force variety show)
2305 R. Australia Asia-Pacific (refer to 0100 M-F)
R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
R. Canada Int. Global Village (Jowi Taylor fields reports & music from global venues)
2306 BBCWS(am) A documentary series
2320 China R. Int. CRI Roundup
2330 China R. Int. In the Spotlight (Chinese arts & cultural magazine)
BBCWS(am) Panel game or quiz show
R. Australia Verbatim (refer to 0605 A)
2332 BBCWS(am) Arthur Smith Presents... (refer to 0132 T)
2335 R. Austria Int. Insight Central Europe (repeat of 2305)

MONDAY-FRIDAY
2305 R. Canada Int. As It Happens (continues from 2230)
2306 BBCWS(am) Outlook (refer to 0306 T)
2315 R. Austria Int. Report from Austria (refer to 0115 T-A)
2345 BBCWS(am) Off the Shelf (refer to 0345 M-F)
R. Austria Int. Report from Austria (repeat of 0145 T-A)

MONDAY
2310 R. Australia Asia-Pacific (refer to 0100 M-F)
2330 China R. Int. People in the Know (interviews with prominent Chinese who are shaping the nation's future)
R. Australia The Europeans (refer to 0405 S)

TUESDAY
2310 R. Australia Asia-Pacific (refer to 0100 M-F)
2330 China R. Int. Biz China (refer to T 0130)
R. Australia Rural Reporter (refer to 0305 A)

WEDNESDAY
2300 W3CQ(7415kHz) Off the Hook (a hacker's view of emerging technology)
2310 R. Australia Asia-Pacific (refer to 0100 M-F)
2330 R. Australia The Arts on RA (an arts-related interview & film review)
R. Canada Int. Dispatches (in-depth reports offering a Canadian perspective on international news topics)

THURSDAY
2310 R. Australia Asia-Pacific (refer to 0100 M-F)
2330 R. Australia The Buzz (refer to 0605 S)

FRIDAY
2300 WBCQ(7415kHz) The Lost Discs Radio Show (spinning obscure oldies & "B" sides from 1955-70)
2305 R. Australia Country Breakfast (Australia beyond the urban fringe)
2330 China R. Int. Life in China (a weekly magazine focusing on the lives of ordinary people in China)
R. Australia Hit Mix (refer to 0630 A)

SATURDAY
2300 WBCQ(7415kHz) The Real Amateur Radio Show
WBCQ(9930kHz) Tampon Tea Bingo Hour (variety & entertainment)
2305 R. Australia The Europeans (refer to 0405 S)
R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
R. Canada Int. Writers & Co. (writer/broadcasters Eleanor Wachtel interviews remarkable writers)
2306 BBCWS(am) Pick of the World (refer to 0306 A)
2330 R. Australia Innovations (refer to 2130 T)
WBCQ(7415kHz) Fred Flintstone's Music Show
2335 R. Austria Int. Insight Central Europe (refer to 0005 S R. Prague)
2345 BBCWS(am) Write On (refer to 0345 A)

Thank You ...

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New Military LMR Band

As we continue to research the changeover of the federal government to narrowband technologies, some interesting discoveries and a previously hidden LMR band have now come to light.

Regular readers of this column and the *Fed Files* column know that the civilian world of the radio spectrum is administered by the Federal Communications Commission (FCC). The federal government equivalent to the FCC is a Department of Commerce agency known as the National Telecommunications and Information Administration (NTIA), and its advisory committee, the Interdepartment Radio Advisory Committee (IRAC).

One of the many general functions assigned to the NTIA is to "assign frequencies to, and amend, modify, and revoke frequency assignments for radio stations belonging to and operated by the United States, make frequency allocations, establish policies concerning spectrum assignment allocation and use, and provide the various departments and agencies with guidance to assure that their conduct of telecommunications activities is consistent with these policies."

Further research in the NTIA bible known as the *Redbook* indicates that the Department of Defense (through the Military Assignment Group) is solely responsible for all frequency assignment actions in the 225-328.6 and 335.4-399.9 MHz. This is a significant departure from any other portion of the government radio spectrum where the NTIA has final assignment authority for frequency allocations.

In a Deputy Secretary of Defense memorandum dated August 1, 2001, the various military departments were given specific guidance regarding the purchase of equipment for Land Mobile Radio (LMR) Systems. This memo addressed the existing mandates set down in the NTIA *Redbook* regarding the change to narrowband technologies between 2005-2008 (see our April 2004 *Milcom* column).

But there was also an interesting mention of another LMR allocation in the 225-400 MHz band.

"In addition, new LMR radios or services procured after the promulgation date of this memorandum (*1 Aug 2001-lvh*) that operate in the 380-399.9 MHz band (which is not subject to the NTIA mandate) shall nevertheless be designed for narrowband (12.5 kHz) operation in order to make efficient use of the available spectrum."

So apparently what we have here is a hidden LMR band that has been created by the Department of Defense for use by the military only.

◆ UHF High Band – 380.0-399.1 MHz

In the mid-eighties, wireless conventional radio systems were introduced to the Navy fleet. On aircraft carriers, for instance, there were five separate wireless systems: Flight Deck Communications Systems (AN/SRC-47), Protected Voice Portable Communications Systems (PVPCS), DC WIFCOM used for damage control, Man-on-the Move System, and a system for general communications.

The "Flight Deck Man on the Move Communications System" (MOMS) frequency assignment was within the 225-400 MHz band. Several years ago one source reported the following frequencies in this band used for the MOMS:

355.300 358.100 362.800 363.300
380.500 383.500 383.550 384.300
386.900 MHz

Notice that five out of the nine frequencies were within the 380-399.1 MHz sub-band.

Because of interoperability problems with the systems listed above, the Navy wanted one single, common integrated wireless communications system for all its naval vessels. The Navy turned to M/A-COM and the HYDRA (Hierarchical Yet Dynamic Reprogrammable Architecture) System, an EDACS-based trunk system.

Until recently, all the Navy HYDRA systems operated in the 406.1-420 MHz band. As most federal monitors know, this band is used by many Federal Government agencies. As a result, it was becoming next to impossible to obtain enough approved frequencies to install HYDRA on new ships. So the Navy requested that HYDRA systems be allowed to operate in a narrowband digital mode in the 380-399.1 MHz frequency band which DoD uses exclusively.

Since this development, HYDRA systems are being installed on a wide variety of Navy ships. The system is extremely low power. Thus a monitor would have to be very close to the ship to monitor the system.

◆ Inter Squad Radios

For several years the need for a low cost alternative for close range communications support was apparent to certain agencies within the Department of Defense. The FCC's creation of the Family Radio Service (FRS) and the proliferation of FRS radios in the market place had many thinking FRS was the solution many agencies had been looking for. Unfortunately, contention arose at the federal level between the National Telecommunications and Information Administration (NTIA) and the FCC about whether or not federal agencies could use FRS.

Several federal agencies began pushing the issue and more than one local group went ahead with FRS purchases in spite of the moratorium. One oft-cited example of FRS usage involved an Army Explosive Ordinance Disposal (EOD) unit in Alaska whose use of FRS was featured in *MRT*, a leading radio industry magazine. The untold part of that story was the confiscation of all those FRS radios when frequency managers learned of the infraction as a result of the article.

So, FRS was illegal for federal agencies, but the need for that kind of low cost, short range communications was still very real. The explosion of FRS and the temptation to step over the line kept the pressure turned up on the frequency management community to provide a solution.

The solution for DoD was found with the creation of the Inter Squad Radio (ISR). DoD frequency managers cleared 14 channels in the 380-399.1 MHz LMR sub-band for this FRS-type communications service. The US Marines were the first to explore the capability. They contracted with Icom America, Inc. to manufacture an FRS-type radio for the ISR frequencies at the same price as the FRS version. The result was the IC-4008M which is derived from their IC-4008A. This test was deemed a success and ISR was

opened to all DoD agencies.

These radios are primarily used for mobile communications and operate at a range of 1 to 2 miles. The power output on these radios is less than 2 watts. The 14 channels are as follows:

396.875	Channel 01
397.125	Channel 02
397.175	Channel 03
397.375	Channel 04
397.425	Channel 05
397.475	Channel 06
397.550	Channel 07
397.950	Channel 08
398.050	Channel 09
399.425	Channel 10
399.475	Channel 11
399.725	Channel 12
399.925	Channel 13
399.975	Channel 14

Almost all of these frequencies were known spectrum holes in the 225-400 MHz UHF band (see the April 2004 *Milcom* column for a discussion of spectrum holes).

This begs the question, are the remaining spectrum holes in the 380-399.1 MHz range being used for LMR (narrowband FM) communications? We think so. It is probably a wise idea for monitors to begin searching the 380-399.1 MHz spectrum with 12.5 kHz steps using the FM mode and see what pops.

Table One below is a list of spectrum holes I have observed within this portion of the spectrum. If you observe any FM activity within this range, please report your results to this column. We look forward to your reports.

Table One: Spectrum Holes 380-399.1 MHz

380.075	380.125	380.175	380.275
380.325	380.450	380.475	380.575
380.625	380.675	380.725	380.775
380.875	380.925	380 950	380.970
381.025	381.050	381.075	381.125
381.225	381.250	381.275	381.325
381.375	381.450	381.475	381.675
381.725	381.750	381.775	381.825
381.850	381.875	381.950	381.975
382.075	382.125	382.275	382.300
382.325	382.375	382.425	382.475
382.525	382.575	382.625	382.650
382.675	382.725	382.775	382.825
382.875	382.975	383.025	383.050
383.075	383.150	383.175	383.225
383.275	383.325	383.375	383.425
383.475	383.525	383.575	383.625
383.675	383.725	383.750	383.775
383.925	383.975	384.075	384.125
384.175	384.225	384.275	384.325
384.375	384.425	384.475	384.525
384.575	384.625	384.650	384.725
384.775	384.825	384.875	384.925
384.950	384.975	385.025	385.075
385.125	385.175	385.225	385.325
385.375	385.475	385.525	385.575
385.625	385.675	385.725	385.775
385.825	385.875	385.925	385.950
386.050	386.075	386.100	386.125
386.175	386.225	386.250	386.275
386.325	386.375	386.425	386.450
386.475	386.525	386.550	386.575
386.625	386.675	386.725	386.750
386.775	386.825	386.875	386.925
386.950	386.975	387.075	387.125
387.175	387.250	387.275	387.325
387.350	387.375	387.425	387.475
387.525	387 575	387.600	387.625
387.650	387.675	387.725	387.750
387.775	387.825	387.850	387.925
387.975	388.025	388.250	388.275
388.325	388.375	388.425	388.450
388.475	388.525	388.550	388.575
388.625	388.650	388.675	388.725
388.750	388.825	388.925	388.975
389.050	389.075	389.125	389.175
389.225	389.250	389.275	389.325
389.350	389.375	389.425	389.450
389.475	389.525	389.575	389.625
389.650	389.675	389.750	389.775
389.825	389.850	389.875	389.925
390.025	390.075	390.125	390.175
390.225	390.250	390.275	390.325
390.350	390.375	390.425	390.450
390.475	390.525	390.575	390.625
390.650	390.675	390.700	390.725
390.775	390.825	390.850	390.875
390.925	391.025	391.050	391.075
391.125	391.150	391.175	391.225
391.250	391.275	391.300	391.325
391.350	391.375	391.400	391.450
391.475	391.550	391.575	391.600
391.625	391.650	391.675	391.725
391.750	391.775	391.825	391.850
391.875	391.925	391.950	392.025
392.050	392.075	392.175	392.250
392.275	392.300	392.325	392.350
392.375	392.400	392.425	392.450
392.475	392.525	392.550	392.575
392.625	392.650	392.700	392.725
392.750	392.825	392.875	392.925
393.025	393.075	393.125	393.175
393.225	393.250	393.275	393.325
393.350	393.375	393.425	393.475
393.525	393.575	393.625	393.650
393.675	393.725	393.750	393.825
393.850	393.875	393.925	393.975
394.025	394.050	394.075	394.150
394.175	394.225	394.250	394.275
394.325	394.350	394.375	394.425
394.450	394.475	394.525	394.550
394.575	394.625	394.650	394.675
394.725	394.750	394.825	394.850
394.875	394.975	395.025	395.075
395.125	395.175	395.250	395.275
395.325	395.375	395.425	395.450
395.475	395.525	395.550	395.575
395.650	395.675	395.725	395.775
395.925	395.950	395.975	396.025
396.075	396.125	396.175	396.225
396.275	396.325	396.375	396.400
396.425	396.475	396.525	396.625
396.650	396.675	396.725	396.750
396.775	396.825	396.850	396.925
396.950	396.975	397.025	397.075
397.150	397.225	397.275	397.325
397.350	397.450	397.525	397.575
397.625	397.650	397.675	397.725
397.775	397.825	397.925	397.975
398.025	398.075	398.125	398.175
398.225	398.250	398.275	398.300
398.325	398.350	398.375	398.425
398.450	398.475	398.525	398.550
398.575	398.625	398.650	398.675
398.725	398.750	398.775	398.825
398.875	398.925	398.975	399.025
399.075	399.125	399.150	399.175
399.225	399.250	399.275	399.325
399.450	399.525	399.550	399.575
399.675	399.775	399.900	399.950

❖ Frequency Changes

Jack NeSmith checks in with the following frequency changes noted within the NOTAM system:

Yuma Proving Ground/Laguna AAF
- 242.175 Tower/Airfield Advisory ex-241.000 [Spectrum Hole]

FACSFAC Virginia Capes, VA
- 382.000 W-122 Primary

FACSFAC Virginia Capes, VA
- 251.300 W-122 Secondary

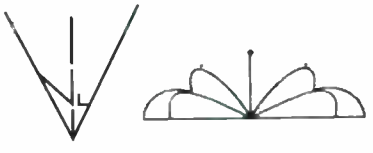
Quantico MCB/MCAF (Turner Field), VA
- 290.375 Approach/Departure Control

❖ Pope Air Force Base

Again our intrepid reporter Jack NeSmith made a trip to Pope AFB, NC, and recorded the following frequencies active:

120.800	Simmons Army airfield (AAF) Ground Controlled Approach (GCA)
121.000	Simmons AAF Range Control/Operations
124.200	Simmons Approach Control [Fayetteville Approach/Departure-lvh]
124.550	Pope AFB Ground Control
125.175	Pope AFB Approach/Departure [*Fayetteville Approach/Departure-lvh*]
125.900	Simmons AAF Tower/Flight Advisory
125.975	Pope AFB Net unknown usage
133.000	Pope AFB Approach/Departure [*Fayetteville Approach/Departure-lvh*]
135.025	Pope AFB Tower
229.400	Simmons AAF Ground Control/ Clearance Delivery
240.625	Simmons AAF Base Operations/ Flight Advisory
257.100	Pope AFB Command Post
275.800	Pope AFB Ground Control/Clearance Delivery
291.100	Pope AFB Tower
312.200	Unknown user/usage
397.850	Pope Approach Departure [*Fayetteville Approach/Departure-lvh*]

And that does it for this month. Until next time, 73 and good hunting.



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Ron Walsh, VE3G0
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Maritime Monitoring Thaws Out

How many people were on the life raft? Did the vessel sink before you got there? What are the ice conditions in St. John's? We are a National Geographic dive team!

That is just a sample of the exciting and informative monitoring heard over the past winter season. With some simple antennas, I have been able to monitor the eastern part of North America well. Both HF and VHF provided some interesting listening.

On VHF, the end of the Great Lakes season provided interesting listening as the ocean ships made their way out of the Seaway before the system became choked with ice. The Inland vessels were rushing to add one more trip to the season. Then the *National Geographic* film crew was searching for models of the Avro Arrow, which were test flown from Prince Edward County near Kingston in the 1950s. Rumor has it they found a new shipwreck for divers to examine. This vessel, *Nadro Clipper*, was used in an episode of Clive Cussler's *The Sea Hunters*, seen on the History Channel.

The HF frequencies yielded a chance to hear the US Coast Guard doing a great job with search and rescue. The *Bow Mariner*, carrying industrial alcohol, exploded and sank off the coast of Virginia. CAMSLANT Chesapeake, Oceana radio, and several Coast Guard aircraft were heard here, with very strong signals. I was impressed with the efficiency of the effort and the very professional radio procedures.

I also had a chance to spend 10 days in Myrtle Beach, South Carolina. With some portable and mobile equipment some interesting monitoring can be had in this area.

The following is a summary of the communications heard, frequencies and modes.

❖ United States Coast Guard

USCG stations still announce their broadcasts on 2182 kHz (calling / distress) and switch to 2670 kHz to give their bulletins. Signals from Fort Macon, Chesapeake, VA, and USCG astern shores were heard here on a regular basis. 5696 kHz and 8983 kHz from CAMSLANT Chesapeake were consistently over S-9.

A search brought up several other frequencies, which have been active (USB):

3023.0 SAR (Search and Rescue on scene)
5427.5 USCG Auxiliary Net
5680.0 SAR Control
5694.0 Air to surface at small stations
5696.0 Air to Surface at large stations
7528.6 USG Auxiliary Net
8971.0 US military maritime patrol and reconnaissance.
8980.0 Phone patch

4316, 5320 and 91210 were mentioned as weather broadcast frequencies.

I was hoping for readers' assistance to verify some HF frequencies listed for the 9th USCG district in Cleveland, Ohio. These are supposed to be using ALE (automatic linking by computer) and USB. I have heard some signals but cannot verify the source. (All are SSB) 5432.9 7530 8126.4 9278.5 11199 13432.6

The classic laker Quebecois

As it turned out, Assistant Editor Larry Van Horn keeps up with such things, and he not only verified the above frequencies as part of the 9th CG District ALE network, but added the following: 3163.4 5264.6 5423.9 6234.2 7530.0 7621.6 7629.1 8126.4 9278.5 10373.6 11199.0 13432.6 kHz

❖ Canadian Coast Guard Radio

On the 2 MHz frequencies I was able to hear St. John's, St. Anthony, Labrador, Halifax and Fundy Coast Guard radio stations. They were heard on 2182 and then switched to working channels. 2598 and 2749 are broadcast channels and were heard well here at night. An interesting contact was the vessel *Atlantic Superior* contacting St. John's NFLD and asking about ice conditions.

Signals on 2206 and 2582 kHz were strong. This is a Canada Steamship lines self-unloading vessel; they often trade on the Great Lakes during the summer. They did mention the *CCGS Henry Larsen* was coming to assist breaking ice.

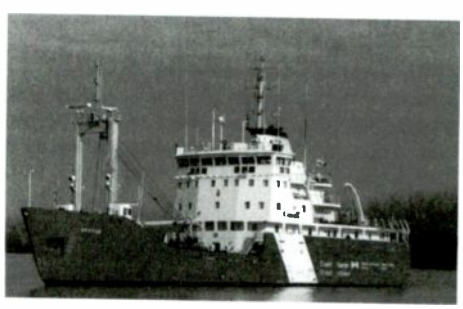
With the summer coming, the stations in the Canadian Arctic will have a lot more traffic. My goal this year is to hear Iqualuit on Baffin Island. A good listing of all Canadian Coastguard Frequencies can be had at website: http://www.ccg-gcc.gc.ca/mcts-sctm/ramn_arnm/Atlantic/part_2_e.htm

A good DX catch would be VBA Thunder Bay's transmitter in Churchill, Manitoba, on Hudson Bay. This is summer operation and is on 2582 kHz at 0040, 1410 and 1520 UTC. They also use 4375 to talk to ships.

❖ Other HF Monitoring

I was able to copy a station for a tug company in Jacksonville, Florida. WPE was very strong on 12,353 kHz USB. I have seen other frequencies (such as 4149) listed for this station but have not heard them here.

An interesting net of yachts was heard on 6516 USB, at 0140 UTC. This was the Blue Wa-


The Canadian Coast Guard Icebreaker Griffon

Training of the Search and rescue Squadron from CFB Trenton Ontario

ter Net and seemed to be a meeting place for yachts. Integrity WCX3457 was the net control and discussions of anchorages etc. were heard. I have no other information on this net. A complete list of worldwide and US coastal stations still operating can be found at **http://www.coastalradio.greaterpeterborough.com**

A nice catch would be Bermuda Harbor Radio. They use 2182 and 2582 kHz for broadcasts. Their web site is **http://www.rccbermuda.bm**.

Those of you who chase long wave DX would do well to look out for station SP on 386 kHz. This is in the Islands of St. Pierre and Miquelon. This is actually French territory about 30 miles off the coast of Newfoundland. Another station is located on Lake Simcoe, in Ontario, on 300 kHz. This is a summer operation only and is not monitored. It is low power and would be an excellent DX catch.

❖ Amateur Radio and Nets

Often listeners forget to monitor the amateur bands for marine activity. There are many marine mobiles on the amateur bands. I have actually worked a Russian vessel on the west side of the Kamchatka peninsula as well as an American amateur on a cruise ship in the Caribbean. My prize catch was one of the last working LST type vessels as it was sailing from Europe to the Southern US. For those of you who still use CW, like myself, we always look for the /MM behind a call sign.

There are several amateurs aboard great lakes vessels (or "lakers" as they are called). VA3RJB, Ron is on the *Algosteel* and VE3WET, Peter, is on the *Canadian Transfer*. They often show up on the ONTARS (Ontario Amateur Radio Service) net, on 3755 kHz LSB and the Trans Provincial Net, on 7055 kHz LSB. Look for them in the morning or mid afternoon.

Another good amateur frequency is 14,300 USB. This is the MMSN (Maritime Mobile Service Net) This net is on from 1200 to 2200 EST (1700 to 0300 UTC) and is very well run. There are many excellent controllers who volunteer their time to assist this net. They have many maritime mobiles check in and they provide a great deal of information. During the problems in Haiti, they were a great source of information. I like to check into this net as often as I can. They also have a website at **http://www.mmsn.org**.

Many travelers on the Inter-coastal Waterway use the Waterway Radio and Cruising Net which meets on 7268 LSB at 1245 UTC (0745 EST) This 40 meter band net has good coverage for the East Coast area. At the same time the Mississauga Maritime Net meets on 14,121 USB. It is popular with Canadian boaters. A good list of maritime nets (amateur and marine) is available at Worldwide Underway Cruising and Weather Resources web site – **http://www.mouseherder.com/xapic/freq.html**

The Atlantic Huron , self unloading bulk carrier, approaching lock 3 of the Welland Canal

Although he is an amateur radio operator, Herb Hilgenberg has been operating his own marine weather net for many years. The Southdown II WX Net starts at 2000 UTC on 12 359 USB. Check-ins actually start around 1930.

An evening shot of the Rt. Hon. Paul J. Martin

Last fall, I had the pleasure of working the Point Sapin, NB lighthouse. The Amateur Radio Lighthouse Society put this on the air. For those of you who wish to hear lighthouses and lightships their web site, **http://www.arlhs.com**, gives details of awards, upcoming operations and locations. A local group is planning to put a historic great lakes lighthouse on the air this year.

Also the Islands on the Air group activate many islands around the world. Their site **http://www.islandchaser.com** keeps you up to date as to what events are planned.

❖ Portable Monitoring

While in Myrtle Beach, SC I had a chance to try some portable monitoring. I ran a wide coverage amateur transceiver in the car, connected to a magnet mount antenna. In the hotel, I used a Grundig Yachtboy and its wire antenna for HF. On the VHF a suction cup mount held up a good VHF antenna for my handheld.

While there, I was able to monitor the Barefoot Bridge over the Inter-Coastal Waterway on channel 9 and some marinas on channel 11. Channel 16 was active and I heard USCG stations at Oak Island, Charleston, Georgetown, and Fort Macon. On the HF, I listened to 2182, 2670, 5696 and 8983 while there. Although I did not spend a lot of time monitoring, it was a worthwhile exercise. I was also pleased to meet with N3FK, Frank, one of the Maritime Net controllers at the Saturday amateur radio breakfast.

❖ VHF Monitoring

When you are monitoring the VHF Marine Frequencies be sure to watch the simplex channels for the "Company Frequencies." Shipping companies often use a channel when their vessels are near an office in a port or canal. For example, Upper Lakes Shipping uses channels 65 or 66 while Algoma Central Marine uses 77, 78 and 88. Some shipping lines use the 450 MHz band for handhelds on board. This is particularly true of cruise ships.

Canadian Marinas are only allowed to operate on channels 68 or 72.

The ship-to-ship channels are starting to come alive. Channels 6, 8 and 10 can be very informative.

A complete list of Marine VHF Frequencies is available at **http://www.coastalradio.greaterpeterborough.com/vhfchann.htm**.

The snow has finally gone from southern Ontario and the ice is slowly melting in the local harbor. A new sloper for the lower HF frequencies is ready to install as well as new coax cables for all my antennas. Plans have been made to raise my VHF Marine antenna for better range and to install a second one.

A second Kenwood R-5000, with several filters, has been installed and dedicated to HF marine monitoring. I am installing a "Rigblaster" and software so the digital modes can be copied. That is a target for the summer and future columns.

My DSL line has now been connected so I can receive emails about the column. I'm looking for suggestions and monitoring input for the West Coast of Canada and the United States as well as Alaska.

I would be happy to make a contact with other hams who are interested in the Maritime field. I can be found on 3755 LSB in the early morning, 7055 LSB in the am and pm, as well as 14300 when I get a chance.

As far as monitoring, I plan to visit the Welland Canal, Toronto, Hamilton, and the Seaway for pictures as well as monitoring. I am attending several Coast Guard Auxiliary courses and visiting the local coast station. My big plan is for a cruise to Alaska for a vacation but, of course, my radio will be in the luggage!

73's and good DX

Reference: VHF channels

Chan	Freq MHz
6	156.300
8	156.400
10	156.500
11	156.550
16	156.800
65A	156.275
66A	156.325
68	156.425
72	156.625
77	156.875
78A	156.925
88	157.425

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Get Ready for More Crowding

Earlier this year, the Federal Communications Commission opened a window for applications for new AM stations and major changes to existing stations. With smaller AM stations going permanently silent in droves, one would think there wouldn't be much demand for new stations.

One would be wrong. Nearly 900 applications for new AM stations have been filed! And you thought it was crowded *now*!

Due to the huge number of new-station applications, I've not been able to fully analyze the situation. I did sample the first eight applications. Five of the eight are for "graveyard" channels (1230, 1240, 1340, 1400, 1450, or 1490 kHz). They're in towns as small as Helendale, California, and Lemont, Pennsylvania, and as large as Philadelphia. Here in Tennessee, six applications have been filed.

To find out whether any new stations are planned in your area, go to **http://www.fcc.gov/mb/audio/amq.html**. Plug in your coordinates and the distance you want to search, and type NEW in the Call Sign box at the top of the page. You may be surprised! (By the way, if you leave the Call Sign box blank, you can get a list of existing stations near your location.)

Along with the new-station applications, nearly 200 applications have been filed for major changes. Major changes fall into several categories:

Changes in city-of-license, with no technical changes. For example, KXEG-1010 Tolleson, Arizona, seeks to change its city to Phoenix – nothing else will change.

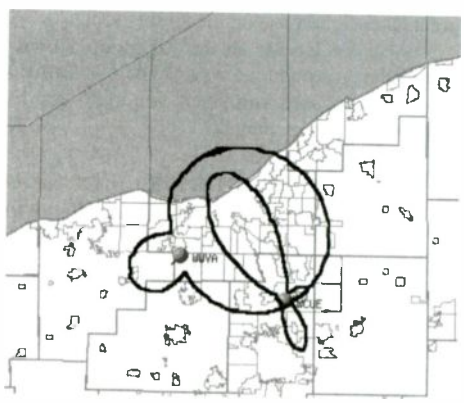
Power increases. Example: WKGC-1480 Panama City Beach, Florida, plans to increase daytime power from 500 watts to 5,000.

Frequency changes. WRGC-680 Sylva, NC, wants to move to 540.

Combinations of the above. WPLX-1170 Germantown, Tennessee, has requested a move to 1180, a change in city-of-license to Capleville, and a power increase to 2,500 watts daytime/9,000 watts at night.

Some of the changes involve stations moving considerable distances. KBLU-560 Yuma, Arizona, proposes to move to Nellis Air Force Base, just outside Las Vegas, Nevada. WGMA-1520 Spindale, North Carolina, proposes a move to the Washington, DC, suburb of Falls Church, and a frequency change to 920. WBSL-1190 Bay St. Louis, Mississippi, proposes to go all the way to Laughlin, Nevada (?!), moving to 1530 in the process. Several other stations propose 1,000+-mile moves.

Probably the most exotic change in the lot is that proposed by WWVA-1170 Wheeling, West Virginia. They've applied to move to Stow, Ohio – an Akron suburb. From that site they'll also have a good signal across Cleveland. It's been a *long* time since a 50,000-watt station has moved to a different city!



WWVA-1170 in Stow, Ohio, won't co-exist with WCUE-1150.

What would happen to WCUE-1150 in bordering Cuyahoga Falls is not known. See the map – the proposed daytime signal of WWVA in Stow will encompass almost the entire coverage area of WCUE. Speculation has it WWVA has an agreement to buy the WCUE license and turn it in for cancellation. WWVA is co-owned with several other stations in the Cleveland area; maybe they'll turn one over to WCUE's owners in return for the 1150 license?

Many of these applications are mutually exclusive. For example, three stations in Florida and Mississippi have applied to move to the 570 channel recently vacated by WVMI, Biloxi. (WVMI moved to 1640 in the expanded band.) Only one of these three applications can be granted. Applications have been filed for 1340 in Rothschild and Mosinee, Wisconsin; again, only one can be granted. Auctions will be used to determine the lucky winners.

When the expanded band was created, it was hailed as a way of "thinning out" the AM dial, getting some marginal signals moved up to the expanded band where they'd have reasonable coverage, and deleting the interference-prone regular-band signals. I suppose few DXers would be surprised to see that isn't happening. In Madison, WI, the move of WTDY-1480 to 1670 was supposed to result in the deletion of 1480. Well, the 1480 frequency (which has since switched to a Spanish-language format as WLMV) may be deleted someday... but an application has been filed for a new station in nearby Monona on the same frequency.

◆ Indecency

Last month, I reported record indecency fines levied against several Clear Channel radio stations in Florida. At the time, the Commissioners expressed concern that the maximum penalties they could levy weren't enough. In March, Congress acted. The House passed, 391-22, a bill that would allow the FCC to levy fines of up to $500,000 in indecency cases; it would also allow the Commission to revoke the license of any station that's convicted of indecency three times. The Senate has passed a similar bill, but with a lesser fine of $275,000.

Conference committees will have to reconcile the differences between the two versions before passing them back for a final vote, and then for President Bush's signature. It's likely this will have already happened by the time this column sees print.

Other provisions considered, but not adopted, would have set the fine as a percentage of the offending station's revenues; required stations to keep recordings of their programming, to make investigation of complaints easier; and provided penalties for airing violent programming. (Canadian stations are already required to keep recordings.)

◆ Bits and Pieces

Liberal Talk: Robert Thomas sent a few clippings from various NYC-area newspapers regarding a new talk-show network that hopes to balance right-leaning shows on existing talk stations. "Air America" expects to begin broadcasts this spring, with liberal hosts like Al Franken and Janeane Garofolo. Liberal listeners may have to take up DXing – Air America affiliates like WLIB-1190, WNTD-950, and KBLA-1580 aren't exactly known for their powerful signals. On the other hand, all-sports radio started on marginal stations (including WNTD) – and today is a huge success, admittedly on stronger stations.

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

George Zeller
georgezeller@monitoringtimes.com

Winter SWL Festival Produces WMPR QSLs

WMPR is one of the most active pirate radio stations in North America today. Their trademark "Dance Party" dance music format is well known to nearly all pirate DXers, as is their "WMPR-6925-You're Invited" identification slogan between the tunes by male and female announcers. Every month *MT* receives several **WMPR** loggings from our readers. But, during the many years that **WMPR** has been active on the pirate radio bands, they have never announced an address for reception reports or correspondence. This lack of communication with their listeners is unusual in shortwave pirate radio broadcasting, where a robust tradition of pirate QSLs for reception reports has always been in place.

But, every now and then, **WMPR** QSLs have materialized in the mailboxes of DXers, apparently always stimulated by loggings of WMPR that have been printed in pirate radio DX information sources such as *The ACE*, the *Free Radio Weekly* internet pirate newsletter, or the excellent *Free Radio Network* pirate broadcasting internet web site.

The most recent round of **WMPR** QSLs materialized very unexpectedly at the front desk of the Best Western The Inn at Towamencin hotel during the 2004 Winter Shortwave Listeners Festival in Pennsylvania. A couple of dozen coveted **WMPR** QSLs arrived with a mysterious letter addressed to your editor. The text of this letter read,

"Dear George, I thought it might be Fun For the group, and it would help me with my backlog of QSLs if you could call people up and give these out during your presentation. Toss out the QSLs you don't give away, or maybe you can get them to send you a s.a.s.e somehow... or give them to J.T.A. to mail? Thanks from the folks at WMPR."

Neither George Zeller nor *Monitoring Times* magazine operates a pirate maildrop service. But, under these rare and unusual circumstances, about half of the QSLs have been distributed to their intended recipients. The other half remain to be claimed by the lucky recipients. A self-addressed stamped envelope sent to the Belfast maildrop can claim the remaining QSLs. Individuals who have not yet claimed these lucky QSLs include the following DXers: Bill Finn, Damon Cassell, Alex Draper, Steve Cherry, David Hockfelder, Brian D. – 11 meter DXer (sic), Anthony Good, Matt Layson, George Ferguson, Donald Snyder, Steve Harcharik, Craig Harkins, P. Innes, and Joe Domaleski. Congratulations to these lucky DXers and about a dozen others who have already received their **WMPR** QSLs.

The 2005 Fest, which remains the largest annual gathering of shortwave listeners in the world, will again be held in the Philadelphia suburbs at the Best Western The Inn at Towamencin. Next year's event has been scheduled for March 11 and 12, 2005. Of course, no pirate radio QSLs are guaranteed next year, but this event is always a lot of fun. You can get plenty of details about the forthcoming event, as well as previous Fests – including photographs of *Monitoring Times* managing editor Rachel Baughn and a variety of *MT* columnists as they enjoy themselves at the Fest – at **http://www.swlfest.com/**

◆ Clandestine QSL via Internet

In DXplorer, Vashek Korinek of South Africa reports receiving a clandestine station QSLs for a reception report that he sent in over the internet. His QSL came from reception of the Voice of Eritrean People on 13690 kHz, where he got a partial data QSL in only eight hours from *webmaster@eritreana.com*. They say that the internet is replacing shortwave broadcasting, but it is also a valuable tool for shortwave broadcast DXers.

◆ CKUT in Canada

Janice Laws and Steve Karlock send in word that they have replaced longtime hosts Bill Westenhaver and Sheldon Harvey as hosts on the "International Radio Report" program on **CKUT**-FM, heard on 90.3 MHz in Montreal. The program is broadcast at 1430 UTC on Sundays. Janice and Steve note that they are very interested in listener contributions of "articles, insider information, club news and events" for broadcast on this show. Both licensed and unlicensed broadcasting is covered by the program. Contributions to the show should be sent to *internationalradioreport@yahoo.com* via e-mail. Those listeners who are out of the range of **CKUT**'s signal can nevertheless listen to the show on the station's web site, found at **http://www.ckut.ca** on the internet.

◆ Brattleboro Given Reprieve

Radio Free Brattleboro, an unlicensed ten watt community radio station on 107.9 MHz in Brattleboro, VT, continues to break new ground in its battle with the FCC for the right to continue their broadcasting. At a March 2 town meeting in Brattleboro, local citizens voted 1,519 to 780 to support the station's continued transmissions. Previously on February 17 the FCC filed a suit against the station in the US District court of Vermont to force its shutdown.

Subsequently on March 15, Judge J. Garvan Martha of the Vermont US District court denied a request from the FCC for a preliminary injunction that would have ordered the station off the air. The station continues to broadcast during this legal wrangling, with additional legal rulings due in May.

◆ What We Are Hearing

Our readers heard all of these North American pirate broadcasters this month. All pirates operate on a sporadic schedule, but shortwave pirate broadcasting increases noticeably on weekends and during major holiday periods. You have to tune your dial up and down through the pirate radio band to find the stations, but the new primary North American pirate frequency of 6925 kHz, plus or minus 30 or 40 kHz remains the place to scan for the pirates. The old 6955 and 6950 kHz frequencies are increasingly abandoned by pirates because of interference from licensed stations, but there are occasional broadcasts on a variety of frequencies just below the 40 meter amateur radio CW Morse Code band.

Big Thunder Radio- Rock music most of the time. Chris Lobdell heard them with a slow scan TV broadcast. (bigthunderradio@yahoo.com)

Black Mountain Radio- Thus far this new pirate has used **WBMR** call letters for its mix of rock and flute music. (None)

Grasscutter Radio- Rock music mixed with two way QSO conversations with other pirates, particularly **Sunshine Radio**. (grasscutterradio@yahoo.com)

Ironman Radio- As seen here, QSLs from this pirate often feature the programming that the station has broadcast. (Belfast)

KRMI- Radio Michigan International has returned with European ethnic holiday music. Despite the call letters, they are not a **WRMI** parody. (krmi6955@yahoo.com)

Radio Cochiguaz- The most active South American pirate continues irregular broadcasts, normally on the weekends. This month they used 11430 and 6950 kHz. (Santiago)

Radio Free Speech- Bill O. Rights with comedy, rock music, and political commentary. (Belfast)

Radio PMS- This apparently new one showed up during some oddball broadcasting at the Winter SWL Fest, emphasizing medical issues for women. (None)

Radio Sicily- Another new pirate, with an unusual format of nonstop Italian opera music, so far via a **Big Thunder Radio** relay (none)

Ragnar Radio- Rock music. QSLs claim the transmitter uses 150 watts into a dipole antenna. (rangarradio@yahoo.com)

Shadow Radio- Usually reruns of the old time radio "The Shadow" detective drama, some rock music. (the_shadow6950@hotmail.com)

Sunshine Radio- Recent announcements confirm their

continued on page 73

SATELLITE SERVICES

MT TRANSPONDER GUIDE www.monitoringtimes.com/mtssg.html

All Frequencies MHz

Robert Smathers
robertsmathers@monitoringtimes.com

Panamsat Galaxy 1R

C-Band - 133 degrees West longitude

1(H) 3720 (none)
2(V) 3740 Univision/Telefutura (digital)
3(H) 3760 Encore Networks (digital)
Love Stories – East
Westerns – East
Mystery – East
Action – East
True Stories – East
Love Stories – West
Westerns – West
Mystery – West
Action – West
True Stories – West
4(V) 3780 Scripps Networks (digital)
TV Food Network – East
Do-It-Yourself Network
Fine Living Network
5(H) 3800 Classic Arts Showcase
6(V) 3820 Spike TV – West (VC2+)
7(H) 3840 Data Transmissions
8(V) 3860 Cartoon Network (VC2+)
9(H) 3880 ESPN / ESPN2 / ESPN Alternates / ESPN2 Alternates (digital)
10(V) 3900 MSNBC (VC2+)
11(H) 3920 Eternal Word Television Network (EWTN)
5.40 WEWN – Worldwide Catholic Radio 1 (English)
5.58 WEWN – Worldwide Catholic Radio (Spanish)
5.76 EWTN Spanish-language SAP
5.94 WEWN – Worldwide Catholic Radio (Spanish)
7.38 WEWN – Worldwide Catholic Radio 2 (English)
12(V) 3940 ShopNBC
13(H) 3960 STARZ!/Encore Networks (digital)
STARZ! – East
STARZ! Theater – East
Block STARZ! – East
Encore – East
WAM – East
STARZ! – West
STARZ! Family – East
STARZ! Cinema – East
Encore – West
STARZ! Cinema – West
STARZ! Kids - East
14(V) 3980 ESPN Deportes (digital)
15(H) 4000 Time Warner Networks (digital)
16(V) 4020 Time Warner Networks (digital)
17(H) 4040 INSP – the Inspirational Network (analog) / iLifeTV (digital)
5.58 Genesis Communication Network
7.92 WNMX-FM Waxhaw, NC - variety
18(V) 4060 Home Box Office / Cinemax (digital)
HBO Comedy – East
HBO Zone – East
WMax – East
@Max – East
HBO Comedy – West
HBO Zone – West
ThrillerMax – East
OuterMax – East
ThrillerMax – West
5-Star Max - East
19(H) 4080 Cinemax – East (VC2+)
20(V) 4100 Home and Garden Television (VC2+)
21(H) 4120 USA Network – West (VC2+)
22(V) 4140 Headend in the Sky (digital)
MTV Jams
Church Channel
JCTV
VH1 Mega Hits
Goodlife TV
College Sports Television (CSTV)
TV One
23(H) 4160 Home Box Office / Cinemax (digital)
HBO – East
HBO 2 – East
HBO Signature – East
HBO Family – East
HBO Latino – East
HBO – West
HBO 2 – West
HBO Signature – West
HBO Family – West
HBO Latino – West
Cinemax – East
MoreMax – East
ActionMax – East
Cinemax – West
MoreMax – West
ActionMax – West
24(V) 4180 Universal Television Networks (digital)

SES Americom Americom-10

C-Band - 135 degrees West longitude

1(V) 3720 AMC - East (VC2+) / AMC – West (digital)
2(H) 3740 Headend in the Sky (digital)
HBO 2 – West
HBO Signature – West
Showtime Too – West
The Movie Channel – West
STARZ! Theater – West
Encore Westerns – West
Encore Love Stories – West
Encore Mystery – West
History Channel – West
Bravo – West
Home and Garden Television – West
ESPN Classic
HITS DMX channels 6-10
3(V) 3760 Nickelodeon – East (VC2+)
4(H) 3780 Univision / Galavision / Telefuturo (digital)
5(V) 3800 STARZ!/Encore Networks (digital) / California Channel (digital)
STARZ! Plex – East
STARZ! Plex – West
STARZ! Cinema – West
STARZ! Kids – West
STARZ! – West
STARZ! Theater – West
Block STARZ! – West
STARZ! Family – West
Encore – West
WAM - West
6(H) 3820 (none)
7(V) 3840 Bravo – East (VC2+) / Bravo – West (digital)
8(H) 3860 TV Guide Channel (digital)
9(V) 3880 QVC Network
10(H) 3900 Home Shopping Network (HSN)
11(V) 3920 The Speed Channel (VC2+)
12(H) 3940 techtv (analog) / techtv (digital)
13(V) 3960 NBC Cable Networks, CNBC (digital)
14(H) 3980 Discovery Communications (digital)
Discovery HD Theater
Discovery Channel – West
Animal Planet
Travel Channel
15(V) 4000 (none)
16(H) 4020 Headend in the Sky (digital)
VH Uno
MTV Espanol
TVE Internationol
Discovery Channel Espanol
CineLatino
HTV Musica
Fox Sports World Espanol
CNN en Espanol
Toon Disney en Espanol
HBO Latino
Utilisimo
HITS DMX – Latin Contemporary
HITS DMX – Fiesta Tropical
HITS DMX – Rock en Espanol
HITS DMX – Latin Jazz
HITS DMX – Regional Mexican
HITS DMX – Tejano
HITS DMX – Salsa
HITS DMX – Musica de los Americas
17(V) 4040 MTV – East (VC2+)
18(H) 4060 iN DEMAND Pay-Per-View (digital)
19(V) 4080 C-SPAN 2 – U.S. Senate (analog) / C-SPAN 3 television, WCSP-FM, Washington, DC – C-SPAN Radio (digital)
20(H) 4100 The Movie Channel HDTV, Showtime HDTV (digital)
21(V) 4120 Discovery Channel – East (VC2+)
22(H) 4140 Flix – East (VC2+)
23(V) 4160 VH-1 – East (VC2+)
24(H) 4180 (none)

SES Americom Americom-7

C-Band - 137 degrees West longitude

1(H) 3720 (none)
2(V) 3740 KMGH-TV, Denver ABC affiliate (VC2+)
7.50 C-Band Talk – Dono Pretzer
3(H) 3760 Occasional video
4(V) 3780 Data Transmissions
5(H) 3800 KDVR-TV, Denver FOX affiliate (VC2+)
5.58 Colorado Talking Book Network
7.50 WOKIE Satellite Radio Network / Radio Free Dishheads
6(V) 3820 KCNC-TV, Denver CBS affiliate (VC2+)
7(H) 3840 (none)
8(V) 3860 (none)
9(H) 3880 Data Transmissions
10(V) 3900 (none)
11(H) 3920 (none)
12(V) 3940 (none)
13(H) 3960 Data Transmissions
14(V) 3980 KUSA-TV, Denver NBC affiliate (VC2+)
15(H) 4000 (none)
16(V) 4020 (none)
17(H) 4040 (none)
18(V) 4060 (none)
19(H) 4080 FoxNet (VC2+)
20(V) 4100 (none)
21(H) 4120 (none)
22(V) 4140 (none)
23(H) 4160 KWGN-TV, Denver W8 affiliate (VC2+)
24(V) 4180 (none)

SES Americom Americom-8

C-Band - 139 degrees West longitude

1(V) 3720 Data Transmissions
2(H) 3740 Data Transmissions
3(V) 3760 Analog SCPC Audio Transmissions / Digital SCPC Audio Transmissions
1404.60 55.40 Northern News Network / Northern Ag Network / Northern Sports Network
1396.05 63.95 Northern Sports Network
1395.90 64.10 Western Montana Radio Network / Red River Farm Network
1383.80 76.20 Genesis Communication Network
4(H) 3780 Data Transmissions
5(V) 3800 Data Transmissions
6(H) 3820 Data Transmissions
7(V) 3840 Data Transmissions
8(H) 3860 Data Transmissions
9(V) 3880 Data Transmissions
10(H) 3900 Data Transmissions
11(V) 3920 Data Transmissions
12(H) 3940 Data Transmissions
13(V) 3960 Data Transmissions
14(H) 3980 Data Transmissions
15(V) 4000 Westwood One/CBS (digital) / Jones Radio Networks (digital)
16(H) 4020 Data Transmissions
17(V) 4040 Learfield Radio (digital) / Jones Radio Networks (digital)
18(H) 4060 Data Transmissions
19(V) 4080 Data Transmissions
20(H) 4100 Data Transmissions
21(V) 4120 Premiere Radio Networks (digital) / ClearChannel Radio (digital)
22(H) 4140 Data Transmissions
23(V) 4160 ABC Radio Networks (digital)
24(H) 4180 Alaska Rural Communication Service (digital)

SES Americom Americom-6

C-Band - 72 degrees West longitude

1(V) 3720 (none)
2(H) 3740 (none)
3(V) 3760 Data Transmissions
4(H) 3780 (none)
5(V) 3800 (none)
6(H) 3820 (none)
7(V) 3840 Data Transmissions
8(H) 3860 (none)
9(V) 3880 Occasional video
10(H) 3900 (none)
11(V) 3920 Data Transmissions
12(H) 3940 (none)
13(V) 3960 (none)
14(H) 3980 (none)
15(V) 4000 (none)
16(H) 4020 Occasional video
17(V) 4040 Occasional video
18(H) 4060 (none)
19(V) 4080 (none)
20(H) 4100 (none)
21(V) 4120 (none)
22(H) 4140 (none)
23(V) 4160 Occasional video
24(H) 4180 La Cadena de Milagro – Spanish-language religious

BELOW 500 kHz

DXING THE BASEMENT BAND

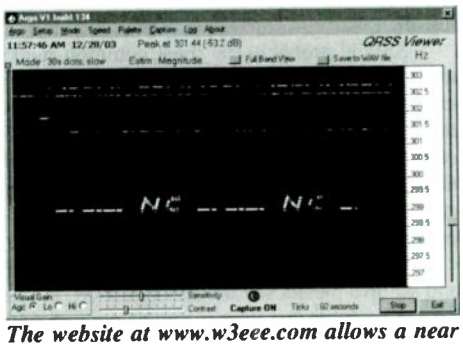
Kevin Carey, WB2QMY
kevincarey@monitoringtimes.com

Super Slow CW Results in Record

It was a pleasure to meet so many *MT* readers at the *Winter SWL Festival* in Kulpsville, PA, held March 12-13. As always, the show featured many interesting programs and displays of the latest gear. I was very pleased to see a large turnout for the Longwave session, *Rumblings in the Basement*. Hopefully, attendees were inspired to check out the basement band for the first time, or to rediscover its many treasures. Copies of the program handout can be obtained by sending a standard-sized SASE to: P.O. Box 56, West Bloomfield, NY 14585.

Just when I think I've seen every radio-related use for the Internet, a new idea comes along. Steve Dove, W3EEE (PA) approached me at Kulpsville to mention his "live QRSS" web site at **www.w3eee.com**. This site allows lowfer operators (or anyone) to see a near real-time snapshot of QRSS (very slow Morse code) activity on the band. Operators who are curious about how well their signals are propagating can "see themselves" on Steve's site, along with other signals that may be present on the band. This is sure to be a helpful tool for experimenters or anyone who follows QRSS activity.

QRSS has become the preferred mode for weak-signal work on the 160-190 kHz Lowfer band. Essentially, it takes advantage of CW's narrow bandwidth, and permits the use of extremely narrow receiving filters. Narrow filtering, combined with display software on the receiving end, often allows signals to be "seen" that cannot be heard by the human ear. For more information, just enter "QRSS" into your favorite search engine and visit the many related web sites.



The website at www.w3eee.com allows a near real-time glimpse into the world of QRSS. This image shows Lowfer "NC" displayed on the site.

❖ New LF Record Claimed

From the April 2nd *ARRL Letter* (American Radio Relay League) comes news of a new long distance record for LF experimenters. Here is an excerpt from the ARRL report:

"Amateur stations in New Zealand and Asiatic Russia are laying claim to a new low-frequency world distance QSO record. Bob Vernall, ZL2CA, told ARRL this week that ZM2E, near Wellington, New Zealand, and UA0LE, near Vladivostok, Russia, completed a two-way contact during the night of March 20 on 137.70 kHz."

"The path length is estimated to be 10,311 km (6,392 miles), which is claimed as a new world record between amateur stations on LF bands," Vernall said. "For several hours signals received at ZM2E were so strong that they could be decoded 'by ear,' despite high peaks of QRN."

By noting tone-on and tone-off times and checking them against a highly-accurate digital clock, the ZM2E operators at one point were able to decode the very slow-speed (QRSS) CW without resorting to Argo DSP software signal detection."

❖ Trivia Time

One of the most enjoyable programs I attended at Kulpsville '04 dealt with the rich history of WWV – one of the longest running stations on shortwave. This session was presented by Myke Weiskopf (CT). Myke spent some time discussing WWV's lesser-known sister stations, WWVB and the now-silent WWVL.

Speaking of WWVL, who can tell me the exact frequency it operated on, and how long it was on the air? What part of WWVL still plays a role in today's upgraded WWVB operation? Drop me a line with your answers and I will draw two correct entries for a choice of either the *BeaconFinder II* directory or a *Sounds of Longwave* cassette tape. Good luck!

This QSL is from the now-silent WWVL that operated on LF. See text for some trivia questions!

❖ LF Loggings

Our loggings this month come from Lou Rossetti (MA), who uses a Drake R8B receiver and a 150-foot "L" shaped wire antenna. To minimize broadcast interference, Lou uses a 335 mH inductor in series with the antenna lead going to the R8B. He also uses a 30-inch loop antenna when noise is a concern. While signal strengths are generally lower with the loop, the signal-to-noise ratio is much better, and he reports hearing many additional stations with the loop. Selections of Lou's logs appear in Table 1.

Table 1. Selected Beacon Logs

Freq.	ID	Location
206	QI	Yarmouth, NS
212	SJ	Saint John, NB
220	BX	Blanc Sablon, QC*
220	IHM	Mansfield, MA
224	QM	Moncton, NB*
227	TAN	Taunton, MA*
241	SFZ	Pawtucket, RI
251	SKR	Bedford, MA
257	FFF	Plymouth, MA*
260	ESG	Rollinsford, NH
266	YZX	Greenwood, NS
269	TOF	Beverly, MA
273	ZV	Sept Iles, QC*
276	YHR	Chevery, QC*
279	CQX	Chatham, MA*
279	RS	Worcester, MA
326	FC	Fredericton, NB*
332	YFM	LaGrande, QC*
332	BE	Bedford, MA
346	LI	Boston, MA
356	AR	Providence, RI
359	AS	Nashua, NH
365	FIT	Fitchburg, MA
368	IMR	Marshfield, MA*
382	LQ	Boston, MA
385	NA	Natash, QC*
389	PVC	Provincetown, MA
390	JT	Stephenville, NS
392	ML	Charlevoix, QC*
397	OW	Norwood, MA
402	LW	Lawrence, MA
414	BC	Baie Comeau, QC*
417	EK	Worcester, MA

* Readable only with loop antenna

❖ LF Receiver Project?

In general, *Below 500 kHz* is not a construction column. Every now and then, though, we tackle simple electronic projects when they have direct application to longwave radio. Would you be interested in building your own "just-for-fun" receiver for LF work? I've been giving some thought to a simple regenerative-type receiver project that could be assembled with readily available parts. Some goals for this project would be to:

- Promote a better understanding of simple receiving circuits, with an emphasis on fun, not theory.
- Present a straightforward design that has a high probability of first-time success.
- Provide readers with a historical perspective on homebrew building practices that were common in the early days of radio.
- Present a useful project that gives the builder a sense of accomplishment.

Would you be interested in a multi-part series on such a project? If so, should the receiver be of solid state or tube design? What frequency range(s) should it cover? What should the project be called? Your comments are most welcome. You can reach me via e-mail or postal mail with your ideas.

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

T.J. "Skip" Arey, N2EI
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Uncle Skip and the Meteors

No, that's not the name of my old rock band.

One of the things that keeps me wanting to hit the word processor every month and churn out my column is the opportunity to look into something that I haven't tried before. Amateur radio is a big stew of operating modes and activities. You would need a great deal of time (and probably a fairly large pot of money) to give everything more than a brief try. Most folks work with a couple of modes of operation that get them excited. By "specializing" you can work a lot of folks and you may even find ways to contribute to the advancement of the amateur radio art.

I admit to being a curmudgeon when it comes to my "normal" operating practices. I don't close out this column every month by saying "I'll see you on the bottom end of 40 meters" for no good reason. That's where you will usually find me pounding brass. (Listen close because I'm also probably running only a couple of watts at best. I love QRP).

But with the incentives of the column and curiosity, every now and then I give the eye to other ways of playing ham radio. One of the latest things that has caught my attention came about when I acquired a pile of old radio books at the silent auction at the Kulpsville Winter SWLfest. A fairly old article in a mid 1970s issue of *73* Magazine caught my eye. The article talked about conducting amateur radio communication by way of *Meteor Scatter.*

For those of you who haven't heard of this activity before, allow me to give you a little general background.

As you probably learned in Mrs. Grundy's junior high school science class, the Earth is constantly bombarded with teeny (and sometimes not so teeny) particles of dust and debris. As this stuff falls into our gravity field, it hits our atmosphere and becomes the classic "falling star" or meteor. What causes that streak across the sky is the trail of hot matter left behind by the meteor as it falls toward earth. The heat is the result of friction with the atmosphere; it is the reason the Space Shuttle is covered with heat shielding tiles. As I understand it, this trail of hot matter serves to ionize the atmosphere along its path.

During experiments related to the development of radar in the 1940s it was discovered that radio signals could reflect off of these ionized meteor trails, scattering the signal to more distant places, hence the name *meteor scatter.* Refinement of this knowledge developed to the point that it became possible to have reliable radio communication, particularly in the lower VHF regions (approximately 28 through 150 MHz). Further, depending on the meteor's angle of entry into the atmosphere, these communications could extend the normal *line of sight* limitations of VHF communications (about 30 miles) to a region in the area of 300 through 1200 miles away from the location of the transmitter.

If you have ever tried to run up your grid square total on 10, 6 or 2 meters in pursuit of the VUCC award, you could see that figuring out how to play this meteor scatter game would be well worth the effort. Also, unlike some of the other *weak signal* VHF modes, meteor scatter QSOs can be accomplished with a fairly modest home station. Full Gallon power and extreme gain antenna systems do not really improve your chances in the meteor communications realm. The main skills needed are patience and an understanding of the conditions under which meteor communications are possible. Tenacity and knowledge – the common keys to any ham radio success!

❖ Increasing your Chances

As I alluded earlier, the Earth always has a certain number of meteors hitting the atmosphere. However, there are certain times when the numbers of meteors heading our way increase dramatically. You may have heard of people talking about *meteor showers.* These occur when the Earth's orbit takes it through the path of orbiting debris left behind by passing comets.

Dozens of these meteor showers occur throughout the calendar year as the Earth moves around the Sun. But for someone just getting started in meteor scatter work, there are a number of relatively reliable events that have a fairly high rate of meteors hitting the atmosphere, improving ones chances of success. Of course, in addition to playing radio these are fun times to go out and look at the night sky. These major events are as follows. (Including approximate peak dates for meteor activity)

Quandrantids	January 3-4
Eta Aquarids	May 4-5
Arietids	June 7
Perseids	August 12
Orionids	October 22
Leonids	November 17
Geminids	December 13-14

The quality and quantity of meteors useful to radio communications will vary significantly from year to year in any of these events but they are all worth taking the time to look at, or in our case, listen to.

Now what makes this even more interesting is that, while these flashes of light speed across the sky appear to the naked eye for only a brief instant, the ionized trail left behind to reflect radio signals can remain in place for anything from a few seconds to up to a few minutes. This is somewhat a function of frequency. In the area of 28 through 50 MHz you are likely to encounter good propagation for between 30 seconds and several minutes. Above 50 MHz the same meteor trail might only yield a few seconds to a minute of contact time. Meteor scatter activity has been reported up into the UHF bands but is not particularly reliable, if for no other reason than that the ability for the meteor trail to function as a reflector drops off to mere fractions of a second.

As you have probably figured out by now, attempting to communicate by meteor scatter propagation is not going to make for a casual QSO. Obviously the ability to work fast is a key skill. Schedules are common and timing is essential. Up until recently, the main practical mode of communication has always been CW at the most insane speed you could operate without your wrist falling off.

SSB is probably the most common mode these days but, as you can see, you better know how to talk fast and follow agreed upon procedures. Now that personal computers have become commonplace, digital modes have been developed that favor meteor scatter communication. You can cram a lot of data into a digital packet lasting micro-seconds.

Even if you're not ready to take the plunge and set up a meteor scatter station just yet, if you have a receiver that covers the 20 through 150 MHz range you may want to tune (or scan) around that area during one of these storms. You are likely to hear signals just pop up, seemingly out of nowhere, and then disappear just as rapidly after a few seconds or so.

If you listen down in those specific areas of the 10, 6 and 2 meter ham bands devoted to weak signal work in the band plans, you will hear the hard core meteor scatter folks doing their thing.

It's a great way to begin to learn operating procedures and tactics for this exciting way of playing radio. Both the Arietids and the Perseids events coming up this summer would be good places to start.

❖ Getting on the Air

Okay, so now let's say you've been bitten by the meteor scatter bug. You probably want to see what you can do to bring your station into line with the practices of folks who play this particular radio game.

Under ideal conditions almost any existing antenna will work to some degree. However, the standard solution for meteor scatter work tends toward Yagis. Three-element beams for 10 or 6 meters and 10 elements for the 2 meter band. Unlike other terrestrial VHF activity, you don't need to worry too much about height above ground. A simple rotor and Yagi combination on top of your roof will put you in the ballpark for meteor signals.

An all-mode rig for your choice of bands capable of between 50 and 150 watts will get you on the air in style. If you have less power, you can make up for it rather easily with a higher gain antenna.

If you want a "turn key" set-up that will give you the maximum amount of activity, I'd opt for a 2 meter SSB rig that can either crank out 150 watts directly or through an amplifier "brick." I'd marry that up to a 10 element Yagi and rotor by way of good quality low loss coax (Belden 8813 type). This set-up will not only give you the tools to work meteor scatter on the same band as most of the North American activity, it is a good basic station for experimenting with other VHF weak signal communication. It would be a great single band VHF contest station, too.

❖ Specialize in Speed

If you're trying your hand at meteor scatter, you will need no special skills, but you will need to have your wits about you. Everyone is kind of busy given the brief periods of time to make a QSO work, so you will want to get a handle on the preferred procedures before you key up the mike.

A good place to begin is at **http://www.meteorscatter.net** . Here you will not only find information about the general aspects of meteor scatter activity, you will also find outlined the procedures for carrying out an efficient, accurate and credible QSO. Another helpful Web site is **http://www.qsl.net/w8wn/hscw/papers/hscw-sop.html** . This site outlines the procedures specific to operations in IARU Region 2 which includes North America. Europe (Region 1) has slightly different practices, so if you choose any source for information about how to proceed during a QSO make sure you're playing by the right rules of the road.

As I said, much of the current activity is SSB voice with some high speed CW thrown in. The trend, however, is to digital modes due to their obvious efficiency in operating in meteor scatter situations.

FSK441 is a digital protocol used for general meteor scatter operations and JT6M is used mainly for activity on 6 meters.

Joe Taylor K1JT offers an excellent freeware program that uses these protocols at his Web site: **http://pulsar.princeton.edu/~joe/K1JT/** . By the way, Joe's program includes JT44 and JT65 if you are interested in Earth-Moon-Earth (EME) communications.

So if you are already active in the Lower VHF region, you probably have all the tools you need to start trying your hand at meteor scatter ham radio. Meteor scatter is a great "exotic" mode for a Technician Class ham looking to break out of the box and try something beyond talking on the local repeaters.

Hmmm, come to think of it, Elecraft makes 6 and 2 meter transverter kits for the K2. I may just have to warm up the soldering iron and give this thing a try. Until then, have fun wherever you operate. And no matter what else I may try, you'll probably still also find me down on the bottom end of 40 meters. And I'll definitely be looking for you on Field Day weekend!

UNCLE SKIP'S CONTEST CORNER

Asia-Pacific Summer Sprint (SSB)
Jun 12 1100 UTC - 1300 UTC

West Virginia QSO Party
Jun 19 1600 UTC - Jun 20 0200 UTC

ARRL June VHF QSO Party
Jun 12 1800 UTC - Jun 14 0300 UTC

All Asian DX Contest (CW)
Jun 19 0000 UTC - Jun 20 2400UTC

SMIRK Contest
Jun 19 0000 UTC - Jun 20 2400 UTC

Kid's Day Contest
Jun 19 1800 UTC – 2400 UTC

Marconi Memorial HF Contest
Jun 26 1400 UTC - Jun 27 1400 UTC

ARRL Field Day
Jun 26 1800 UTC -2100UTC, Jun 27

QRP ARCI Milliwatt Field Day
Jun 26 1800 UTC - Jun 27 2100 UTC

His Maj. King of Spain Contest (SSB)
Jun 26 1800UTC - Jun 27 1800 UTC

Outer Limits continued from page 69

close relationship with Grasscutter Radio. (None, but some replies have resulted via grasscutterradio@yahoo.com)

Take It Easy Radio- Rock music shows by various artist, including the Eagles, whose song became their station name long ago. (takeiteasyradio@yahoo.com)

Undercover Radio- Dr. Benway has added relays of broadcasts from Mars to his usual format of rock music "from the middle of nowhere." (Merlin and undercoverradio@mail.com)

Voice of Captain Ron Shortwave- Captain Ron still is primarily a rock music pirate, with some pirate radio material. (Captainron6955@hotmail.com)

Voice of Pancho Villa- As usual, Pancho went on his midnight ride during the Winter SWL Fest in Pennsylvania. This year he suffered a wardrobe molfunction, of course. (Blue Ridge Summit)

WBNY- Commander Bunny retumed around Easter with his usual numbers transmissions and advocacy for the Rodent Revolution. This one is one of the best clondestine station parodies of all time. (None, former address defunct)

WHYP- This James Brownyard memorial station commemorates the licensed **WHYP** from North East, PA. Their comedy and rock format is well produced. Niel Wolfish says that he heard the voice of George Zeller on this pirate, and also on **WTAM**-1100 radio news during the same weekend. (Providence)

WJFK- This John F. Kennedy memorial station remains o big mystery in the pirate radio world. Few people heard their broadcast this year (normally around November 22), but several DXers have received their QSL anyway, now marked with a 6925 kHz frequency that differs from similar QSLs issued in the past. (None; responds to unknown information sources).

WMPR- Techno rock "dance party" music station still very active. Their recent antics are our lead story this month. (Still none)

❖ QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or $2 US to foreign locations. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses: PO Box 1, Belfast, NY 14895; PO Box 28413, Providence, RI 02908; PO Box 109, Blue Ridge Summit, PA 17214 and Casilla 259, Santiago 14, Chile.

Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletins for submitting pirate loggings remain *The ACE* ($2 US for sample copies via the Belfast address above) and the e-mailed Free Radio Weekly newsletter, still free to contributors via *niel@ican.net*. The Free Radio Network web site, another outstanding source of content about pirate radio, is found at **http://www.frn.net** on the internet, and some pirates will QSL a report left on the FRN.

❖ Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month's valuable contributors: Skip Arey, Beverly, NJ; Scott Barbour Jr., Intervale, NH; Artie Bigley, Columbus, OH; Cachito, Santiago, Chile; Ross Comeau, Andover, MA; Rich D'Angelo, Wyomissing, PA; Harold Frodge, Midland, MI; Vince Havrilko, Kadena AB, Okinawa; Ed Kusalik, Coaldale, Alberta; Janice Laws, Montreal, Quebec; Chris Lobdell, Stoneham, MA; Greg Majewski, Oakdale, CT; Michael Porter, Englewood, TN; Terry Powers, La Mesa, CA; Mike Prindle, New Suffolk, NY; Lee Reynolds, Lempster, NH; Fred Roberts, Germany; Robert Ross, London, Ontario; Martin Schoech, Merseburg, Germany; John Sedlacek, Omaha, NE; Lee Silvi, Mentor, OH; and Niel Wolfish, Toronto, Ontario.

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ANTENNA TOPICS

BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Clem Small, KR6A
clemsmall@monitoringtimes.com

Dipoles, Dipoles, Dipoles

The Hertzian antenna is our old friend the horizontal, center-fed, half wavelength dipole (fig. 1A). This antenna and its derivatives comprise the most popular group of antennas ever devised. Let's take a look at some of them.

❖ Variations on a Theme

Changing the Dipole's Feed Point:

Several dipole designs are fed at points other than the element's center. For instance, the Windom antenna (fig. 1B) has its feed point about a third of the way in from one end. The combination of this feed point plus the element length used allows this antenna to function effectively on a number of HF bands.

Another example of a non-center fed dipole is the Zepp end-fed half-wave (fig. 1C). This antenna was developed to be trailed at the end of an open-wire feed line below a Zepplin lighter-than-air craft to keep sparks and corona away from the ship's flammable hydrogen gas. Land-based stations use this design by hoisting it between two masts.

Other antennas with feed points at the end of half wavelength elements are the collinear array, which might be called a "double Zepp" (fig. 1D), and the extended double Zepp.

Actually, a dipole's feed point can be placed anywhere along the antenna's length. At the center of a half-wavelength dipole, as in the classic Hertz design, the feed point impedance is considerably less than 100 ohms. At each end the impedance runs to thousands of ohms.

If the feed point is moved progressively from the center to the end of the antenna its impedance changes progressively from the low to the higher values. Robert Victor,VA2ERY, has used this principle to develop a "clothesline" folded-dipole antenna (fig. 1E). It is looped over pulleys like a reeled clothesline. Pulling the loop around the pulleys will move the antenna's feed point anywhere along the antenna's length. Thus the position of the antenna's feed point – and therefore the feed point's impedance – can be adjusted from a low value at the antenna's center to a high value at its ends. This allows matching the feed point impedance to the antenna's feed line impedance across a wide range of frequencies.

Changing the Dipole's Length:

Another Hertz-derived antenna is the shortened dipole. Fed properly, antennas as short as a quarter wavelength can give surprisingly good performance and are quite useful in limited-space installations. Note that, although the shortened dipole's radiation and reception pattern is quite similar to the half wavelength's pattern, lengthening the dipole sufficiently beyond a half wavelength causes lobes to form in its horizontal pattern. As the elements are progressively lengthened, the antenna's horizontal pattern becomes more directional with its direction of maximum response, changing progressively from broadside toward end-fire.

A different approach to lengthening was developed by Franklin, one of Marconi's engineers. The Franklin design (fig. 1F), also known as the "collinear" design (see "double Zepp" and "extended double Zepp" above), extends the antenna by adding half wavelength elements directly off the ends of a half wavelength dipole. Phasing stubs are used to attach these extra elements so that all the elements operate in-phase. The horizontal pattern of this antenna remains maximum broadside to the antenna elements, but becomes progressively more narrow as more elements are added. This collinear design was used by Marconi for greater directivity and gain in his globe-spanning Imperial Beam antenna.

Folding the Dipole:

The folded dipole antenna (fig. 1G) uses two or more parallel dipole elements spaced close to each other, and joined at their ends. This leads to an increase in the feed point impedance and bandwidth of the antenna. The high, center-feed impedance makes it useful when open-wire feed line is used, or for raising the feed point impedance of a driven element on a beam antenna where the coupling to other elements of the beam otherwise makes an ordinary dipole element's impedance quite low.

Multi-banding the Dipole:

Several multi-band dipole designs have been developed. Operation on two or more harmonically-related bands can be had by using an ordinary half wavelength dipole at its fundamental design frequency, and nearby odd-harmonic frequencies of that fundamental.

A multi-band antenna (fig. 1H) can be made using several dipoles which are cut to resonate on different bands. The antennas are all connected to a common feed-point.

Traps are circuits which can electrically isolate portions of an antenna element. Using traps, a single dipole (fig. 1I) can be made to resonate on multiple bands.

Adding inductance in each leg of a dipole antenna will decrease the antenna's resonant frequency. By switching more or less inductance into its elements a dipole can cover a number of different bands.

The G5RV antenna is a dipole which covers multiple HF bands through a combination of a specific element length, and the transforming action of a length of open-wire transmission line connected between the antenna and its coaxial feed line.

Another folded-dipole variant, the T2FD (terminated, tilted, folded dipole), offers an extremely broad bandwidth. It covers several bands at the cost of dissipating some of its signal power as heat in a resistor included in the design. Despite these losses, users often report good results using this antenna.

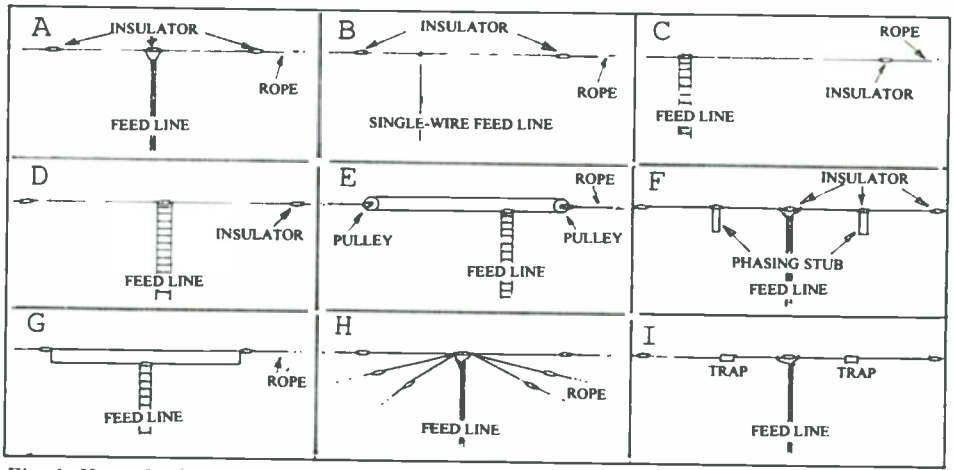

Fig. 1. Hertz, half-wave, center-fed dipole (A), Windom, off-center fed dipole (B), Zepp, end-fed dipole ©), double-Zepp (D), Clothesline folded-dipole antenna (E), Franklin collinear dipoles (F), folded dipole (G), multi-band dipoles (H), trap dipole (I), (antennas not all drawn to same scale).

This Month's Interesting Antenna-Related Web site:

For my take on constructing o Hertz dipole check out:
http://www.monitoringtimes.com/html/mtantennaprimer2.html.

In the post, much interest has been expressed in the CFA, or crossed-field ontenna. The following site cloims thot: "... its behovior os determined by meosurement wos not as their inventors cloimed, ond it con be reploced by o simple ond more efficient looded monopole...":
http://www.comsistel.com/HAM%20documents/Trainotti%20CFA%20IEEE.pdf

A different report discusses the CFA inventor's claims, but foils to find support for those cloims:
http://www.antennex.com/preview/index.htm

Dipoles as Beam Elements:

Dipoles are frequently utilized as elements in beam antennas. We've already mentioned the Franklin, the collinear array, and extended, double Zepp which are all beams of a sort. The common Yagi-Uda and LPDA (log periodic dipole array) beams utilize several dipoles to attain increased directivity and gain. There are various phased-element beam designs which use multiple, half wavelength dipoles.

Dipoles can be oriented at any angle from the traditional horizontal to vertical. If they are oriented at a sloping angle in regard to earth they exhibit directionality, and are known as "sloper beams."

❖ A Useful Series of Books

L. B. Cebik, a very reader-friendly and prolific writer on antennas, has a series of two excellent antenna books titled: *Antennas from the Ground Up, Volumes 1 & 2*. The material covered provides excellent general coverage of antenna functioning and basic antenna designs. These volumes are appropriate for any HF radio hobby enthusiast, in particular amateur radio operators and shortwave listeners. A wide variety of wire, HF antennas are covered, as well as much antenna-related information.

The chapters in this series were originally written as articles for the QRP amateur radio publication, *Low Down*, with the goal of "setting reasonable expectations for antenna performance." Pursuant to this goal, a somewhat unique but very useful aspect of this series is that multiple radiation-reception patterns are included for many of the antennas covered. More importantly, Cebik discusses the factors that will change these patterns as we actually build the antennas in our real-world backyard. This information adds much to the antenna-builder's ability to select an antenna-system design appropriate to their needs. Relatively little is given on actually constructing antennas, so most of the nuts-and-bolts of making these antennas is left to the reader's ingenuity.

In addition to the many different antenna designs included in this series, topics covered include feed lines, using antenna tuners, matching, standing-wave ratios, the effect of noise on reception, antenna modeling, grounds, and many other useful and practical topics.

If you're wanting to get involved in understanding practical HF wire antennas, and to learn what they can do for your communications, then these books are an excellent resource. They are available from MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762 . Phone information: (800) 647-1800, (662) 323-5869.

RADIO RIDDLES

Last Month:

I referred to Kurt N. Sturba's surprisingly-good results using relatively small, non-elevated metal objects (a lawn chair, and a shopping cart) as antennas. Then I asked: "Do you suppose that he was trying to teach us something of value by demonstrating his good results with those puny antennas? Or was he just lucky, and wanting to brag about it?"

No, Kurt wasn't bragging. Of course I can't speak for Kurt, but if I recall correctly it seemed to me that he was showing us at least two things that are not too well known to beginners, and even to some old-timers. One is that, on HF, you don't need a perfect antenna with a low SWR on your feed line to get your transmitter's power radiated. Adding an antenna tuner at the transmitter and using low-loss feed line will get that job done with most any antenna.

The other thing that I think he wanted us to realize is that, if you can't put up your ideal antenna, you can still have a lot of fun making contacts, and/or monitoring interesting signals with a less-than-ideal skywire.

This Month:

"Antennas" were once called "aerials." Why do we now call them "antennas?"

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

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Marc Ellis
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The National NC-46

The radio I've chosen for our next restoration project is a moderately-priced communications receiver introduced by The National Company just after World War II. It briefly competed with the Hallicrafters S-40 (which, incidentally, was one of our previous restorations) before it was discontinued. Like the S-40, the NC-46 was based on a pre-war design, but dressed up in a revamped cabinet with postwar styling.

❖ NC-46 Ancestors

The NC-46 was a descendant of an unusual series of receivers from normally-high-end manufacturer National. In the series, manufacturing costs had been cut to suit depression-era pocketbooks. A simple slide-rule dial (later including a bandspread pointer) was substituted for the celebrated "Type PW" vernier drive found on the National's best receivers. There was no "S" meter or r.f. stage. And, remarkably, there was also no power transformer, making this an a.c.-d.c. radio. In later models an expensive design feature, the sliding catacomb coil tray, was replaced with a simple bandswitch.

Normally, the a.c.-d.c. design was associated with the most inexpensive and cheaply-constructed consumer radios. However, The National Company didn't see it that way. These sets, housed in heavy steel cabinets, conformed to the firm's usual high-quality construction standards. They performed very well, though National's advertising admitted that images were present on the higher-frequency bands due to lack of the r.f. stage. The final pre-war model, the Model NC-45, sold for as little as $50.00.

❖ Postwar Marketing

Now fast forward past World War II to 1946, when the reworked Model NC-45, in a freshened-up two-tone cabinet, was hurried onto the postwar market as the Model NC-46. Cost was about $100.00 and the accessory speaker was extra. It was still an a.c.-d.c. radio with no r.f. stage. Compare this with the competing $79.00 Hallicrafters S-40, which had an r.f. stage, a built-in speaker, a power transformer – and tuned to 43 MHz as compared with the NC-46's standard 30 MHz.

The National NC-45, predecessor of the NC-46. (National Company Photo from Alan Douglas Collection.)

It comes as no surprise, then, that the NC-57 appeared in 1947 to compete directly with the S-40A (an almost unchanged S-40), which appeared that same year. The NC-57 had completely-revised modern styling and features equivalent to those of the S-40A. In addition it tuned all the way up to 54 MHz, covering the entire 6-meter band, and boasted a voltage-regulated oscillator stage. Its approximately $100.00 price was competitive with that of the now-repriced S-40A.

The National NC-46 restoration project set just after being removed from storage.

The NC-46 was discontinued in 1948, leaving the NC-57 as National's lone moderately-priced offering. The latter was manufactured for another two years before it, too, was discontinued. The NC-46 was clearly an artifact that would probably never have been released if it weren't for National's need to get a new set on the postwar market as quickly as possible.

However, this radio had heavy-duty construction and a functional appearance which – to my mind – outclassed that of the NC-57 and even that of the S-40 (whose looks were created by famed designer Raymond Loewy). This radio looked *professional*, not like a postwar consumer set from the drawing board of an industrial designer. Its straightforward, no-nonsense layout, generously-sized gleaming black knobs, and even its separate speaker, harkened back to radio's roots. This was a set that exuded romance, graced one's operating table, and looked like it could hardly wait for its knobs to be tweaked in search of choice DX.

As such the NC-46 makes an interesting collectable, particularly because it was discontinued early in its production cycle. Yet it is still to be found at hamfests and antique radio meets. Keep your eyes open and one of these engaging radios may beckon to you!

❖ Features of the NC-46

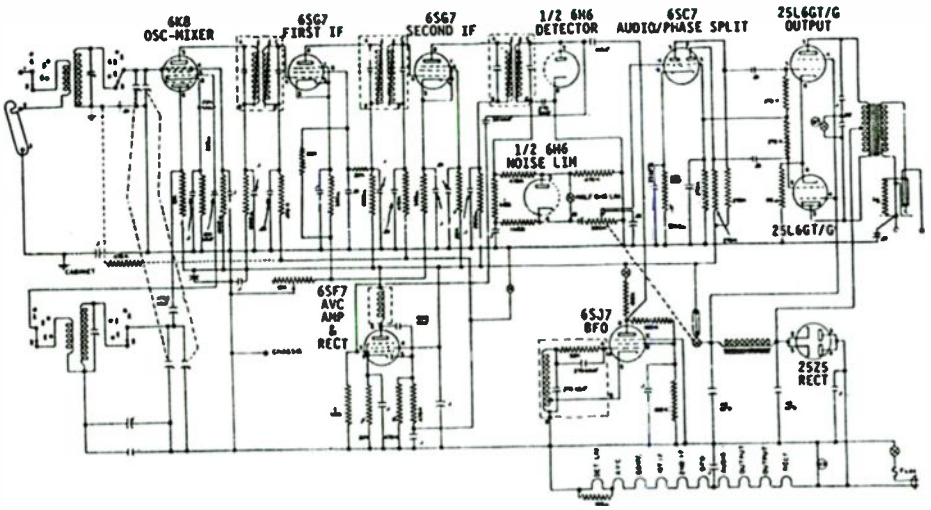
This receiver covers 0.54 - 30 MHz (broadcast through ten meters) in five bands. Frequency readout is on a slide-rule dial of generous length with a separate pointer for the electrical bandspread system. In addition to the main tuning, bandspread, and bandswitch controls, there are the usual volume and sensitivity controls, as well as toggle switches for the beat frequency oscillator, automatic volume control, noise limiter, and tone control.

The power switch is located on the sensitivity control. An odd feature is that the receiver muting switch (or B+ switch as it is called) is not a separate toggle, but is located on the volume control. Thus, the volume must be turned all the way down to click the switch off, then turned back up to the desired listening level after clicking it back on. However, there are terminals on the rear apron in series with this switch so that if the latter is left on, the send/receive function can be controlled by an external switch or relay.

Another curious and inconvenient feature is the location of the headphone jack on the rear apron. Since operators often switch back and forth between speaker and phones, this becomes quite a problem. The phones can't just be left permanently plugged in because inserting the plug automatically silences the speaker.

Tubes include a 6K8 oscillator/mixer, two 6SG7 i.f. amplifiers, 6H6 detector/noise limiter, 6SF7 AVC amplifier, 6SJ7 CW oscillator, 6SC7 first audio/phase inverter, two 25L6s providing push-pull audio output and a 25Z5 rectifier. The push-pull audio seems to be a rather luxurious feature for what is supposed to be a stripped-down radio. Perhaps, given the low operating voltages available from the a.c.-d.c. power supply, a push-pull circuit was necessary to provide decent volume from the large accessory speaker.

A more practical reason might be that, as a set with no power transformer, the NC-46 tube heaters had to be connected in series for operation directly from the power line. Thus the heater voltages had to add up to the line voltage. But tubes with 6-volt heaters normally operated from a power transformer had to be used for most of the stages in this set.



Schematic of the NC-46. Note heater string (at lower right) connected across the a.c. (or d.c.) line.

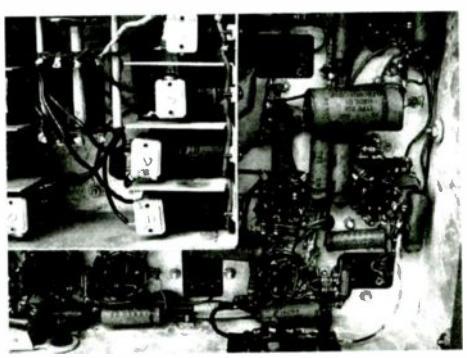
Higher-voltage tubes were generally not available in the specialized configurations necessary for a communications receiver. However, such tubes, having the 0.3 ampere filaments suitable for series hookup with the 6-volt types, *were* available for rectification (25Z5) and audio output (25L6). Using two of the latter made the total voltage of the series string add up to the 117 volts required for connection across the power line.

❖ Cosmetic Issues

I picked up this NC-46 at an Antique Wireless Association conference a few years ago. I was drawn to it for a couple of reasons, not the least of which was that I had admired the model as a youngster and was tempted to acquire one for my first ham station. I was talked out of that by the ham father of a high-school friend who – although he had one in his own station – pointed out the deficiencies I've just discussed. I followed his good advice, but I've had a soft spot for the radio all these years.

The other reason for my purchase was that the set looked a bit disreputable and as if it could use some work, a feature that would probably make a good restoration article someday. And that time has hopefully come.

Now, having moved the radio from my storage shed to my workshop, I was taking my first hard look at it. The disreputable look comes from the grimy and scarred paint. But most of the actual paint damage seems to be on the hinged top of the radio and the panel surrounding the dial window. These parts are removable and are painted the lighter grey in the set's two-tone grey color scheme. I can repaint them without worrying about getting an exact color match with the rest of the radio.



Close-up of underchassis wiring suggests the meticulous construction of this radio.

The dial window itself is missing. I'm not sure if the original was glass or plastic. I'll have to remove that dial window panel to get a better look at the window mounting arrangement. The rear apron has an RCA jack and a switch that are not supposed to be there. This is the kind of thing that makes a restorer's heart sink. Remember all the mindless and difficult-to-reverse modifications I found during our S-40 restoration?

I already knew that the top of the chassis, in contrast to the grungy appearance of the outside paint, was exceptionally clean. I had checked that out in the flea market before buying the set. But now, taking a more leisurely look, I was impressed all over again. Furthermore, the appearance of all the visible parts, as well as the shield cans and housings, spoke of the very high quality for which The National Company was so well known.

❖ Peeking Inside

This is not a set with a front panel and chassis that can be pulled out of the cabinet as a unit. Like all a.c.-d.c. sets, the chassis has the potential of being "hot" with the full a.c. line voltage. For operator safety, the chassis must be electrically isolated from the metal cabinet. To accomplish this, it is fastened to the cabinet via insulating shoulder washers at several points around its periphery and thus doesn't come out very easily!

However, National has thoughtfully provided servicing access in the form of a large removable cover plate on the bottom of the cabinet. Removing the mounting screws, I held my breath as I pulled off the panel – hoping not to discover atrocities such as had greeted me when I first got under the chassis of the S-40.

I was *very* pleasantly surprised. My first impression was of the almost compulsively neat and tight organization of the wiring. All long leads were bundled and laced; changes of direction were at 90-degree angles; very few components had leads more than a quarter of inch long thanks to careful planning and strategically placed terminal strips. That could make recapping a bit difficult, but all the same I couldn't help responding to the quality of the work.

The only modification I could see involved the switch and RCA jack that had been mounted on the rear apron. I'm not sure what their purpose was and won't know until I've had a chance to trace the wiring. They may have been for a phono input or for an i.f. output to be used with a "Q-Fiver" (a war surplus command receiver connected as a second i.f. strip – a common addition of the era – which would certainly have helped with those images mentioned by National).

Whatever had been the intended use for the jack and switch, I'm not sure I understand how it could have possibly worked out. The ground terminal of the jack was in electrical contact only to with rear apron of the radio which, as part of the cabinet, is electrically isolated from chassis ground. So the jack was essentially an open circuit. In fact, if the jack *had* been wired to the chassis, the cabinet of any equipment plugged into it would have had the potential of being "hot" with the full a.c. (or d.c.) line voltage. Well, these are the little mysteries that will arise when one is digging into an old receiver!

See you next month, when we'll do a partial disassembly and further inspection of the NC-46.

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Scanner Tips: Choosing a Scanner

The time to research a radio is before the purchase. Buying a radio, then posting a query on the Internet afterwards asking, "What do you think of this model?" makes little sense.

Manufacturers' advertisements don't tell the whole story, so don't rely on them to specify exact frequency coverage. Some buyers of the Yaesu VR-120, Yaesu VR-500, Alinco DJ-X2000T, and ICOM IC-R5 portables are surprised when they discover missing frequency ranges in the military air or land mobile bands. Learn about the frequency gaps before purchasing. Read comments on the Yahoo groups (**http://groups.yahoo.com**) devoted to that model and read *MT*'s product reviews.

❖ Impressive Models

I was most impressed by the following deluxe, tabletop radios which perform well on both shortwave and VHF/UHF:

- ICOM IC-R8500 (Jan 1997, fig. 1): Reliable performance across a wide frequency range. Ruggedly built and easy to operate. Rejects intermod better than my other radios. Well documented computer interface.

- AOR AR-5000 (Dec 1996): Complex keystroke combinations, but reliable performance both on shortwave and VHF/UHF. Rear panel jacks permit connecting several accessories.

The following models are discontinued, but available at reasonable prices on the used equipment market:

- Uniden BC780XLT (March 2001, fig. 2): Analog trunk tracker. Very fast scanning of conventional memory channels. Wide frequency coverage, alpha labels, CTCSS and DCS squelch, tuning knob, computer control. The price of used BC780XLTs is starting to drop below the $200 range.

- Uniden BC9000XLT (March 1995 and June 1996): Wide frequency coverage, 20 banks, alpha labels, CTCSS (optional board), tuning knob. Large, easy to view display.

- Radio Shack PRO-2005 and PRO-2006 (Oct. 1990 *MT*): These are older models but still excellent performers for conventional scanning. Wide frequency range, including the UHF military air and 75 MHz bands. Good image and spurious signal rejection. The PRO-2005 and PRO-2006 are virtually the same except for scan and search speeds.

On a tight budget? The following models may be purchased new at low cost and are good performers:

- Uniden BCT8 (Feb. 2004): Competent, inexpensive trunk tracker which may be computer controlled.

- Uniden BC278CLT (Nov. 1999): Inexpensive, yet provides good conventional performance.

If you require a portable scanner with ability to track conversations in APCO 25 digital trunked systems, your choices at this point are limited to the pricey Radio Shack PRO-96 (Dec. 2003, March 2004) and BC296D (April 2004).

I am struck with the Radio Shack PRO-95 (Jan. 2003) analog trunk tracking portable which had a sale price under $150. It runs on ordinary AA batteries and "just plain works."

My favorite portable scanners are tiny and provide wide frequency coverage:

- Yaesu VR-120 (July 2001): Small enough to carry in a shirt pocket. Alpha labels. TV audio bands. Can scan combinations of memory banks and seems to run forever on two AA batteries. Note: The USA model has several frequency gaps in the UHF military air and cellular phone bands.

- ICOM IC-R5 (July 2003): Small portable with good audio. Features include alpha labels, CTCSS, and DCS squelch. Wide frequency coverage. Note: The USA model has frequency gaps at 822 - 824, 849 - 851, 867 - 870, and 894 - 896 MHz, which prevent monitoring important 800 MHz land mobile systems.

❖ Frugal Scanning

I rarely purchase a new scanner at market price. Most of my later model scanners were bought used or at steep discount when a newer model was on the horizon.

For example, dealers were closing out the Yaesu VR-120 new for $109 shortly after Yaesu introduced the replacement VR-120D for $200.

Radio Shack initially sold the PRO-92 (Jan. 2000) for a hefty $350, but slashed the price to under $100 a few years later. The PRO-2067 was a honey of a radio when I reviewed it in September 2000, but the price was near $350. Radio Shack cleared them out a few years later for under $150.

Radio Shack puts their scanners on sale at least twice a year and the savings are usually steep.

❖ Buying a Used Scanner

You can save a boat load of money if you buy a used scanner in good condition. Buying a used item sight unseen is usually risky, unless you know the seller or you buy from a business with a good return policy. Grove Enterprises and a few other reputable dealers offer used equipment for sale.

When shopping for a used portable, be sure to inspect the case for evidence that the radio has been dropped. Pay close attention to the corners, looking for dents or cracks. The laws of probability dictate that a falling scanner will most likely land on a corner rather than landing flat on a side.

❖ Receiver Tips

- PRO-92, PRO-2067: The Radio Shack PRO-92 and PRO-2067 will display a false "136.5" CTCSS code on signals which are actually using DCS. When the radio reads "136.5," always check for the presence of Digital Controlled Squelch. - *Kevin O'Rourke*

- To perform a full reset on most Uniden scanner models, press the 2, 9, and Manual keys simultaneously while powering on the radio. Press the 2, 9, and Hold keys on newer models without a Manual key. This will cause the scanner to forget the frequencies and settings you may have programmed.

- Try different antennas (fig. 3). Don't presume that the stock antenna furnished with a scanner is optimal. As we reported in our original reviews, the stock antenna furnished with the Yaesu VR-500 (Feb. 2000 *MT*) and VR-120 (July 2001 *MT*) has a deep performance null centered near 159 MHz and extending a few MHz on either side. I often use Pryme RD-9 antennas for shirt pocket portables because I want a nearly invisible antenna which bends easily and doesn't sacrifice performance.

Scanner Speedup? Perhaps

- Old crystal controlled scanners may be sped up by simply changing a resistor or capacitor in the scan rate oscillator circuit.

- Don't try to make your programmable scanner scan faster by replacing the microprocessor's timebase crystal. There are too many side effects, e.g., a higher temperature in the CPU, shortened rescan delay, missed weak signals, etc.

Spectrum Display

Do you have a panoramic display or spectrum analyzer connected to your receiver's 10.7 MHz IF output, but the IF output level is too low to produce good vertical deflection? If so, connect a shortwave preamplifier between the radio's IF output and the display input. Be sure to use a DC blocking capacitor in series to prevent any DC voltage present at the IF output jack from damaging the display device.

Though an untuned, wide band preamp will give greater frequency response, I've used the tunable Ameco PT-2 (fig. 4) and PLF shortwave preamplifiers, with a blocking capacitor, to amplify the IF outputs of ICOM IC-R7100 and IC-R8500 receivers.

Equipment Repair and Maintenance

- You can clean dirty radio knobs using a toothbrush and soapy water, but a more effective method is to remove the knobs from the radio and place them in an ultrasonic cleaner for a few minutes with a small amount of liquid dishwashing detergent and water. I bought ultrasonic cleaners (fig. 5) at garage sales for under $5 each.

- Low audio output and microphonics are symptomatic of a bad audio output capacitor. This is the electrolytic capacitor in series between the external speaker jack and audio amplifier.

- To quickly determine whether a receiver's local oscillator is working, listen for its signal using a second receiver. Connect a short length of insulated wire to the second receiver's antenna jack and use the wire as a sniffer probe near the receiver you're testing.

  You can use this technique to adjust the crystal alignment coil in a receiver like a Plectron or Motorola Alert monitor if the second receiver is accurately calibrated.

- Use 3/8 inch soft plastic furniture leg tips to protect BNC jacks when not in use (fig 6). The leg tips are sold in most hardware and home center stores.

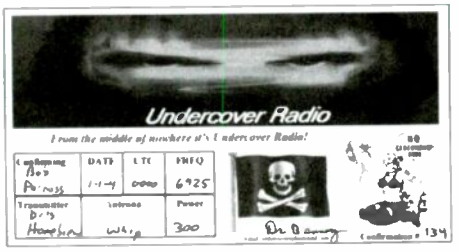
Cloning Problems

When cloning a portable scanner using another scanner or a computer, make sure the scanner is powered by fresh batteries and not an AC power supply. Using weak batteries or a wall wart can cause data transmission errors.

Beyond Scanning

Tune below 30 MHz from time to time. VHF/UHF scanning is lots of fun, but there are other interesting radio signals to monitor, including military, overseas aircraft, foreign broadcasters, and pirates (unlicensed).

For instance, I usually listen for pirate radio stations on New Year's Eve. I heard Undercover Radio on 6.925 MHz and snagged a full color QSL card (fig. 7) and an audio CD.



Clubs

Active participation in a good radio club can make the difference between having a hobby as opposed to merely having a radio. Find a club in your area, meet other scannists in person, swap frequencies, and make new friends.

I belong to CARMA, the Chicago Area Radio Monitoring Association. We meet monthly, enjoy a meal together, swap information, and show off our radios. We communicate via email lists between the monthly meetings. Club members arrange group tours of dispatch centers, air traffic control centers, and other communications facilities.

It's Only a Radio

Don't invest your ego in your radio. The quality of your scanner is unrelated to the quality of you as a person. Make peace with your scanner's imperfections.

NOTICE: It is unlawful to buy cellular-capable scanners in the United States made after 1993, or modified for cellular coverage, unless you are an authorized government agency, cellular service provider, or engineering/service company engaged in cellular technology.

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Ham Radio Deluxe – for SWLs

When is a ham program not a ham program? When you can use it for shortwave listening, of course! Many radio programs are geared toward the amateur radio community but have great features for us monitoring folk as well. Ham Radio Deluxe is one you'd expect to be a ham radio only program. Not so, as we will discover.

❖ One Deluxe Ham and SWL To Go!

Rig control, basic logging, scanning, internet connection to shortwave databases, connection to a DX cluster for the latest hot ham frequencies, synthesized voice announcements of frequency, mode and S-meter readings, an included earth mapping program, and the decoding program PSK31 are some of the features of Ham Radio Deluxe (HRD). And it's FREE!

The array of radios that HRD can control is large and growing daily. It is clearly aimed at transceivers. However, the receivers are well represented in HRD 1.2B334 by ICOM R75, R8500, the little R10 and Kenwood's R5000. The ICOM menu allows the user to input the CI-V address, so in theory it should work with all ICOM radios such as the R71, R7000 and R7100, although not all of the radio's functions will be accessible from the program.

I used my trusty ICOM IC-R10 for this article. I am not sure of the computer requirements of this program. Just let me say that it worked flawless and without hesitation on my old HP Pavilion 3266, which uses a Pentium I 233 MHz CPU.

❖ Downloading & Installation

HRD can be downloaded from **http://www.hb9drv.ch**. Did I mention it can be downloaded for no charge? The download of this 6,300kB file took a while on my dial-up connection. High speed Internet has not yet arrived to the woods of New England!

Be warned that in order to use HRD's speech synthesizer you must have installed Microsoft's MS Reader and MS Text to Speech programs. These are available free from Microsoft's website. If you are on dial-up be prepared to wait a bit for these 3700kB and 5800kB programs to download.

Installation of HRD is quick and simple. No problems here. Likewise for the Microsoft programs. The R10 was connect to the computer's serial (RS232) port via a level converter.

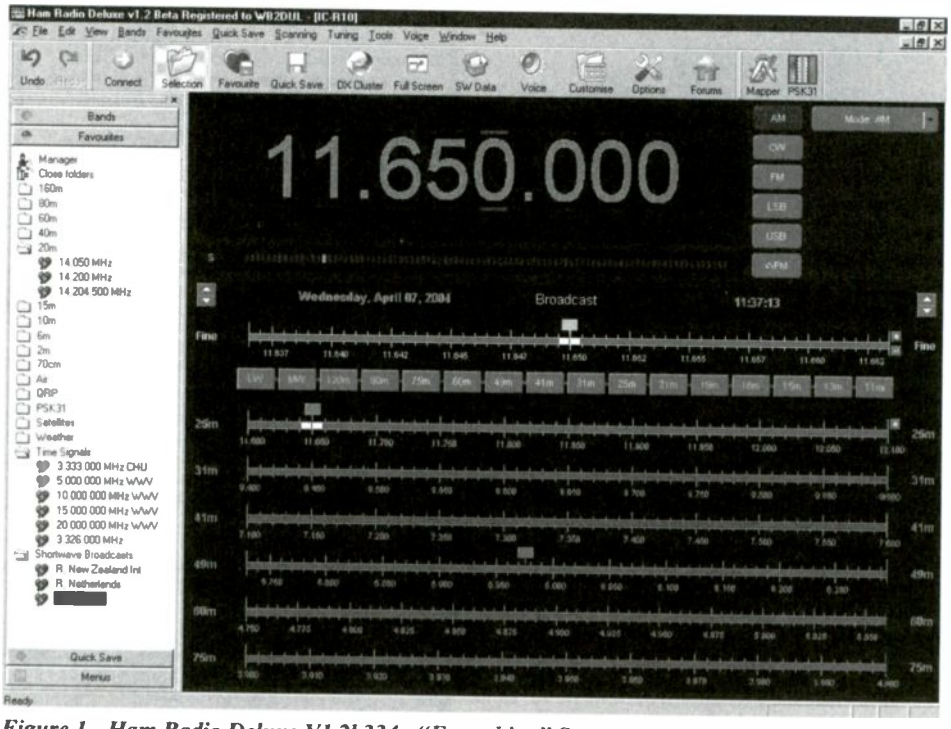

Figure 1 - Ham Radio Deluxe V1.2b334 - "Everything" Screen

❖ What's a Level Converter?

A reader just recently asked me this, so for newcomers and as a review for the rest of us, let's answer Loren H.'s question.

In order to control a radio from a computer, clearly there needs to be a connection between the two so data can be transferred. The computer's serial port, also called RS232, has a certain level that is considered a binary "1". For historical reasons (originating from the use of RS232 with telephone lines), these voltage levels are not commonly found in today's digital equipment, which use a lower voltage level to identify a binary "1" state. Hence the need for a Level Converter. Okay, what is it electronically?

If you are handy with a soldering iron, I refer you to Maxim Semiconductors for an array of inexpensive level converter chips. If not, you can buy a ready-to-use level converter from a number of sources. I'd suggest you start with **http://www.hosenose.com/interfaces_contents.asp** – one of the most inexpensive that I have seen on the Internet. For this test I used a homemade converter based on a Maxim chip.

❖ KIVSS - *Very Simple*

Figure 1 shows HRD's main screen; it is beautiful in its simplicity. Here you can see from the large numbers that my R10 is monitoring 11.980 MHz in the AM mode, shown in the top right. The rest of the screen takes a bit of navigation.

At the top of Figure 1 are two rows of the most frequently used commands. The topmost, starting with File, are in the form of drop down menus. The line below this is in the form of icons. There is a lot here, but we will just cover the "basic quick use" of HRD for monitoring. Frequencies can be accessed in many, many different ways in HRD. Let's start with those huge digits in Figure 1.

❖ Tuning Methods - *Lots*

First using the arrow keys, the keyboard, and the large numbers, you can directly input a frequency. Using your mouse, click on any of the large digits. Then using the <- and -> side-to-side arrow keys, move to the digit you desire to change. If you wish to tune in kilohertz, move to the fourth digit from the right. Then you can increase or decrease the tuned frequency using the up/down arrow keys. Need finer tuning? Just slide over using the side-to-side arrow keys. I found it a very convenient method of tuning.

Another tuning method utilizes an on-line shortwave broadcast database. Take a look at HRD's icon command line display in Figure 1. Now look toward the middle and you will see a box-like icon that is labeled "SW Data." You know what SW stands for? That's right ... shortwave! Who said this is just a ham radio program?

Clicking the SW icon it brings up the Shortwave Radio Database-ILG Radio box which you see in Figure 2. From here you can access ILG Radio's shortwave broadcast database via the Internet. The first time you run HRD you should download and save the current on-line database. Then the ILG Radio's website need only be accessed for updates.

The saved database can be sorted by time, language, geographic target, station name, station country or station city. The user can choose to see only stations which meet selected conditions. In Figure 2 we have chosen to display only stations broadcasting in the English language, at 20:00 hours GMT, and which are targeted to North America.

Tuning is as simple as moving to a station in the list using the up/down keys. If you look closely, you'll see that the large number displayed in Figure 1 (11.650) is the same as the highlighted "R. Australia" line in Figure 2.

◆ A List of My Own

Okay, so what do you do if you find a frequency you want to log? HRD has two different "memory" methods. Looking to the left side of Figure 1, a whole list of folders and individual frequencies can be seen. This is my "Favorites" list as can be seen by the label directly above the list. The user can save any frequency and mode that is being monitored (and displayed by the large number) in this section just by clicking "Favorites" in the icon command line.

Doing this brings up the box shown in Figure 3. Here the user can add a title and choose a storage folder or make a new folder. The frequency and mode are automatically entered but can be modified manually. We have made a new folder "Shortwave" and stored "R. Australia," as can be seen in Figure 1 at the lower left.

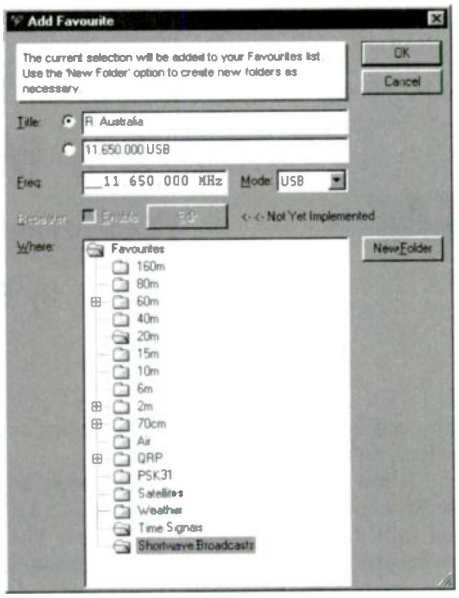

Figure 3 - Storing "Favorites" Frequencies and Modes

The Quicksave icon performs a similar function, but without any user input by saving the frequency on a list without a title. The Quicksave frequency list is viewed by clicking the "Quicksave" label seen in Figure 1 on the lower left. You can tune your receiver to the named frequency by clicking on a Quicksave entry.

◆ More Tuning!

If you look at Figure 1, just below the large numbers you will see the word "Broadcast." Then below that is a line of buttons and then rows of frequencies. Look closely and you will see the buttons are the shortwave broadcast bands expressed in meters. Each button has a row corresponding to that frequency band. For example, we are tuned to 11.650 MHz (large numbers). This is in the 25 meter band and we can see a light marker on the row below the buttons marked "25 Meter."

Using the mouse we can tune to other frequencies nearby by dragging this line marker. Alternatively (yes, even more choices!), tuning can be performed by mouse wheels and end of line scrolling. In all manual tuning methods, frequency steps are user programmable.

The user can set custom bands of frequencies and the corresponding buttons and lines displayed, via the "Band" menu on the left side of Figure 1. This is very handy for jumping around the frequency spectrum when using a radio such as the wide ranging IC-R10.

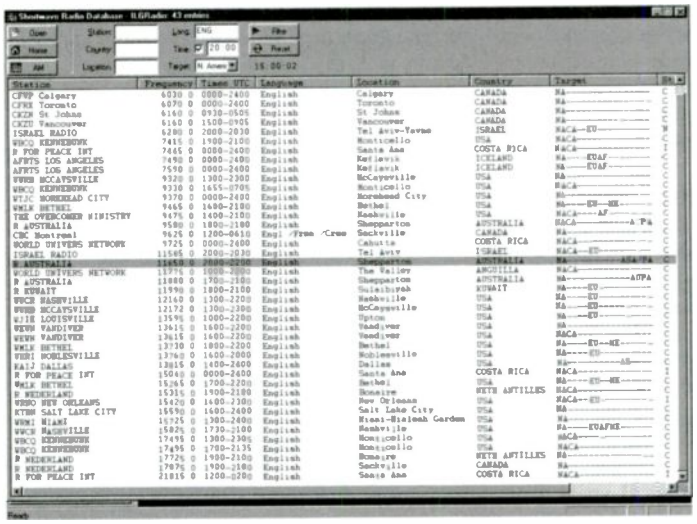

Figure 2 - Shortwave Database ILG Radio Display

◆ Did I mention Scanning?

The program can scan between user-definable frequencies. The user can also define scan step, direction, resume time, repeat/one time scan and speed. Since the scan is triggered by S meter readings, the threshold can be set. My R-10/interface did not appear to support S meter readings so I cannot comment on the scanning capabilities of HRD. However, I did monitor VHF/UHF frequencies and save them to a custom Favorites folder.

People, this program is very well thought out, easy to operate and is fun to use. And did I mention it is *free*?!

There is so much more to Ham Radio Deluxe, such as the voice announcements of frequency and mode. We should not forget about Mapper and PSK31 programs, which are included and can be accessed from the top right of Figure 1. We could go on for pages. Instead I encourage everyone with a computer and computer controllable radio to try Ham Radio Deluxe for themselves.

◆ Summary

This program, as the name suggests, does just about everything if you are a Ham operator. But we looked at it from a monitor's point of view. We did not use the transmitter control and features of the program.

The program is very intuitive to use, which is surprising with all of its features. I have two suggestions, both dealing with the "Favorites" storage. A user-inputted comments section would be very helpful for each stored "Favorite" as well as an automatic day-date-time stamping. Going a step further, sorting of the favorites by various keys, as in the shortwave database, would make HRD perfect for hams and monitors.

This product requires registration, but it is a *free* registration! Simon Brown, HB9DRV, is the author and has given it to the radio community free of charge. With all of its features it rivals and surpasses most of the commercial radio programs selling for over $50. I find it amazing and very exciting. We may have found the program that sets the bar for ALL radio software! And did I mention it's free?!

Till next time when we'll re-discover the axiom not to judge a book by its cover, or name.

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MT REVIEW

Monitor 4 Geiger Counter Kit

By Bob Grove, W8JHD

As international fear grows with the threat of terrorism, more and more civilians feel vulnerable. Words like "dirty bomb" get tossed about with few Americans really knowing what they mean. A few have some notion that it refers to radioactivity, but that's about it. And what if such a device does go off? How would we know if there's a danger to us?

It's questions like this that led me to research a bit about such nuclear threats and to see what I could do to prepare myself without becoming a wide-eyed zealot.

Basically, a dirty bomb is a conventional explosive (gunpowder, dynamite, ammonium nitrate slurry) which has been laced with radioactive waste collected from a variety of sources.

What kinds of waste, you ask? Well, up until the 1970s, glow-in-the-dark watch, clock and instrument dials contained radium chloride; dust-static eliminators for record players contained radioactive polonium; and red-orange glazing in the pottery industry was likely to contain uranium oxide.

More recently, hospitals are using increasing amounts of radioactive isotopes in diagnosis and treatment; smoke detectors utilize a pellet of americium oxide to ionize air particles; the mining and hydrology industry employ radioactive tracers to subterranean mapping; radioactive mineral specimens are widely available on the Internet; and even some gas mantles for portable lanterns are impregnated with radioactive thorium to improve its incandescence lifetime.

Can such constituents of a dirty bomb be deadly? It all depends upon its contents and the resourcefulness of the terrorist in accumulating the load. And what happens when eruptions on our sun send massive clouds of energetic particles into our atmosphere? I'd like to know if there's nuclear activity around me, wouldn't you?

Affordable and Available Protection

About two decades ago, the now-defunct Heathkit Company of Benton Harbor, Michigan, offered an inexpensive Geiger counter kit, a radiation detector that would show the relative presence of the most common types of nuclear energy – alpha and beta particles, gamma rays, and the ever-present cosmic radiation as well as X-rays.

It just so happens that the kit, known as the Monitor 4, is still available, both as a kit and fully factory assembled and tested. The pocket-size detector is powered by a standard nine-volt battery and is entirely self-contained.

A two-inch meter reports in two scales – counts per minute (CPM) and milliroentgens per hour (mR/hr). A sensitivity switch can elect any of three positions to accommodate various field intensity levels; it also allows measurement of the battery voltage status. Another switch permits selection of the silent meter and blinking LED only, or the added activation of an internal piezo speaker to render the familiar audible clicks traditionally associated with Geiger counters.

Let's Build One

The kit arrived promptly and securely; parts were carefully packaged and a handy inventory allowed confirmation of its contents. A substantial zipper case is included, as is the solder for the job.

Two manuals accompanied the kit; one for step-by-step assembly and final alignment and operation, the other to pictorially identify components and circuit-board locations and procedures. But this wasn't just any old manual – all of the resistors, capacitors and diodes were carefully held in position with transparent tape alongside their part numbers and values!

Not only that, but a vial of conformal compound is provided to coat the high-voltage components to prevent humidity failure. These are examples of extraordinary service for a kit company to provide, and they made a big difference during assembly. They give the impression that this Geiger counter means business.

No Real Problems

An experienced, skilled kit assembler should be able to do the soldering in two hours with an extra hour for final fiddling and pruning. We found the manual easy to follow, and only experienced problems when we decided to ignore the schedule and fly by the seat of our pants! As tempting as this is for Type A personalities (I speak from experience!), it's not a good idea. There's a reason for the manual.

Over the years, as parts become obsolete or hard to find, substitutions are made. These usually, but don't always, get into the manual. This was the only problem I encountered and it was immediately and courteously resolved by a phone call to the factory. The very last step, closing the clam-shell case, was delayed by a persistent resistance that wouldn't allow the two halves to mate properly.

It turned out that a small, plastic icicle left over by the injection-molding process wasn't actually supposed to be there (it looked like a support for the circuit board). Snip, problem solved.

Let's Try it Out

Inserting the nine-volt battery into its snap and switching the unit on, I immediately had the pleasure of hearing the clicks, watching the meter and seeing the LED flash – what a rush! First time and no errors! Without any calibration procedure, the unit has 20% accuracy, improved to 10% with appropriate alignment tools.

But most of us are well satisfied with seeing the meter hang low, not caring how many mR/hr that means. It's when the needle dances off the scale, the LED seems to come on solid without blinking, and the clicks become a buzz that we become understandably alarmed!

I tested the Monitor 4 on an array of household sources that I have accumulated – old radium-dial paint chips, smoke detector pellets, gas-lantern mantles, even my microwave oven. They were all "hot" except for the microwave oven; I guess they've made substantial improvements in X-ray shielding over the years!

A Final Look

I'm very pleased with my Monitor 4. Over the years this model has given reliable service. (I still have my original Heathkit and it's never had any attention but occasional battery replacement.) It was like meeting an old friend to see the new kit come in, and it was a pleasurable experience building it.

The Monitor 4 is available from the manufacturer, S.E. International (web site **http://www.seintl.com**) for $170 plus shipping. S.E. International, Inc. P.O. Box 39, 436 Farm Rd. Summertown, TN 38483-0039; 1-800-293-5759 Fax: 931-964-3564; *radiationinfo@seintl.com*

Experimenting with DRM

By Mark J. Fine, mark.fine@fineware-swl.com

DRM stands for Digital Radio Mondiale (**http://www.drm.org**), a fairly recent development in audio streaming over shortwave and mediumwave. (See 4-part *Computers & Radio* Nov 2003 through Feb 2004.) Technically, these signals are transmitted using interleaved data streams using multiphase quadrature amplitude modulation over a typical AM channel. Once demodulated by the receiver, a software application must provide further demodulation to convert the digital stream back to audio.

The signal can be received using normal shortwave radios with one catch. The total signal bandwidth is approximately 10 kHz wide. This requires that a receiver have a filter that is wide enough to capture the full bandwidth of the signal. Several receiver models have been modified to accommodate this bandwidth issue, primarily by means of picking off one of the intermediate frequencies, and modulating down to a 12 kHz center frequency.

Receiver Selection and Settings

Upon looking at the DRM specifications, it was determined that it was theoretically possible for us to do a DRM receiving test without having to modify a receiver. We have a couple of receivers that have the required output bandwidth. The Drake R8A has a 12 kHz filter, which is automatically switched in for FM demodulation. However, the radio signal must be first demodulated using AM or SSB to be effective. We had contemplated modifying the Drake R8A so the FM filter would work for the AM modes. Since this is our primary receiver, that option was quickly ruled out.

Another receiver capable of wideband output was our NRD 535D, which has an approximately 12kHz wide AUX filter. This is sufficient to get the signal through; however, the signal would have to be "moved" into the correct offset frequency for any software to operate. It was thought that we could get the full width of the signal by putting the receiver into a sideband mode and de-tuning by 5 to 8 kHz. A better solution was to make use of the receiver's internally selectable CW offset. This worked fairly well. But, the rolloff of the filter was a bit much to get any reliable software decoding. Moving the passband in the direction of the signal helped to alleviate that problem. A summary of the settings used for the NRD-535D are in Table 1.

By using the settings in Table 1, we were able to get a signal that was within 10dB between the lowest and highest frequencies in the SSB-demodulated signal. Since CW on the NRD-535D is a lower-sideband mode, we opted to experiment with the tuning frequency to simulate a guard band. Depending upon signal strength, this meant tuning 1 to 3.5 kHz above the DRM's center frequency. For example, afternoon transmissions from Sackville are currently on 9800 kHz between 2055-2400 UT. For this, we would actually tune the receiver to between 9801 to 9803.5 kHz to create to desired effect. Since the CW Offset is set to -5 kHz, this actually moves the center frequency of the DRM signal -6 to -8.5 kHz from the receiver's displayed frequency, and is well within the filter's 12 kHz bandwidth.

Table 1 - JRC NRD-535D Receiver Settings

Frequency	Center frequency +1 to +3.5 kHz
Mode	CW
Bandwidth	AUX (12 kHz)
AGC	Slow
Passband	-2000 Hz
CW Offset (BFO)	-5000 Hz

Software Selection

Currently, there are only two options for decoding a DRM stream. The DRM Consortium (**http://www.drmrx.org**) sells a product called the DRM Software Radio for 32-bit Windows operating systems that costs about US$60 depending on exchange rates. There is also a version called Dream (**http://drm.sourceforge.net**) that was developed by a couple of teaching students, Volker Fischer and Alexander Kurpiers, at Darmstadt University of Technology, Germany. Dream is provided under the GNU-General Purpose License (**http://www.gnu.org/copyleft/gpl.html**) in the form of C++ source code for both 32-bit Windows and Linux. A SourceForge project has been set up for this at **http://sourceforge.net/projects/drm/**, where the latest cvs versions can be downloaded. Dream requires a few libraries to be built and installed before it can be created. Dream was designed for Trolltech's Qt v2 (**http://www.trolltech.com/**), which is common to both Windows and Linux. We used Qt3 for our Red Hat 8 (**http://www.redhat.com/**) installation, which was already built-in. This and other required libraries are in Table 2.

Building Dream

For experimental purposes, we attempted to build all of the parts of Dream under Red Hat 8. This also presented some problems, since the application did not properly interface to our SoundBlaster Audigy card. The program would hang during initialization even though the application (and drivers) was properly built. Dream can be built to use either the standard Open Sound System (OSS) drivers, or with the Advanced

Table 2 - Required Software Libraries

Library/ Package	Windows	Linux
Dream		
Source:	http://sourceforge.net/projects/drm/	http://sourceforge.net/projects/drm/
Pre-compiled:	Dream.exe	
Qt v2.x		
Source:	QtWin230-NC	http://www.trolltech.com
Pre-compiled:	qt-mt230nc.dll	(Qt v2 and v3 are built-in to Linux)
FFTW v3.0.1		
Source:	http://www.fftw.org	http://www.fftw.org
Pre-compiled:	WinFFTWInst.zip	
Qwt Widgets v4.2.0		
Source:	http://qwt.sourceforge.net/	http://qwt.sourceforge.net/
Pre-compiled:	WinQWTInst.zip	(Needs both the QWT and QWT-developer
packages)		
FAAD2 v2		
Source:	http://faac.sourceforge.net/	http://faac.sourceforge.net/
Pre-compiled:	None	
NewsService Journaline®		
Source:	WinFhGJourLib.zip	Not implemented in Linux
Pre-compiled:	WinFhGJourLib.zip	

Linux Sound Architecture (ALSA).

After spending a few days getting ALSA to work under KDE, we realized that the problem wasn't the sound card. The problem was an undetermined conflict with KDE's Analog Realtime Synthesizer (aRts) system, which was apparently blocking the card's recording capability. The problem could be quickly rectified by disabling aRts, or by running under GNOME. We decided to stick with GNOME.

Experimenting with Dream

Dream is an interesting and complicated application. It uses the soundcard to "read" the digital signal, and then decodes it into the several DRM control, information and audio streams. It first performs time and frequency synchronization to determine if it is receiving DRM or just noise, as well as to provide the appropriate channel estimation and tracking mechanisms.

Once synchronization has occurred, it decodes three QAM signals: the Fast Access Channel (FAC) in 4-phase QAM, Service Description Channel (SDC) in 4 or 16-phase QAM, and the Main Service Channel (MSC) in 16 or 64-phase QAM. The FAC is what tells the DRM receiver the primary content and format of the main stream, and how to decode it. The SDC provides secondary information about the sender and any other text data, similar to Radio Data System (RDS) on FM broadcast stations. The MSC is the audio and data stream content, which is typically a 12 or 24-bit Advanced Audio Coding (AAC) signal, with optional Spectral Band Replication (SBR) encoding.

Dream also provides iterative multi-level channel coding techniques for each stream, which provides forward error correction for moderately noisy signals. It also employs various channel estimation and synchronization methods that can suit varying channel conditions and computer processing power.

Dream provides several displays as the signal is being acquired to evaluate signal quality and aid in tuning. During synchronization and channel estimation, Dream takes the captured audio and determines the center frequency of the DRM signal. It then shifts it to 6 kHz for further decoding, using fast fourier transforms. The application provides two displays for this: a real-time spectral display and a power-shifted display.

Once synchronized, it provides three constellation plots that display the phase purity of each of the FAC, SDC and MSC streams. Dream also provides signal quality meters and "stoplight-style" status bars for each stream. However, we found that the constellation plots were more informative, if not as enjoyable to watch.

We had some problems with our initial Linux installation of Dream. The application would acquire the data properly. However, it would only properly decode the FAC and SDC portions. This was primarily using the Sackville transmissions of 9800 at 2055-2400, 6015 at 0000-0059, 6140 at 0100-0159, and 6010 at 0400-0459. All of the received signals were strong, although fluttery at times due to varying geomagnetic conditions over the test period. We were able to get a received 27dB signal to noise ratio (SNR), a very clean MSC constellation display, some occasional bleeps and burps, but the application refused to decode any audio.

After a couple of weeks of experimenting with the Linux version, we attempted to try the compiled Windows version and accompanying Qt dynamically linked library (DLL). After a lot less experimentation, we were finally able to hear a DRM signal originating from the Deutsche Welle transmitter in Sines, Portugal (15440 at 0800-1400 UT). The reception wasn't great, but it was generating a lot more intelligible audio than the Linux setup. With a fair signal, Dream only lost synch a few times and quickly recovered.

What was interesting is that the MSC constellation did not have to be perfectly clean in the Windows version in order to generate clean audio. Upon looking at Dream's log files, the Windows version was correctly decoding over 800 packets for 10 received AAC data frames. The signal was reported as a fairly low SNR of 15-20dB. In sharp contrast, the Linux version was receiving clean signals of 25-27dB SNR and had only correctly decoded less than 60 packets per 10 received frames.

Success under Linux

We were finally able to get the Linux version operational. The problem we were having getting Dream to decode audio was due to two issues: an incompatibility of faad2-RC3 with the new DRM standard and problems with the way faad2 is built. In order to get Dream to properly decode the latest DRM standard you will need the "final" release of faad2-2.0, dated 9 Feb 2004. Note that there are some additional issues with this release that will create a defective Makefile. Table 3 describes the way we were able to get it built correctly (as root) after unarchiving the source tarballs (comments in brackets).

Table 3 - Procedure for Building faad2 in Linux

```
[ build faad2, use the top of your own source
   tree for the next line ]
# cd ~/faad2
 # sh ./bootstrap
[ need to set c/c++ flags, due to inconsistency
   in the configure script ]
#  export CFLAGS="-g -O3 -DDRM -
   march=i686"
#  export CXXFLAGS="-g -O3 -DDRM -
   march=i686"
[ we also use XMMS so we're building with the
   other two package settings ]
# ./configure —prefix=/usr —with-drm —with-
   xmms —with-mp4v2
[ edit Makefile since it's broken ]
# emacs Makefile
[ rem out the rpm: section at the end, and save
   the Makefile ]
[ make sure all old stuff is out of there before
   building faad2 ]
# make clean
# make
# make install
[ rebuild Dream, use the top of your own source
   tree for the next line ]
# cd ~/DRM/drm-1.0
[ we use ALSA so... ]
# ./configure —prefix=/usr —enable-alsa
[ make sure all old stuff is out of there ]
# make clean
# make
# make install
```

Building under Windows

Like the Linux version, we decided to try building the Windows version. At first we tried emulating a Linux setup using various Linux-on-Windows tools, such as MinGW/MSYS and Cygwin. These are nice tools; however, the build environment (Unix for some things, Win32 for others) is not supported within the source code available. We were only able to get the code to build using Microsoft Visual C++ v6. Workspace and other development support files for compiling under VC++ is included in all of the Windows source packages.

Upon using Visual C++ we found two particular issues. First, the compiler had problems with the headers from the installed Qt interface package. This was solved by installing Service Pack 3 (SP3). SP3 was included with our Visual C++ distribution. It didn't seem to need it at first so it was never installed. Other experimenters also have claimed problems and installed SP5, which is now available on the Microsoft web site.

Our second problem was a bit more complicated. The faad2 code uses the ALIGNED modifier in several places within the code, which is intended to bit-align several memory tables. We were able to build faad2 by tabbing through the listed errors and removing the ALIGNED modifiers (200+ in all).

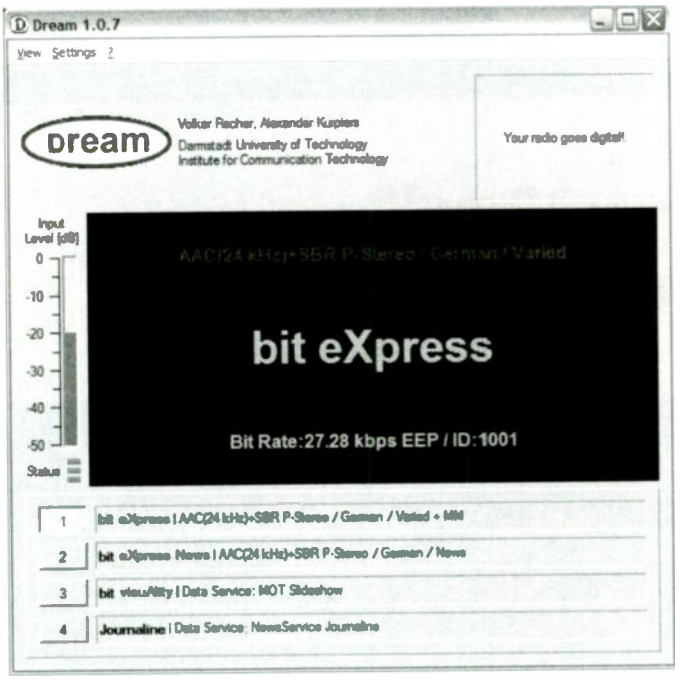
We did not attempt to compile the other required packages. We opted to just copy the pre-compiled libraries and header files for FFTW, Qwt and Journaline® into the drm/libs directory. Once faad2 is built, you must also copy its resulting library and header file prior to building Dream.

DXing with DRM

Who says you can't DX with DRM? We decided to try some real-time DXing using the DRM Live Broadcast Schedule. We already mentioned the DW transmission from Sines on 15440. It is somewhat irregular in reception, but does produce audio for the most part. In addition to Sines, we were also able to receive a very clean Radio Kuwait transmission originating from Sulalbiyah, on 13620 at around 1200-1300 UT in Arabic. The transmitter power is not stated, but the audio was fairly easy to decode, given that the MSC is only 16-QAM. We were also able to receive the 35kW Voice of Russia transmission from Taldom in French on 12060 at approximately 1700 UT. However, the audio was very irregular and was only decoded in fits and starts.

The best catch by far, was a 30-100W transmission from Erlangen, Germany, on 15896 at around 1400 UT. The transmission is from bit eXpress, which is apparently intended to be an on-campus transmission from Friedrich-Alexander University in Erlangen-Nürnberg, Germany.

bit eXpress makes full use of the four available content streams in the DRM specification: "bit eXpress" (music and variety), "bit eXpress



News", and two data streams. The two audio portions are in Parametric Stereo (P-Stereo), and are streamed at a 27.28 kbps raw bit rate. The two data portions consist of slide shows that are transmitted at a 4.08 kbps raw bit rate, called "bit visuAlity" and Fraunhofer's NewsService Journaline®. bit eXpress is listed as transmitting 24-hours a day.

Given the low power, location, and frequency of the broadcast we suspect that it's best received just after dawn on the East Coast of North America. This reception window will shift to later times (e.g., as late as 20-23 UT) as the summer approaches. The signal occasionally lifts out of the noise during local daylight hours. However, this makes it hard for Dream to consistently obtain time and frame synchronization.

Effects of Interference

Throughout most of these experiments we have found the standard tenets of shortwave reception are more critical with DRM. Typical analog broadcasts would be difficult to hear when the signal is just above the noise level, but potentially still very intelligible. There is no noise or interference with decoded DRM audio. Either you hear it or you don't.

This first seems to require a signal with an SNR of between 10-15 dB, depending upon the encoding of the MSC. 16-QAM encoded signals with low raw bit rates will be easier to decode than a standard 64-QAM channel, as we found with the Radio Kuwait broadcast. Some synchronization may occur at levels as low as 5 dB SNR. This may also allow a few SDC packets to be captured, providing a nice visual ID of the transmitting station and the content.

Another factor that seems to be much more critical with DRM is the amount of in-band and adjacent channel interference. When listening to an analog signal, local carriers and other interference are merely an annoyance. They can be usually excised using filtering and notching techniques. However, DRM is especially sensitive to these things. Interference can mean the difference between hearing something and hearing nothing. Although the signal is spread 10 kHz wide, any narrow in-band or adjacent carriers that are 5 dB above the DRM signal tend to disrupt the phasing that is required. This appears as a rippling effect on the envelope of the signal's spectrum and creates intermodulation and an artificially induced selective fading. It disrupts overall phasing and increases the apparent delay of the received signal. Dream will not decode any audio if it calculates that greater than approximately 5ms of delay exists.

It is doubtful that anyone can do anything about in-band interference, since notching would also remove critical portions of the data. As well, the position of the adjacent interferer is more critical in our ad hoc receiving equipment. First, we are decoding the signal within the rolloff portion of the NRD-535D's AUX filter. Therefore, a carrier closer to the receiver's center frequency would be much more disruptive than one further away.

We have also found that interferers on the higher end of the spectrum can be somewhat controlled by moving the NRD-535D's PBS closer to 0. This will attenuate the interference, but may also disrupt the spectral balance of the signal's sidebands. Adjusting the PBS too close to 0 will cause one sideband to be much lower than the other, decreasing the probability that it can be reliably decoded. We suspect that receivers that are designed (or modified) for DRM, such as the TenTec RX-320D/350D and AOR 7030 use much better filtering for rejecting adjacent channel interference.

Improvements in Dream

In the month and a half of experimenting with Dream, we have seen several marked improvements in the application. Volker Fischer, one of the primary developers, has been hard at work listening to comments from the users and making incremental progress on a daily basis. In addition to several performance improvements, Volker has also added several user friendly improvements as well.

In addition to DRM, Dream also has a software-based AM demodulation feature, which allows you to tune a normally modulated AM or SSB signal. This has been vastly improved by allowing you to "tune" to a peak in the spectral display and select the appropriate mode and bandwidth. Also included is support for Fraunhofer's NewsService Journaline®. There is also a capability to start Dream as a transmitter, rather than a receiver, so that amateur radio hobbyists can likewise experiment with the technology.

Volker has also included a DRM station selection window, which may be periodically updated from the DRM web site. The station window allows you to see which stations are on at a given time and is automatically updated. Clicking on a station also allows you to re-tune a select set of receivers: WinRadio G3, AOR 7030, or an Elektor 03/4. We have been working with Volker to also add code for the JRC NRD-535D (using our tuning process above) and the TenTec RX-320D. Support for other DRM-compatible receivers may follow.

Winterfest Demonstration

With the assistance of VOA's Dr. Kim Elliot, we have demonstrated the use of Dream with the NRD-535D at the recent SWL Winterfest on March 12-13, 2004. We were able to set up next to another DRM display, using the WinRadio with a built-in DRM capability. Although reception on the same antenna system was similar, there were many instances where Dream decoded heavily faded signals, where the WinRadio would not.

Since these applications are heavily based in software, the power of the hosting computer system is a large factor. We were using a Gateway 400S laptop, which uses a 2GHz Pentium 4 mobile processor and an ESS-1989 (Allegro) soundcard. The WinRadio setup may not have been as powerful.

Conclusion

Our success with both the Windows and Linux versions conclude that DRM can be decoded with a standard receiver that is capable of wideband output. The TenTec RX-340 can be made to tune DRM signals using a procedure very similar to the one we have been using with the NRD-535D, which is openly advertised on their web site. Caution should be taken that this procedure may be only true for the Dream software, which performs an integrated frequency shifting function. The DRM Software Radio firmly requires a 12 kHz IF output to operate properly. It does not include the extra frequency shifting, which requires more real-time processing power.

Further information about DRM and Dream can be found using all of the links provided. With the number of DRM transmissions constantly changing, it is especially worthwhile to frequently check the DRM Live Broadcast Schedule for any updated transmission information.

This is your equipment page. Monitoring Times pays for projects, reviews, radio theory and hardware topics. Contact Rachel Baughn, 7540 Hwy 64 West, Brasstown, NC 28902; email editor@monitoringtimes.com.

Jock Elliott KB2GOM
jockelliott@monitoringtimes.com

Simmons CaptureView™ – Reach Out and Snap Something

If you've been reading this column for a while, then you already know that I have a soft spot in my heart for first-responders – the folks who put themselves in harm's way to help others. In my view, they deserve all the support and best equipment we can give them.

There are times, though, when the most prudent thing rescue and emergency services personnel can do is to watch from a distance. Imagine, if you will, a situation that occurred a few years ago near Troy, NY: there was a fire at one of those tank farms where petroleum products of various kinds are stored. It was eventually contained without serious incident, but in a situation like that, the smart thing is to assess the situation from a safe distance, just in case the whole thing decides to blow sky high. At times like that, it would also be very handy to be able to share what you are seeing with other people – like the folks back in the command center.

And that's *exactly* where this month's product comes in. The Simmons CaptureView is a full-featured binocular integrated with a digital camera that can take still pictures or short movies. The binocular is an 8-power folding roof prism design with fully coated lenses and 42mm objectives. The minimum focusing distance is 16ft and the angle of view is 8 degrees, providing a field of view of 376 ft. at 1000 yards. The eyepiece lenses have fold-down eyecups that allow eyeglass wearers (like me) to get a full field of view. The right-hand eyepiece also has an adjustable diopter for those whose right eye differs from their left.

The Simmons CaptureView combines a good pair of binoculars with a telephoto digital camera.

The camera is mounted between the right and left barrels of the binocular. The lens is an F4.0 fixed focal length that is the equivalent of a 400 mm lens on a 35mm camera. Minimum focusing distance for the camera is 20 meters. Sixteen megabytes of built-in memory are capable of storing up to 40 images from the 2 megapixel CMOS sensor, and there is a slot for SD memory cards, up to 256MB.

Oh deer – three whitetails snapped at 175 yards with the CaptureView.

The CaptureView measures 4.9" wide by 3.25" high by 5.75" deep. It weighs 26 ounces and requires two AA alkaline batteries. I'm probably suffering from some television-induced brain damage, but the CaptureView's three-module configuration reminds me of the starship *Enterprise*.

It comes with a USB cable for downloading pictures to your PC, a CD-ROM of software, neck strap, cleaning cloth, and carrying case.

My overall impression is that the CaptureView is well made and is not significantly larger than some 7 x 35 binoculars I have owned. The binoculars provide crisp, clear views, and I was extremely pleased with them. The focus wheel is underneath the camera mounted in the middle, but it takes only a little while to become accustomed to that.

The camera module requires some additional description. At the extreme rear, there is a hatch that, if you squeeze both sides, can be removed to install the batteries. Above that is a slot for the optional memory card. Moving up again, there is a tiny port where the USB cable plugs in.

On top of the camera is a flip-up color liquid crystal display that measure about 1.25" wide by 1" high. To the rear of the display are two large buttons and, when the display is in its upright position, two smaller buttons are visible in the display "well." To turn the camera on, press and hold the left-hand big button (the MENU button) for 3-5 seconds. In this mode, the display shows you what the camera lens is viewing.

Another poke of the same button will allow you to display the menu itself, from which you can select still or movie mode, playback, movie length, resolution options, time and date, exposure options, date stamp, and a number of other choices. The two smaller buttons are used to toggle among various options, and your selection is confirmed by pressing the MENU button again. Once everything is set to your liking, press the right-hand big button – the shutter – to capture the still or movie that you want. Through the USB cable, any image grabbed by the CaptureView can be downloaded to your computer and then moved by network or wireless to where it needs to be.

In all I found the CaptureView to be an excellent piece of gear, and I can heartily recommend it. There is, however, one caution: the camera lens is the equivalent of a 400 millimeter telephoto lens and any movement of the lens will be exaggerated in the image. As a result, for greatest sharpness of image, try to make sure that you brace the CaptureView to avoid movement that could cause blurring of the picture.

The SRP of the CaptureView is $249. For more information, visit:
http:www.simmonsoptics.com

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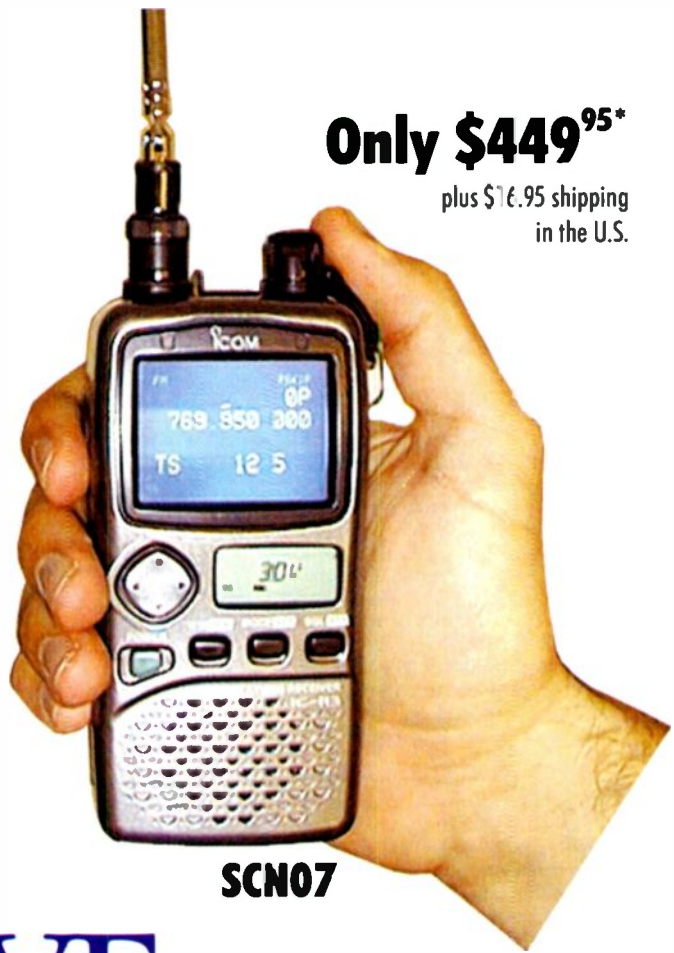

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The Grove Military Frequency Directory, Second Edition, edited by Larry Van Horn, N5FPW, is $39.95, and may be ordered from Grove Enterprises. Call 1-800-438-8155, email order@grove-ent.com or write 7540 Highway 64 West, Brasstown, NC 28902.

Lightning Guard

The Lightning Guard Model-V 100 will protect your receiver or transceiver from lightning when you're away from the shack. The two connections most vulnerable to lightning-induced voltage spikes are the AC power cord and your antenna coax. When these are connected to the Lightning Guard, power and rf signal are allowed through to the receiver or transceiver only when its internal relays are energized.

In the MANUAL mode, when the Lightning Guard is switched OFF, the relays de-energize, disconnecting AC power and the antenna, and connecting both sides of the AC power cord of your receiver or transceiver and the antenna input to the AC power ground wire. An external

ground can also be connected.

In the AUTO mode, the main power switch is left in the ON position. Then if there is a momentary interruption in AC power (as there often is with lightning storms), the relays de-energize, connecting everything to ground. The relays remain de-energized, and your equipment remains grounded until manually reset. The AUTO mode should only be used when it is desirable for AC power to remain ON, but some degree of protection is still necessary.

If voltage spikes occur that are high enough to jump the relay contacts, they are jumping to ground and not through your transceiver. This will effectively protect your equipment from lightning. Of course with a direct hit, nothing can guarantee protection.

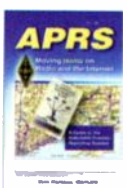
Maximum AC current is 10A. Maximum RF power is 200PEP. SO 239 connectors are provided. Models are also available for computers and high end TVs. Introductory Price: $80.00 plus $8.00 for Priority Mail shipping. This unit is not intended to replace a surge protector, but goes in front of the surge protector or line conditioner for the ultimate in protection.

Electronic Specialty Products LLC, P.O. Box 711, Geneva FL 32732; 407-349-9150; **http://www.electronicspecialtyproducts.com**

APRS – Moving Hams on Radio and the Internet

Stan Horzepa

Early in my ham radio career when living conditions (an apartment) only allowed for VHF/UHF operations, I discovered the world of amateur packet radio. I was fascinated with the ability to communicate keyboard to keyboard with other hams over large distances in the VHF/UHF spectrum using low power rigs.



Packet has been around since the 1970s and it has continued to evolve. In fact, the packet of yesterday does not even closely resemble what we see in use today in the VHF/UHF spectrum.

In 1992, Bob Bruninga, WB4APR, introduced a new concept in packet operation called the Automatic Position Reporting System. APRS is among the most popular activities which use personal computers in ham radio applications. Getting started often requires little more than a VHF radio and a computer. Add a portable Global Positioning System (GPS) receiver, and you have precise position information at your fingertips. Connect the GPS receiver to your APRS station, and you can transmit your location information even as you're moving!

So what are some of the things that you can do with APRS?

- Track moving objects on maps (other stations, public service vehicles, marathon runners, etc.).
- Display weather statistics and storm warnings.
- Find a hidden transmitter or jammer.
- Access the APRS network on the Internet (even without a radio!)

And now Stan Horzepa, WA1LOU, has written a guide to help the newcomer access this exciting mode of communications. In this book, you'll learn how to configure hardware and software to make the best use of your APRS station. Software examples include programs for Windows, Mac and Linux. Follow detailed discussions of APRS operation and technical support. To help you get started, there's also a complete Glossary of Terms and a summary of APRS software commands.

If you are interested in increasing your VHF/UHF horizons, then a copy of *APRS – Moving Hams on Radio and the Internet* should be on the bookshelf in your ham radio shack. This is the third APRS book written by *QST* columnist and ARRL author Stan Horzepa. The softcover book (ISBN: 0-87259-916-7; ARRL Book number 9167) sells for $17.95. You can order from the ARRL website (**http://www.arrl.org**), on their toll-free telephone line 1-888-277-5289 (Outside US +1-860-594-0355), or via snail mail at ARRL Publication Sales Department, 225 Main Street, Newington, CT 06111-1494 USA.

Review by Larry Van Horn

Faces of Railroading

Carl A. Swanson

Over the years, the interest categories of scanner monitoring have remained relatively constant. While it's no surprise that public safety communications is by far the strongest, railroad buffs have a strong contingent of their own. Whether it's the romantic allure of the open range, or the haunting recollection of a steam engine whistle in the night, railroads continue to fascinate our readers.

But the trains can't go on their own; it's the people with their courage, persistence, loyalty and heart that continue this great industry. Frequencies are everywhere on the Internet; faces are not.

What's NEW

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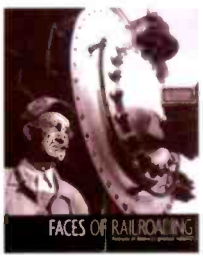

Carl Swanson, senior editor of *Model Railroader* magazine, has assembled this enjoyable photo-essay showing the history and people of the railroads – the stations and passengers, the crew of engineers, conductors and porters – and the scenery of America as it passes their windows. This book is a great gift for the railroad buff: 160 sharp, black and white photos on 160 pages in an oversized, hard-cover book.

Faces of Railroading is $29.95 plus shipping from Kalmbach Publishing, 21027 Crossroads Circle, PO Box 1612, Waukesha, WI 53187-1612. Phone (262) 796-8776 or order from their website: **http://store.yahoo.net/kalmbachcatalog/62083.html**

Review by Bob Grove

The Amateur Scientist

Those of us who grew up reading each edition of *Scientific American*, ogling at the new discoveries, delighting in the simple projects for home experimenters which were included each month, will be thoroughly delighted with this new, exhaustive compendium of "The Amateur Scientist" columns and projects from the beginning through their conclusion with the final column in the March 2001 edition of *Scientific American*.

These columns were always written for anyone to understand, yet not so oversimplified as to do an injustice to the discipline. Not only that, but the topics were interdisciplinary, directed to the scientific generalist, folks like me that are inspired by nature and our universe and want to learn all we can about it while we're here.

And now these 1100+ columns have been faithfully recorded for posterity, reproduced here in a two-CD set which runs on Windows, Mac, Linux and Unix platforms. Search entries are enabled by a self-contained Java engine, making topical searches a breeze. Just a hint of a few project titles reveals the wonder awaiting the science fair student or inquisitive adult:

- Spying on an Invisible World (making a video microscope for $10)
- Waiter, There's a Hair in my Hygrometer (a home-made humidity indicator)
- Recording the Sounds of Life
- Getting Inside an Ant's Head (examining an ant's brain)
- Son of a Gun (with adult supervision!)

..and the list goes on and on with over 1000 more!

You can get this two-volume set of CDs for an unbelievable low price of only $24.99, and that's a bargain in *any* language! Support the Society of Amateur Scientists by ordering from their web page: **http://www.sas.org/Merchant2/merchant.mvc?** click on "Software" and then the HTML book title to see details and ordering information. Or you can order from **http://www.brightscience.com**, or from **http://www.amazon.com**. Whichever you choose to order from, you'll be glad you did!

Review by Bob Grove

DXers Technical Guide

The fourth edition of *A DXer's Technical Guide* is now available from the International Radio Club of America bookstore. In its nearly 200 pages you will learn about the principles underlying the design of successful receivers, antennas and receiving accessories, find reviews of the best commercially available DXing equipment in different price ranges, as well as detailed instructions for building one's own antennas and other DXing aids. Although it focuses on the technical backdrop to medium wave DXing, it will also be of interest to serious shortwave listeners and low band radio amateurs.

IRCA members can get their copy by sending $15.00 US to the IRCA Bookstore, 9705 Mary Ave NW, Seattle WA 98117-2334. The non-IRCA member price is $17.50... overseas, please add $3.00. Make checks and money orders out to Phil Bytheway.

Well-Dressed but Wired

Combining European styling with American ingenuity, the TEC (Technology Enabled Clothing) sport jacket from Scott eVest is the epitome of functional fashion. From the exterior, this three- button worsted wool navy blue Sport Jacket appears traditional. On the interior, however, it offers 14 hidden, ergonomically designed pockets, a Personal Area Network (PAN) and an abundance of unique features designed to make your life easier.

The PAN consists of hidden channels that allow users to connect devices without any visible wires. In addition to connectivity, special pockets are designed to accommodate digital cameras, portable keyboards, GPS devices, small laptop computers, two-way radios, airplane tickets, magazines (or frequency lists), wallets, keys, pens (or spare antennas), and much more. Yet when fully loaded, the jacket hangs smoothly from the shoulders with no bulges or bumps, betraying none of what is hidden inside. Do you think the FBI orders from Scott? You bet!

The Sport Jacket is $249.99 from Scott eVest LLC, 323 Shady Lane, Ketchum, Idaho

83340-2626, or call 1-866-909-VEST (8378), or visit http://www.scottevest.com

By the way, while you're on line, check out the 100% silk, bright red Gadget Tie to go with the jacket or for Father's Day ($34.99 but on sale at press time for $29.99) – The design features cell phones, PDAs, MP3 players and more. (Sorry, no radios.) The back of the tie has a hidden pocket, naturally!

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 Rachel Baughn, editor@monitoringtimes.com

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The New NOAA and METOP Satellites

If all goes well, later this year the National Oceanic and Atmospheric Administration (NOAA) will oversee the launch of NOAA-N, the next in the series of polar-orbiting weather satellites (WXSATs) to follow NOAA-17. This will be a timely launch – assuming that it does not slip too much – scheduled for September, October or December (depending on your source of information!).

NOAA-N will be placed in sun-synchronous polar orbit with an ascending pass at about 1340UTC (meaning that it will pass over your location at a high elevation not long after noon, about 1340 hours local time). This satellite effectively replaces NOAA-16 which is already showing significant problems with its imaging scanner, and which ceased APT transmissions due to the failure of a switch.

NOAA-N will be renamed NOAA-18 once successfully in orbit, and will not just be another NOAA WXSAT. It forms the first component of the **Initial Joint Polar-orbiting Operational Satellite System** – IJPS – the first of four polar orbiting satellites planned for the NOAA-EUMETSAT constellation. Both NOAA-N and the next satellite NOAA-N' (NOAA Prime) will eventually be joined by METOP-1 and 2 in complimentary orbits: the NOAAs are to be "afternoon" satellites and the METOPs "morning" satellites. The NOAAs weigh about half as much as the METOPs and have design lifetimes of at least two years, with the METOPs are planned for five.

The two satellite series have some common payload equipment for their joint mission. Both will carry the same AVHRR (Advanced Very High Resolution Radiometer) scanner that produces real-time image data in six channels (visible and infrared) for immediate transmission. This ensures continuity with previous NOAA satellites. Both will carry the HIRS (High Resolution Infrared Radiation Sounder) to produce measurement profiles of humidity, and ozone levels in 20 channels of data.

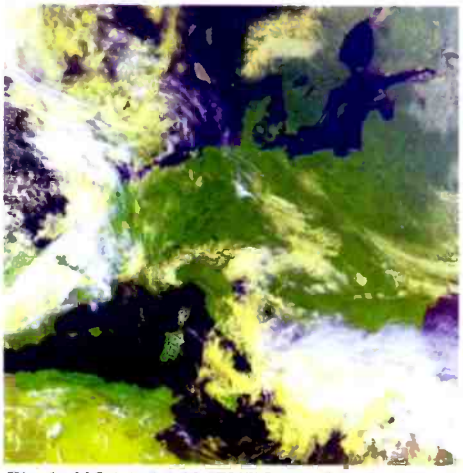

Fig 1: NOAA-16 1247UTC April 1 showing a pass over western Europe with minimal synchronization problems.

The Advanced Microwave Sounding Unit A1 and A2 (AMSU) for measuring the atmosphere under complete cloud cover is also common. The Microwave Humidity Sounder (MHS) measures humidity and rainfall rates, and the Space Environment Monitor (SEM) makes measurements in the earth's radiation belts.

Each satellite can be commanded from a ground station. The POES Satellite Control Center in Suitland, Maryland, will command, control, and receive data from the NOAA satellites. Similarly, EUMETSAT will support the METOP satellites from its Control Center in Darmstadt, Germany. Ground stations will be able to command both satellites, by means of a common interface.

The IJPS program will provide many opportunities for joint support. NOAA and EUMETSAT will support data from POES blind orbits, (those in which the satellite is not visible from the NOAA stations). It can be collected at Svalbard and forwarded through Darmstadt to NOAA for processing. This support will allow NOAA to access data from all orbits in near real-time in order to provide user requirements for the latest data.

❖ Image transmissions

Users with suitable reception equipment will continue to receive HRPT (high resolution images) and APT (low resolution images) from the NOAA satellites. However, the transmission frequencies will change to 137.1 MHz (lower) and 137.9125 MHz (upper). MetOp satellites will provide HRPT (more accurately, it is AHRPT – Advanced HRPT) and a new LRPT (Low Rate Picture Transmission) format.

Like APT, LRPT will be transmitted in the VHF band, but will carry all five image channels, compressed to a reduced resolution of 4km. Both transmissions will require new hardware. The data will therefore require special software for decoding. Given the availability of standard APT from NOAA-N, I suspect that there will not be a rush to buy new hardware for decoding METOP data!

The HRPT stream will be modified internally to allow the addition of the different instruments on board. It appears that the HRPT stream should still be receivable with existing hardware, but the organization of the data means that new decoding software will be required.

The biggest problem, for those amateurs wishing to monitor the new transmissions for decoding purposes, will be encryption. Much to the concern of amateur users all over Europe, EUMETSAT encrypted METEOSAT Primary Data, requiring users to pay to obtain decryption hardware, as well as obtain formal permission. This has been slightly relaxed in the case of METEOSAT-8, the new European geostationary WXSAT, but for METOP it may add a significant problem. Any person wishing to decode the data will have to formally register their details.

NOAA-N' (N prime) launch is now shown as no earlier than October 2005, possibly 2008, and may not be launched even then if it is not required for replacement purposes.

❖ Possible Data Encryption

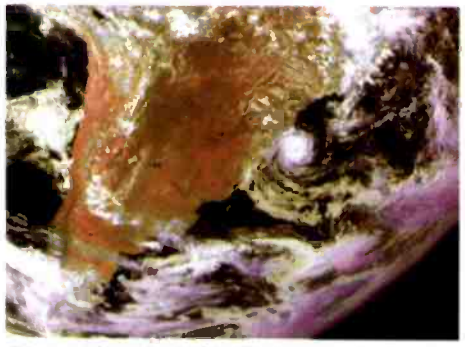

Fig 2: GOES-12 1800UTC 27 March showing hurricane unusually far south.

As with METOP, there will be a selective encryption scheme available for implementation on the new satellites. There is no plan or intention to charge for the data, but, bearing in mind the joint military role of the spacecraft, one must assume that selective data denial would be possible in the event of any period of conflict.

NPOESS (National Polar-orbiting Operational Environmental Satellite System) satellites will continue to deliver data to users worldwide in accordance with US national data policy:

1) data will be downlinked openly around the world at no cost to the receivers

2) capability for data encryption/data denial exists for national defense needs (denial can be done on a worldwide or geographic basis)

Current APT and WEFAX Frequencies:

NOAA-12 and -15 transmit APT on 137.50 MHz

NOAA-17 transmits APT on 137.62 MHz

These three satellites are currently providing good quality APT:

GOES-10 (west) and GOES-12 (east) use 1691 MHz for WEFAX

LRIT (the new digital format for geostationary WXSATs) is time-shared with WEFAX from GOES-12.

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Closing Comments

Broadband Over Power Lines

By Rachel Baughn, KE4OPD, Editor

Broadband Over Power Lines (BPL) is a high speed, 2-26 MHz, data transmission system that uses the power line as a conductor. It is being touted (mistakenly, we believe) as a cost-effective means to bring Internet access to rural households. It is of concern to *MT* readers because the unshielded power line will radiate and likely cause interference to HF and low VHF reception. The FCC's Notice of Proposed Rule Making (NPRM) on Broadband over Power Line (BPL) systems, ET Docket No. 04-37, invites comments on the proposed procedure to mitigate interference when it inevitably occurs.

The current deadline for reply comments is June 1. We urge readers to educate themselves on this issue of particular concern to shortwave listeners and amateur radio operators.

Thanks to the hard work of the Amateur Radio Relay League (**http://www.arrl.org**) and Joe Buch N2JB and others from the North American Short Wave Association (**http://www.anarc.org/naswa**) for providing the following points to aid in your argument to the FCC.

It is important to understand that no additional rules or permission are required to allow BPL to operate under existing FCC rules. The NPRM is simply proposing procedures to allow victims of interference to get the BPL service to "mitigate" the interference. Your comments need to be directed to why such solutions are incomplete and what additional rules need to be adopted before the promised protections are effective.

Amateur Radio

The proposed rules do make it clear that interference to licensed operators, including hams, will not be tolerated. However, the rules are weak on implementation and enforcement:

The current rules do not offer any practical protection for mobile amateur radio stations. The interference to mobile stations could not be identified, the interfering BPL operator found, and adaptive steps taken quickly enough to be of practical use to the mobile amateur operator.

Therefore, radiation emission standards should be set sufficient to protect mobiles, and BPL systems should be tested for rules compliance by an independent laboratory prior to initiation of service.

Standards should be set for interference mitigation: mitigation should be available 24/7 and should be immediate upon receipt of a complaint. To aid in identifying and reporting interference, the BPL database must be readily accessible to the public and kept up to date.

To ensure an informed marketplace, marketers of BPL services must give clear notice to consumers that licensed radio services have priority and that the delivery of BPL services therefore cannot be guaranteed. Because of the potential for severe, wide-area interference, there must be severe penalties for non-compliance with these rules.

Shortwave Listeners

Any interference to international broadcasting is illegal under both international radio regulations and the FCC's own Part 15 regulations that require that interference must be promptly terminated. The FCC's proposed procedure for interference mitigation is impractical for the listening public for the following reasons:

The burden of proof will be on the unskilled listener to demonstrate to the BPL provider or the FCC enforcement function that the interference claim is valid. The spectral signature of BPL interference will be different for each type of modulation, since the FCC has not standardized the modulation format. To expect unskilled listeners to prove that BPL is the cause of their interference problem is unreasonable and impractical.

Many international broadcast listeners use portable receivers when traveling around the USA. As with mobile ham operators, such listeners cannot be expected to know the contact information for reporting BPL interference in each area – and certainly not fast enough for timely mitigation.

Many international broadcast listeners are tourists, foreign students or immigrants to this country with limited English language ability who use shortwave radios to listen to foreign broadcasts in their native language. Identifying, locating, and reporting BPL interference is asking too much of people who are not proficient in BPL technology, the English language, or FCC bureaucratic procedures.

In theory, once notified, the BPL service provider must quickly move the energy to a frequency that does not cause interference to the entity that complained. Of course the energy may then interfere with another user of the spectrum who will then complain.

International broadcasters change frequencies according to time of day, season of the year, and time within the eleven-year solar sunspot cycle. The proposed rules would require prompt response to interference complaints to frequencies which do not remain static.

In addition to mandating that mitigation be available 24 hours per day and 7 days per week, and that substantial penalties be put in place (NASWA suggests $10,000 per day), the FCC should also establish a specific response time for interference complaints to be resolved before penalties are invoked.

The FCC does not propose any third party entity to arbitrate disputes. It is likely that the enforcement function will fall to the FCC, which has neither the staff nor the budget for timely or effective investigation and resolution.

How to Comment

Readers are encouraged to submit their comments; there is strength in numbers Even though an organization representing many members may file, that filing counts as only one comment.

Before filing, read the NPRM at: http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6515783486 (or just go to **http://www.arrl.org**, click on story "ARRL Encouraging "Thoughtful, Considered" Comments on Proposed BPL Rules" and follow links to the document and other background stories)

You can submit your comments electronically via the web at:

http://www.fcc.gov/cgb/ecfs/

Under ECFS Main Links, click on "Submit a Filing." In the "Proceeding" field, enter "04-37" and complete the required field. Comments may be typed into a form or you may attach a file. Comments also may be submitted via e-mail, per instructions.

If you have to file comments in writing, send an original and four copies to: Commissioner's Secretary, Office of the Secretary, Federal Communications Commission, 445 12th Street, SW, Washington, D.C. 20554. Make sure the subject clearly states it is a response to ET Docket No. 04-37. All responses should be received by the FCC by June 1, 2003.

For additional technical background, we recommend:

http://www.ARRL.org/tis/info/HTML/plc/

This page is open to thoughtful opinions on radio-related topics. Views expressed on this page do not necessarily reflect the opinion of Monitoring Times or Grove Enterprises.

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