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# Monitoring Times

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February 2004

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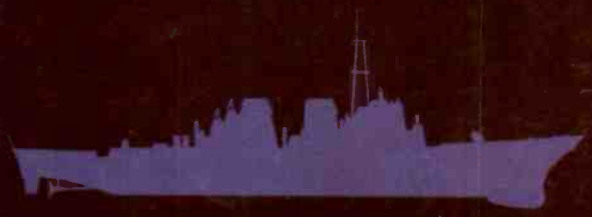

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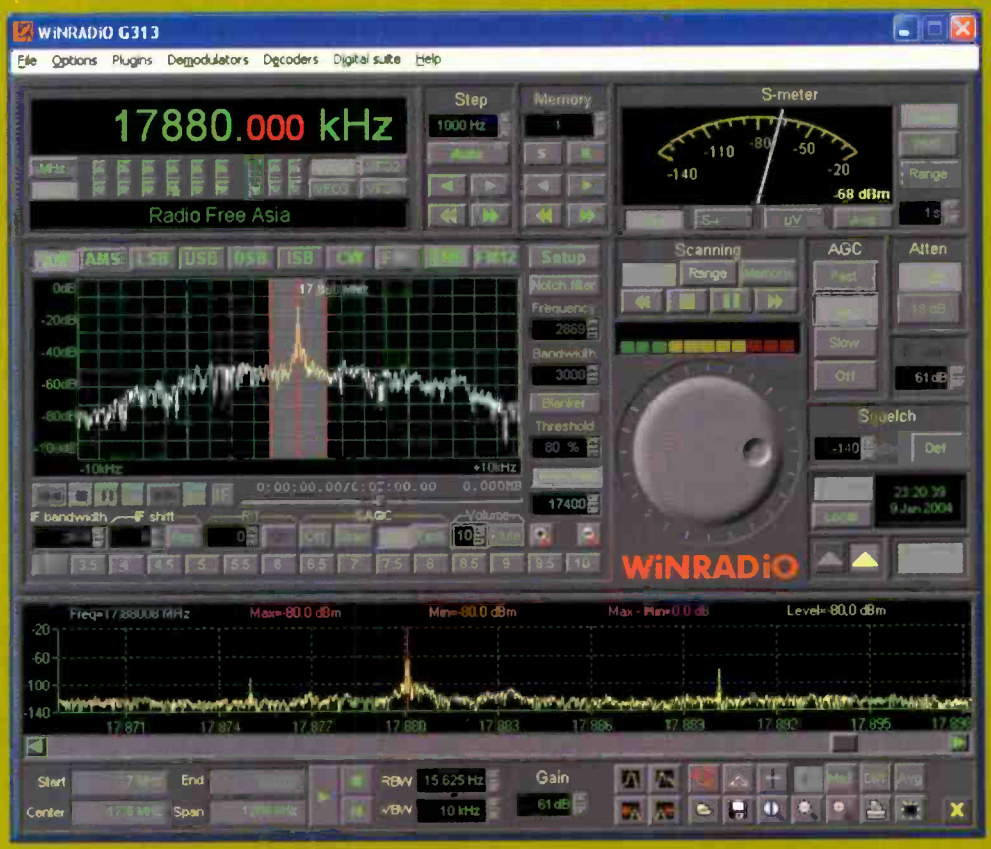


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Monitoring Times

Vol. 23, No. 2 February 2004


*Cover Story*

## Monitoring the South American Military

By Ron Peron

HF utility monitors who want a change of pace have only to turn their antennas toward South America to find interesting and challenging communications networks. Best of all, if your Spanish isn't up to deciphering the voice nets, there is a wealth of information to be had by monitoring the ALE digital networks and translating at your leisure.

Here are the results of the author's reception of military communications from Mexico, Venezuela, Brazil, and Ecuador. Story starts on page 12.

Cover design by Bill Greve.

# CONTENTS

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# Reviews:

Of special interest to drivers is the **Uniden BCT8** scanner, with its preprogrammed service channels, police vehicle alert, and trunk tracking ability – an impressive radio, says Bob Parnass (page 78). John Catalano wraps up his review of **Digital Radio Mondiale** monitoring and summarizes his findings on page 80.

A couple of accessories well worth checking out are the **MFJ Travel Tuner**, reviewed by Bob Grove on page 82, and the **PowerPort GearHarness**, reviewed on page 83 by Skip Arey.

Jack Elliott reviews a book appropriate to any season – *How to Survive Any Storm*, written by well-known storm expert Warren Faidley (see page 86). This is one book you'll want to keep within easy reach. See more book reviews in *What's New* on page 88.

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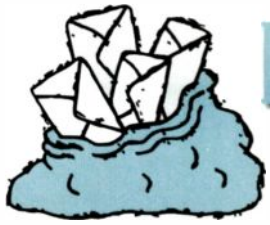

# LETTERS TO THE EDITOR

## The Evolution of MARS

After receiving his December issue of *Monitoring Times* and the invitation for a discussion on the Military Affiliate Radio Service in *MT*, Ron Perron suggested, "Why not go one step further? Take the lead and host a 1-2 day symposium on the subject and invite your colleagues at *Popular Communications* and *QST* to join you as hosts. Invite the Commanding General of MARS along with some of his minions (civilian & military) to address the issues and join in a discussions and deliberations on how to make MARS better. Such an open forum I'm sure would entice many in our hobby to attend and add to the discussions."

While we're very flattered by Ron's confidence in *MT*'s strength of influence (not to mention deep pockets and unlimited staff), I hasten to say *MT* is not on a crusade against MARS. Having made our point, and giving our readers a chance to weigh in, we will leave the subject for at least another year to take up other radio topics. This month we print a statement from Dino Papas, KL0S/AAT3BE/AAA9TC, US Army MARS National Training Coordinator, in our *Closing Comments* on page 92, and below are other reader comments, plus a final statement on this issue from MT Assistant Editor, Larry Van Horn.

"I read the article written by Larry Van Horn, N5FPW and find it quite interesting. I agree that MARS needs a major shake up. When I joined I ask for assistance in passing my training phase but to no avail. They give you 6 months. Needless to say I resigned before I even really got started, within 4 months. Training officers in the PA MARS group would not return emails or phone calls. Being a military veteran I thought I would try helping our military but that didn't work out well.

"I have been in emergency services since 1961 and have never been treated like I was not needed until I joined PA Army MARS.

"Aside from MARS taking lessons from the ARRL, they should take a good look at our local communities across the country. Volunteer emergency services are the back bone of the country.

"They are the people, (the First Responders) that keep this great country up and running. No unions to deal with, no taxpayer dollars are invested in their training and these wonderful people give millions of hours on a year to year basis away from their families serving their communities.

"As I have seen, the only taxpayer money going to MARS is to support headquarters, the volunteers pay for their own equipment, I.E.: The Hams."

*– Jim Roble, N3BRS, Emergency Management Coordinator, Retired Fire Chief, Ambulance Commander, and Law Enforcement Officer*

"Perhaps Tomas [Tomas Hood, NW7US (AAR0JA/AAM0EWA) *Letters*, Dec 2003] can provide specifics detailing an actual emergency communications support role assigned to MARS by JDOMS or other national interests, or of an actual emergency communications support operation in which MARS provided portal to portal support. Opening a net and saying that this constitutes actual emergency communications support operation without actually having provided direct support is, according to the recent DAIG investigation report, misleading and deceptive. The criticism stems from just such misleading and deceptive statements regarding past support or actual customers. ARES and RACES can provide verifiable specifics regarding actual support operations.

"The DAIG investigation included a ten year scan of FEMA reports looking for a bona fide MARS support report and found none. Inferences and closed circuit internalized exercises favored by MARS, in which participants largely talk to themselves, hardly qualify as either preparing for or providing actual support. "

*– Al Uvietta, kc5s@arrl.net*

"Enjoyed your comments in the October *Monitoring Times* article. As a 30 + year army MARS member, I tend to agree with your conclusions. However, I did read the DAIG report (which I don't have handy at this moment) and in it, they cite the specific steps that MARS has to follow in order to support a Civil agency. This procedure is mandated by a federal law.

1st, the Governor of the state(s) involved has to utilize all existing emergency state resources.
2nd, the governor(s) then request the President to declare an emergency.
3rd, the President declares an emergency.
4th, at this point a Federal emergency response team headed by FEMA kicks in.
5th, FEMA calls upon DoD for appropriate assistance.
6th, DoD exhausts its active duty resources.
7th, DoD tasks the various MARS chiefs for assistance.

"During the emergencies you cite in your article, to my knowledge, DoD never requested MARS assistance. While we individual MARS members are willing to participate as required, we weren't called upon. Indeed, according to the above procedure, my view is that to respond to a bona fide emergency, our chances to do so are very near ZERO.

"As I see it, our MARS management needs to clarify/validate the above procedure so that the members understand more precisely when they are to react. Awhile back, this topic was introduced on the 'Question of the Week' (an informal Chief, Army MARS weekly net) and unfortunately the response was somewhat ambiguous and left the impression that the federal law didn't apply to MARS.

"Currently the only mission I see we have is to provide domestic intelligence reports to DOMS/JDOMS in the form of EEI reports. That being the case, MARS may well be better served by being incorporated within one of the Intelligence services.

"In summary I'd say if your intent was to create a little internal 'soul searching' within MARS, you were successful. Whether or not the MARS leadership will so do, remains to be seen."

*– Jack Finch*

I want to thank everyone who has responded publicly and privately to my editorial in the October 2003 issue of *MT - Can't lead From Behind*. I am glad to see that most responders have resorted to constructive, responsible dialogue as a result of our editorial comments.

Unfortunately, I cannot say the same for the leadership of the Army MARS program. Shortly after our editorial hit the newsstand the item below was broadcast nationwide by the Chief of Army MARS, Robert Sutton, on his Friday night Chief's HF radio net.

ITEM # 8: ATTACK ON MARS. We have been notified of a recent article in a tabloid that has once again attacked the MARS programs, all three services. Once again it has not provided accurate information and has not addressed the issues to the MARS Chiefs for validation of the accusations prior to publication. The charges are based upon unidentified sources (as always). It is readily apparent there are some individuals who's only goal is to kill the MARS program. I have also been informed that the author of the article is a HAM, who apparently does not want to recognize that the volunteer MARS programs and the accomplishments are made by HAMs as well. This does not speak well to the amateur radio community nor to the outstanding contributions that our volunteer members have made to the MARS program and the improvements that are continually being made. On the other hand, those that are MARS members and are performing in an outstanding manner know better. Why am I raising this issue? Basically because it appears to be designed to hinder recruitment of potential new members and bias those who have recently joined and have not had an opportunity to find out the facts for them selves. This will be another agenda item at the Chiefs Panel meeting.

I can't help but wonder on what planet in our solar system Mr. Sutton is actually residing? It is quite obvious that Mr. Sutton choose to make these off-the-cuff comments to his membership without even reading Fred Maia's original piece (which was sent to them before publication) or my editorial. Had he read them he would have discovered that our comments were not directed toward the membership and hams in general, but on the program leadership which has failed a great group of volunteers.

So now I have a direct message for the Army MARS leadership: There is absolutely nothing inappropriate about expressing concern about MARS lack of mission compliance. It is largely Mr. Sutton and members of the Army MARS program top management who have characterized these expressions as harmful and designed to de-

stroy the MARS program. Your failed leadership is to blame here, not the individual MARS members.

In another defense of the MARS program, a correspondent pointed to things that MARS should be doing rather than specific emergency communications that MARS actually provided. Somehow, the defenders of the MARS program claim to be engaged in refining procedures, training and exercises. In truth, these never seem to translate into that elusive emergency communications support operation that is the MARS mission statement.

And now looking at Mr. Papas' comments in this month's *Closing Comments*, I differ with Mr. Papas' perspective in several key areas. But instead of taking these on one by one I would rather get to the main concern we have outlined above.

I would challenge Mr. Papas or anyone else in the Army MARS leadership to produce specific instances in which Army MARS provided direct point-to-point emergency communications support for any significant agency (government or civilian) during any recent disaster. And providing Essential Elements of Information (EEI) reports cannot be part of this assessment. EEI messages essentially involves little more than information gathered from broadcast media reports and e-mailing them via the internet to Department of Military Support (DOMS).

So where is the substance? Inferences won't cut it any more.

I must point out that we, the taxpayers, didn't draft the mission statement for the MARS programs, so we do not have to apologize for demanding that these federally funded programs meet their main mission requirements. The American taxpayer is footing this bill and we have a right to have our money put to good use, in programs that work properly, and for the benefit of us all. If the leadership of those programs cannot get it right then it is time to fire them and get someone else who can.

*Larry Van Horn, N5FPW*
*Monitoring Times Assistant Editor*

## Fractal Challenge

Barry Williams forwarded a news story about Penn State developing fractal antennas for broadband network applications. When I mentioned my fascination with the topic, he responded, "Yes, fractals are very interesting. I became interested when the first public programs to create fractals came out around 1986, or thereabouts. They were painfully slow but worth the wait on 8 MHz processors!

"I thought (too late) of another link that was way off the radio topic, but may mesh with fractal antennas since you are interested, too. It had to do with inkjet printing of ICs. Anyway, I think it is Xerox who has perfected printing techniques on overhead type projection film with inks that print with electrical inks....

"Wouldn't it be a huge step if we could print fractal antennas?! If you could print your antenna pattern at home you could produce some good home/limited space antennas for window mounting, attic mounting, etc. You could also link many sheets of printed antennas, too. Imagine an attic full of linked antenna sheets. I would be interested in printing extremely dense sheets for indoor LF/VLF antennas instead of using a lot of wire. I see another home project brewing now.

"I used to experiment with inks when the first inkjet printer came on the market. Maybe I can find an electrically conductive liquid on the market to inject into ink cartridges. Any help to steer me to suppliers would be appreciated. I remember seeing a product from Caig that is a trace pen. You use the marker type pen to either make or repair traces. Caig is the manufacturer of the famous DeOxit.

"This could be an interesting article in *MT* for space limited hobbyists if it pans out. It should appeal to scanner owners, too, especially in hotel rooms. The possibilities are endless...car window antennas, stealth antennas, artful sheets on the walls, etc. Maybe I can make products with framed line art pictures of Tesla, Einstein, etc that are actually antennas. Oh well, it is fun to think about. (g)"

*– Barry Williams*

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*

Monitoring and the Law

**Jorge Rodriguez**
*jorgerodriguez@monitoringtimes.com*

# May the Law Be With You

The Adirondacks of upper New York conjure up different images for different people but they all have one thing in common – peacefulness. For some, the Adirondacks are the northern part of the Appalachian Mountains, even though they are really, geologically an extension of Canada. Others use the term to refer to the Adirondack Park created in 1892 by the State of New York to conserve water and timber resources in the region.

Today that Park is the largest publicly protected area in the contiguous United States – greater in size than Yellowstone, Everglades, Glacier, and Grand Canyon National Park combined – approximately 6 million acres. Such a peaceful place was an unlikely setting for the latest conflict between amateur radio operators and the government over radio use and possession laws, but last summer that's where the latest battle was waged.

Last May 31st at around three in the morning Richard Lalone, KC5GAX a licensed amateur radio operator, was stopped on his way home from work. Driving during the "magic drunk" hour, when police make many of their drunk driving arrests, Lalone was on his way home from the Fort Drum Army base near Watertown, New York, when he was stopped. Although he was driving below the speed limit, Trooper Rice thought he was wandering in his lane and stopped him to investigate.

As she approached Lalone's vehicle she noticed a single 2-meter antenna on the roof of in addition to the Jeep's AM and FM steel whip antenna. The detail was unremarkable at the moment as she asked the driver for his license and registration. On the dash of the vehicle, though, she noticed a two-way radio – an ICOM 706 MKIIG. The radio was not tuned to any police channel. The Trooper returned to her vehicle to check the license and registration. Richard Lalone turned back to listening to his stereo, which was now receiving some sort of interference. He would later find out the Trooper had left the patrol car's speed radar on and it was apparently interfering with his stereo.

A few minutes later Trooper Rice found Lalone's license and registration in order and returned to his vehicle to send him on his way. As she returned his drivers license and registration, she asked about the radio mounted on the dash, which Lalone was turning on and off in an attempt to discover the source of the new interference.

## ◆ Guilty Until Proven Innocent

Lalone told her it was a two-way amateur radio and that he was a ham radio operator. "Can it receive police calls?" the Trooper asked. "It's capable of receiving them," Lalone told her.

Remembering her training and that such radios were illegal, Trooper Rice asked Lalone to remain while she investigated this new development. She again returned to her car and using a mobile telephone called her headquarters to double check what she remembered about police radios in vehicles in New York. At headquarters another officer looked up the offense in a Desk Book. The current New York State Police Desk Book contains, among other things, a chart by which officers can quickly look up a summary of the law for most New York Vehicle and Traffic law offenses.

The Officer at headquarters told Trooper Rice that having a radio that can receive radio signals used by the police was a violation of New York Vehicle and Traffic Section 397. What neither Trooper Rice nor the Officer informing her knew, was that an exception in the law for licensed amateur radio operators had not been included in the Desk Book when it was prepared. Lalone and his lawyer would later learn that the New York State Police Desk Book was incorrect.

Trooper Rice returned to the stopped vehicle and informed Lalone that his radio was against the law. Lalone politely protested and explained that he was a licensed amateur radio operator. He showed the Trooper his Federal Communications Commission license and told her there was an exception in the law. However, he did not have a copy of the New York law with him to show the trooper. The Trooper listened to Richard Lalone's explanation, but with the incorrect information she had received from headquarters, she had no choice but to write him a citation for illegal possession of a radio in a vehicle. The Trooper was polite and professional throughout and did not confiscate the radio.

After handing him the citation and explaining to him that he had to appear June 9th in Court to answer the charges against him, she allowed Lalone to leave. Richard Lalone drove home relived that he was not going to jail and that his radio had not been confiscated, but somewhat confused about the officer not understanding the law or believing his license exception.

## ◆ Up in Arms

In the days that followed the stop, Richard Lalone sought out the help and advice of the local amateur community. In the new "town square" of the twenty-first century – the online chat rooms and message boards of the Internet – messages about the encounter flew. Slowly the ham radio community in the area became slightly outraged. Disbelief over the apparent refusal of the State of New York to recognize an exception in the law grew into discontent. Some licensed amateur radio operators even suggested that if the State was going to behave this way they might need stop helping the state when it came to civil defense drills and other emergencies or risk arrest. Suddenly the volunteer communications assistance that the amateur radio community provides in times of emergency in the Adirondacks was in jeopardy.

Through the help of Harry Kohler, by the time Richard Lalone's scheduled court date of June 9th rolled around, he had enlisted the help of attorney Susan Terry. Terry, also a licensed amateur radio operator, was a former prosecutor and Assistant New York Attorney General. She agreed to take on the case *pro bono*, as a public service for Richard Lalone and the amateur community. That meant she would not get paid the several hundred to sometimes several thousand dollars that it can take to defend a case like this.

After conducting her initial investigation of the facts and reviewing the law in New York to insure there were no recent changes, Terry contacted the Assistant District Attorney on the case Dylan Tester. "The law does not apply to Mr. Lalone," she told him. "He is exempt by virtue of his federal license." Tester agreed and considered dismissing the

*continued on page 86*

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

| | |
|---|---|
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| 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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### AOR® AR8200 Mark IIB Radio Scanner

AOR8200 Mark IIB-A wideband handheld scanner/**SPECIAL $539.95**
**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:***
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## IN MEMORIAM

The loss of a parent is always difficult, and is certainly made no less painful by the memories of the holiday season. The editorial and publication staff of *Monitoring Times* extends our heartfelt sympathy to Editor Rachel Baughn in the loss of her mother, Evelyn Thomas, on December 22, 2003.

*-Bob Grove, Publisher*

## Man charged after second rescue by satellite locator

Carl J. Skalak, 55, of Cleveland, Ohio, who was the first person in the continental United States to be rescued by the National Oceanographic and Atmospheric Administration's (NOAA) new Emergency Personal Locator Beacon (PLB) system, has been rescued by the same system again. But there is an interesting twist to his second rescue.

This time he was greeted by law enforcement officers, who charged him with two counts of third-degree falsely reporting an incident. He was arraigned in December 2003 and posted $10,000 bail.

During his second rescue, a helicopter from Fort Drum military base lifted Skalak out of the Five Ponds Wilderness Area, the site of his November 14, 2003, rescue.

After the first rescue, Skalak said he planned to return to retrieve his canoe and other gear, the *Watertown Daily Times*. That trip led to his arrest, said Stephen W. Litwhiler, spokesman for the New York State Department of Environmental Conservation.

"His latest distress signal prompted a search involving 13 forest rangers, who were initially unable to reach Skalak due to lake effect snows," Litwhiler said. "The next day, DEC officers arrested him," he said.


These new NOAA Personal Locator Beacons become operational on July 1, 2003, and are small-scale versions of those used by boaters and pilots. The beacons emit a signal that can be tracked by a worldwide satellite search and rescue system when they are activated in an emergency. This signal is picked up by weather satellites operated by NOAA. You can get more information on this new system at **http://www.sarsat.noaa.gov/.**

## New Interface at FCC Website

The FCC unveiled on December 14, 2003, a new online filing interface for its Universal Licensing System (ULS), on the web at **http://wireless.fcc.gov/uls**, which includes the Amateur Radio Service.

Among other features, the ULS's new look will include easier-to-read on-screen forms that guide users through filing and simplify such routine tasks as applying for license renewal, address change or vanity call sign. The FCC says the introduction of its new system, called "ULS License Manager," concludes phase one of an ongoing ULS overhaul by the Wireless Telecommunications Bureau.

ULS License Manager will be compatible with most major Web browsers and computer platforms and no longer will require downloading Java and Java Script files.

The ULS will require all filers to log into the system using an FCC Registration Number (FRN) and Commission Registration System (CORES) password. Taxpayer Identification Numbers (TINs) no longer will be accepted for log-in purposes, the FCC said.

There's also a new paper version of FCC Form 605, dated December 2003. One change is that Form 605 no longer requests a date of birth and will only accept an FRN and CORES password. There are no Amateur Service-related changes to any Form 605 schedules. The FCC says Amateur Service applicants may continue to use the March 2001 (or later) edition of Form 605, although it encourages use of the newest version. The new FCC Form 605 now is available via the FCC Web site at **http://www.fcc.gov/Forms/Form605/605.html.**

## And More Changes at the FCC

The FCC announced late last year a reorganization of its Wireless Telecommunications Bureau (WTB) "to more effectively support the FCC's strategic goals – broadband, competition, spectrum, media, homeland security and modernizing the FCC." The WTB administers the Amateur Radio Service (Part 97) and amateur licensing, which now will fall within the newly named Public Safety and Critical Infrastructure Division. D'wana Terry, formerly chief of the Public Safety and Private Wireless Division, will head the new division.

In addition to the Amateur Service, the Public Safety and Critical Infrastructure Division will oversee Part 95, Marine, Aviation, Intelligent Transportation Systems, Public Safety Fixed Microwave, Public Safety and Private Land Mobile services and E911, among other areas. Responsibilities moved elsewhere include Fixed Microwave (Part 101), Instructional Television Fixed Service, Multipoint Distribution Service, and the Multichannel Video Distribution and Data Service.

## Nano Radio Invented

Two Cornell University graduate students and a research associate stuck an antenna on the top of their eight-story building, then went back down to their basement laboratory and, after some fiddling, found they could tune in the nearby radio station from Ithaca College.

On October 23, their success translated into a $25,000 check, a prize in the 2003 Collegiate Inventors Competition.

The three Cornell researchers work in nanotechnology – the art and science of making things that are far smaller than a human hair. Their invention, a tiny, micromechanical oscillator, is much smaller than those now used in electronics. Oscillators, the timing components in electronic circuits, are needed to maintain accurate frequencies.

The invention could lead to devices such as a tiny cell phone that could be mounted on an earring or a smart pill capable of taking readings and sending signals as it moves through your body. The pill would use radio frequency communications so doctors could track it without relying on other means, such as X-rays.

"It's like putting a little cell phone inside your body," said Robert Reichenbach, a 25-year-old graduate student in electrical engineering.

The inventors' competition, which

## BULLETIN BOARD

**February 15: Aurora, CO**

Aurora Repeater Association Hamfest at the Adams County Fairgrounds (US 85 north, take East 124th Road West and it becomes Henderson Road when you pass Brighton Road; Fairgrounds are to the north); Talk in 147.15 (+); 9 a.m.; admission $4. VE Testing at 10 AM by Mile High VE Team Contact Wayne Heinen N0POH for more info 303-699-6335 email n0poh@arrl.net; Aurora Repeater Association, P.O. Box 471802, Aurora, CO 80047-1802

**February 29: Hicksville, NY**

Long Island Hamfair and Electronics Show Winterfest sponsored by the Long Island Mobile Amateur Radio Club (LIMARC). Levittown Hall at 201 Levittown Parkway in Hicksville, NY (Directions on the LIMARC website at: http://www.limarc.org/fest.htm) Talk-in on W2VL, 146.85 - repeater 136.5 PL. 9:00a.m.; admission $6.VE Test promptly at 10a.m. LIMARC VE Liaison, Al Bender W2QZ at w2qz@limarc.org or 516-623-6449. For more hamfest information contact the Hamfest Chairman, Brian Gelber at: WB2YMC@hotmail.com, or wrie LIMARC Hamfest, P.O. Box 392, Levittown, NY 11756-0392.

Cornell won in the graduate category, is sponsored by the National Inventors Hall of Fame and Hewlett-Packard Company.

## Pennsylvania State Police Consolidating Dispatch Hubs

Pennsylvania State Police are entering the final stretch of a long-planned switch to a $130 million dispatch and records management system expected to improve efficiency and response times across the state. The state has been preparing for these changes over the last two years.

The first of five regional dispatch centers will open in Harrisburg this month. Within three years, dispatchers who are now in 81 locations will be working in just five regional centers, barring delays.

Other changes include switching to a new computerized records management system and upgrading the computerized mapping system used to get troopers to incidents more quickly.

Already, computers have been installed in all patrol vehicles to take advantage of a separate project to upgrade the state's emergency radio system. All 1,200 state police patrol vehicles are equipped with computers – called Mobile Dispatch Units – that allow officers to easily send and receive reports and messages.

## Longtime *MT* Staffer Passes

On November 5, 2003, the radio hobby lost one of its top monitors, Robert E. (Bob) Evans. Bob had been a monitor of the shortwave radio spectrum for well over three decades. He was a specialist in aeronautical radio communications, an interest that was kindled at an early stage in his monitoring career. He also specialized in HF/VHF digital communications monitoring.

In 1989, he authored his first book, the *Aeronautical Communications Handbook-HF Edition* which was soon followed by the *Worldwide Aeronautical Communications Frequency Directory* in 1991. Material from his first book was incorporated into the commercial pilot's training program for Eastern Airlines. His last book, *The Worldwide Aeronautical Communications Frequency Directory*, second edition, was published in April of 1994.

As a writer, he contributed to several other radio-related books, including: Fine Tuning's *92/93 Proceedings*, *The Soviet Maritime Merchant Vessel Directory* and *Understanding ACARS*.

Bob also served as a column writer/editor for both of North Americas leading monthly communications publications – *MT*'s *Digital Digest* column (July 1993-December 1998) and the *ACARS Downlink* columnist in *Popular Communications* magazine. He also served as the editor of *The RTTY Listener*, a customer newsletter published by Universal Radio. Bob was a regular speaker at ham and shortwave radio clubs, *MT* Expos and other major international radio conventions.

A graduate of St. Augustine's College, Ryerson Polytechnical Institute and the University of Toronto, he taught business and computer studies at the college level for 15 years.

He spent the next decade as a computer management information systems consultant in the automotive field. In that capacity he developed and delivered management training programs for a number of North American automotive and computer companies, including General Motors, Ford, Hyundai, Mazda, Porsche and IBM.

He authored a number of computer user and application training manuals for these corporations. Prior to his death, Bob was self-employed as a senior technical writer and corporate trainer through his company R.E. Evans & Associates.

An accomplished nature and studio photographer, his other passions include Egyptology, Astronomy, Computers and the Internet, Classical Music, Stamp Collecting and Wine Tasting and Appreciation. He traveled extensively and conducted educational tours in Egypt and photographic and wildlife safaris in East Africa.

He was a member of the Armed Forces Communications and Electronics Association, the Society for Technical Communication and the Society for the Study of Egyptian Antiquities.

Bob made his home in Don Mills, a suburb of Toronto, Canada, for many years.

*-Larry Van Horn*

Communications was written by the editors of Monitoring Times from news and clippings submitted by our readers. Thanks to this month's reporters: (via snail mail) Anonymous, New York; Ira Paul, Michigan; Doug Robertson, California; Brian Rogers, Michigan; Robert Thomas. Connecticut; (via email) Anonymous, John Figliozzi, Maryanne Kehoe, D Prabakaran, Ken Reitz, Larry Van Horn, Barry Williams, Robert Wyman, Ed Yeary.

# Monitoring the South American Military

By Ron Peron

Our geographic neighbors to the South, in Latin and South America, are not that far away and offer some interesting monitoring. Most of the nets that I'm going to tell you about are relatively easy catches for listeners in the US and Europe. I live in Maryland and for the last several months I've been listening to the military HF ALE nets of several of these countries. Before I jump into the details of what I've been hearing, I think a little background would be useful.

I've been listening to HF utility stations for about six years and was not into the digital signals world. I concentrated my listening on SSB voice nets and had catalogued many Spanish language nets. My Spanish, however, is very weak (a generous self-assessment) and my ability to find out to whom I was listening was quite limited.

That all changed in May of this year when I "leaped" into the digital world. I had been reading the posts on the Worldwide Utility Newsletter (WUN) list and began to get curious about what these "ALE" nets were all about. I did a little research and decided to give it a try. I installed Charles Brain's wonderful little PC-ALE program. It only needs a modestly powerful PC, a sound card, and a couple of inexpensive cables and you can be up and running with the digital "dogs."

Once I had the program installed and learned how to run it (a very easy learning curve, I might add), I was surprised at the wealth of information that was available on nets in the HF ALE world. Using information I found in Hugh Stegman's *Utility World* and Mike Chace-Ortiz's *Digital Digest* columns and Mike's Utility Monitoring Central web site (**http://www.chace-ortiz.org/umc**), as well as posts on the WUN list (See Resources), I started searching around to see what I could hear. I was soon regularly monitoring nets in Mexico, Colombia, Venezuela, Brazil and Ecuador.

My HF "shack" consists of a well-worn Sangean ATS-909 and a fairly new Icom R-75. For antennas I'm using a PAR Electronics EZ-SWL and a home-brew 130-ft dipole, both of which are up in my attic. For various reasons, such as overhead power and cable lines, trees and a small suburban lot, outside antennas are not an option. My equipment is rather modest, but I hope you'll see that it doesn't take much to be monitoring some interesting nets from wherever you're located.

## The South American Scene

Enough "background"; let's get down to what makes the South American countries interesting listening. First of all, several of them cooperate with the U.S. in the war against drugs – sometimes on a covert basis. Several of these countries have internal problems of their own which also provide interesting listening. Mexico, for example, in addition to fighting the drug traffickers is periodically faced with internal strife from the native Indian populations which requires the intervention of their military forces.

Venezuela, like Mexico, is fighting the drug war while at the same time its President, Hugo Chavez, strives to maintain his power. Over the last couple of years there have been several strikes and incidents of civil unrest requiring intervention by the military. Venezuela is a major producer of crude oil and a member of the Organization of Petroleum Exporting Countries (OPEC), making its stability one of our country's national interests.

We're all familiar to some degree with the situation in Colombia. The government there is fighting a two-front war, one against the drug cartels and their powerful influence and the other against several rebel paramilitary organizations trying to bring down the elected government. Both these "wars" are being waged with overt and covert help from the U.S. The fairly large American military and civilian presence in Colombia makes a very inviting target for attacks, kidnappings and harassment by these paramilitary groups. Kidnapping foreigners, especially Americans, and holding them for ransom has become one of the major fund raisers for these paramilitary groups.

Let's take a look at some of these countries and their military/paramilitary HF ALE nets that I've been able to monitor. A word of caution here. These frequencies and ALE identifiers were in use as of the writing of this article in late November 2003. They may have changed since then. The same applies to the web sites and URLs that I mention in the article.

## MEXICO

### Army:

The Mexican Army has divided the country into 12 Military Regions (Region Militar) and these are seen as RM ## in ALE. These Military Regions are further subdivided into 44 Military Zones (Zona Militar). I have not yet seen a reference to Military Zones in HF ALE communications. So far I've only seen the Mexican Army using HF ALE. However, I would suspect that their Air Force and Navy also use it as well.

My monitoring indicates that there are various categories or groupings of ALE identifiers used on Mexican Army nets. The different categories may represent different echelons of command or perhaps units in various geographic regions of Mexico. Sometimes, after the ALE "handshake," the communicants will use an encrypted voice system

I am indebted to Hugh Stegman who has provided several of the frequencies and ALE identifiers used by the Mexican Army. He listens from California and can usually hear the Mexican military nets better than I can from Maryland.

### Planets

Freqs: (USB)
- 06955.0
- 09025.0
- 09060.0
- 0135.0

Identifiers:
- Venus
- Marte (Mars)
- Urano (Uranus)

Tierra (Earth)
Universo (Universe)
Mercurio (Mercury)

**Minerals/Jewels**
Freqs: (USB)
04650.0
07777.0
08047.0
08084.0
09060.0
10135.0
10444.0
Identifiers:
Aluminio
Acero (chrome steel)
Cobre (copper)
Diamante (Diamond)
Jade
Zeta (?)

**Countries**
Freqs: (USB)
09060.0
Identifiers:
Espana
Israel

**Animals**
Freqs: (USB)
05252.0
05263.0
08050.0
09060.0
10135.0
10444.0
Identifiers:
Tigre
Pantera (Panther)
Lobito (small wolf?)
Puma
Leon (Lion)
Jaguar
Chacal (Jackal)
Cardenal (Cardinal)

**Meteorlogical**
Freqs:
07777.0
09025.0
Identifiers:
Huracan (Hurricane)
Ciclon (Cyclone)
Rayo (Lightning bolt)
Centella (Lightning)

**Miscellaneous**
Freqs: (USB)
07777.0
08050.0
09060.0
10444.0
Identifiers:
123- possibly Army HQs
Ganzo (?—possible garble)
Espartaco (??)
Coca (Cocao)
Torre (tower)
Alfil (Bishop)
RM ## (Region Militar-Military Region)- 5, 7, 13, 15, 17.

## COLOMBIA

**Navy:**
Freqs:
5406 USB
5493 LSB
6809 USB
10608 USB
11155 USB
13530 LSB

SECRETARÍA DE LA DEFENSA NACIONAL | SEDENA

Identifiers:
Radgena- Unidentified control ashore
FSUCA- Submarine Force (Fuerza Submarino), Cartegna
Pijao- SS# 28 "Pijao"
Malpelo- BO-156, Auxiliary vessel
CESYP= Comando Especiale San Andreas Y Providencia
CARIBE= San Andreas Caribbean Command
Caldas3= (Corvette "Caldas", CM-52)

**Army:**
I've also monitored what I call a Colombia telephone network. I think it's being operated by the military and serves both military personnel and local inhabitants living and stationed in the rural areas. It appears that this network provides opportunities for telephone calls from these rural area into the major population centers

Freqs: (All LSB)
10937.0 (poss—only voice noted)
11430
13500
14000
16430
16529
Identifiers:
MOM- Unidentified location
Mochuelo- placename
Sejeri- possible placename
PRF 320 (possibly Border Radio Post—Puesta Radio Frontera)
PRF 321
1501- Unidentified location
1901- Unidentified location.

There's another net I call the "Sitio" net. All the subscribers on this net use Sitio ##E as their ALE identifiers. SITIO is Spanish for "site" or "location" and I believe the E suffix equates to Ejercito (Army). I believe that these "Sitio" subscribers are Colombian military combat support units (intelligence, logistics, medical) stationed around the country supporting the government's war on drugs.

I ran across a web site in Spanish. The web site is entitled Radiografia del Ejercito de Colombia. According to this web site, the Colombian Army has a battalion-level series of Combat Support Units (Apoyo de Servicios Para el Combate - ASPC). The mission of these units is to provide support to combat units in the field to assist them in carrying out their missions.

The ASPCs provide supply, transport, health and other services which permit the combat units to maintain their tactical capabilities. The Order of Battle for these ASPC units closely parallels the Sitio ##E identifiers I've seen.

Freqs: (USB)
6955
8560
10326
11018
13530

## VENEZUELA

**Air Defense Command:**
As you would expect, this net serves various air defense missile sites and surveillance radar units based at/near Venezuelan Air Force bases and other strategic locations such as hydroelectric dams. The Headquarters of the Venezuelan Air Defense Command (CDDA) is at El Liberator Airbase, just outside of Caracas.

Freqs: (USB)
05695.0
07810.0
09065.0
11130.0
13475.0


Identifiers:
CDDA- Air Defense Command Center (Centro de Defensa Aerea)- El Liberator Airbase
GURI- Air Defense site at Guri Dam
MENE or Menemauroa- Air Defense site
MAR or Maracay- Air Defense site
PTOORDAZ or PTO- Puerto Ordaz Air Defense site
GUA or Guasdualito- Air Defense site
MARGARITA- Isla Margarita Air Defense site
MONTECANO- Air Defense site
PTOFIJO or Puerto Fijo- Air Defense site

**Navy:**
Along their Atlantic/Caribbean coastline, the Navy has two zones of responsibility: the Western Zone (Zona Occidentale-HQs Punto Fijo) and the Eastern Zone (Zona Oriente-HQs Carupano).

Like several other countries in the area, their geography dictates that the Navy also has a riverine component operating in the Central Zone (Zona Centro-HQs Puerto Cabello) and an Southern Zone (Zona del Sur-HQs Caicara del Orinoco). The riverine forces use small craft to patrol the country's many rivers, including the large Orinoco River which winds through the jungle areas bordering Colombia, Brazil and Guyana.

Freqs: (LSB)
08260.0
08280.0
08285.0
09350.0
10650.0
12546.0
14790.0
20400.0

Identifiers:
ARMARIO- Naval base at Puerto Cabella (named after Agustin Armario de Puerta Cabella)
BNARCO, Commando, Basa Navale Amario
BDIRCO- Batallon de Ingenieros de Combata (Combat Engineer Battalion)
CANCO- unk
COFFRI1- Commander of Riverine Forces
DCCOP-Direccion de Coordination Y Control Operacional
DIVIMCO1- unk
MASCARA- unk
MACABRO- unk
BRION- Frigate "Almirante Brion", F-22
FEDERACION- Patrol Craft "Federacion", PC-12
LIBERTAD- Patrol Craft "Libertad", PC-14
PUNTA BRAVA- Auxiliary vessel "Punta Brava", BO-11
CAPANA- Capana-class Medium Landing Ship " Capana", T-61
ALBATROZ- Patrol Boat "Albratroz", PG-31
PELICANO- Patrol Boat "Pelicano", PG-34
F-21- Frigate Mariscal Sucre
F-22- Frigate Almirante Brion
F-26- Frigate Almirante Garcia
T-63- Medium Landing Craft (LSM) Goijaira
T-64- Medium Landing Craft (LSM) Los Llanos

**Army:**

1st Infantry Division
08260.0
11625.0
2nd Infantry Division
05760.0
07597.0
08187.0
09232.0
10156.0
11610.0
3rd Infantry Division:
07597.0
08050.0
09232.0
09259.0
10150.0
12192.0
13464.0
13506.0
4th Infantry Division:
12185.0
13455.0
5th Infantry Division:
05406.0
06786.0
07399.0
09233.0
09906.0
10115.0
12191.0


14569.0

Units noted:
CUFAN- Unified Armed Forces Command
Regional Command Centers (CRC) of Regions 1, 3, 4, 5, & 7
13th Inf Bde
102nd Motorized Inf Group
131st Motorized Inf Bn
22nd Inf Bde
23rd Special Operations & Security Bde
222nd Motorized Inf Bn
224th Motorized Inf Bn
2MA6- Special Operations Unit
2MA8- Special Ops unit
31st Inf Bde
311th Motorized Inf Bn
32nd Inf Bde
340th Tactical Comms Bn
341st Tactical Comms Bn
347th Tactical Comms Bn
348th Tactical Comms Bn
349th Tactical Comms Bn
41st Armored Bde
42nd Armored Bde
43rd Armored Bde
431st Motorized Cavalry Group
432nd Motorized Cavalry Group
433rd Motorized Cavalry Group
442nd Armored Battalion
4MA0 (Special Operations Unit)
501st Hqs Bn
51st Jungle Inf Bde
512th, 513th & 514th Jungle Inf Bns
5MA0 Special Ops Unit

I've noted the following identifiers in the Venezuelan ALE. Using some web Spanish language resources I have come up with what I believe are probable expansions for these identifiers. I stress that these are my own postulations and may not be the true expansions.

CLC= Communications Logistics Center (Centro Logistico Comunicaciones)
SCLC= Communications Logistics Center (Centro Logisitico de Comunicaciones)-see note
CRC= Regional Communications Center (Centro Regional de Comunicaciones).
PCRC= Regional Command Post (Communications) (Puesto de Comanda Regional Comunicaciones)
PCRM= Regional Command Post-Maintenance (Puesto de Comanda Regional Mantenimiento )
CLM= Maintenance Logistics Center (Centro Logistico Mantenimiento)
SCLM= Maintenance Logistics Center (Centro Logistico Mantenimiento)-see note
CGE= Army Hqs (Cuartel General de Ejercito)
CUFAN (Unified Command of National Armed Forces-Comando Unificado del la Fuerza Armada Nacional)

Note: I'm not exactly sure what the "S" equates to in the SCLC/SCLM identifiers. It is used by battalion-level units when communicating with higher echelons, i.e. brigades and above. I believe it has to equate to something like "sub", "subordinate" or "secondary", but I could find no logical Spanish language equivalent.

## BRAZIL

Brazil is the largest country in South America. As such, the Brazilian military uses an extensive HF network. The Brazilian Navy is "blue water" navy and it also maintains a large HF ALE network.

### Navy

Freqs: (USB)
08031.0
08310.0
09117.0
09306.0
11010.0
11452.0
11455.0
11486.0
11530.0
12132.0
12370.0
12437.0
13101.0
13224.0
14705.0
14780.0
15932.0
16355.0 (SAR)
19709.0

Identifiers:
ERMBEL - Brazilian Navy Radio Station, Belem
ERMNAT - Brazilian Navy Radio Station, Natal
ERMRIO - Brazilian Navy Radio Station, Rio de Janeiro
FCONST - Brazilian Navy Frigate F-42 CONSTITUIÇÃO (Classe NITERÓI)
FDEFEN - Brazilian Navy Frigate F-41, Defensora, Niteroi-class
FUNIAO - Brazilian Navy Frigate F-45 UNIÃO (Classe NITERÓI)
NDDCEA - Brazilian Navy G-30 CEARÁ (Navios de Desembarque-Doca)
NEBRSL - Brazilian Navy U-27 BRASIL (Navio-Escola)
SARBR - Brazilian Search & Rescue.
CVINHA - Corvetas V-30 INHAÚMA (Classe INHAÚMA)
FBOSIS - Frigate "Bosisio", F-48
PE1- possibly Sao Pedro de Aldeia (Naval Air Base)
CE1- probably Ceara (Naval Port)
BR1- probably Brasilia (VII Naval District)
MS1- probably Manaus (Commando Naval do Amazona Occidental)
RS1- unidentified
SMA- unidentified
RE1MO - Base Naval do Recife (Estado

Pernambuco)
BA1SE - Base Naval do Bahia, Aracaju (Estado Sergipe

## ECUADOR

During the summer of 2003, units from the navies of US, Ecuador, Chile, Peru and Colombia took part in the Pacific Phase of UNITAS-03. I was able to monitor the following participants.

Freq:
07900.0 USB

Identifiers:
COOPNA - Naval Operations Command (Comando Operaciones Navale)
CFF - Commander Frigate Force (Comando Fuerza Frigata)
CORMAN - Corbeta Manabi (CM 12)
CORGAL - Corbeta Los Galapagos (CM 15)
CORORO - Corbeta El Oro (CM-14)
CORESM - Corbeta Esmeraldas (CM 11)
LAMCUE - Launcha Missileria Cuenca (LM 24)
HALCON - Type B 119 class PG "Halcon"

## RESOURCES

Mexico: (http://www.sedena.gob.mx/ejto/index.html)
Colombia: Navy ((http://www.armada.mil.co); Army (http://www.ejercito.mil.co)
Venezuela: Air Defense ((http://www.fav-club.com/comdef.htm); Navy (: (http://www.fav-club.com/armada.htm); and Army ((http://www.fav-club.com/ordendebatalla.htm).
Brazil : (http://www.mar.mil.br).
Ecuador: (http://www.fuerzaarmadaecuador.org/naval).

Even though my Spanish is very weak I find it useful to look at the web pages of the Ministries of Defense of the various countries. They are usually a good starting place and can normally be found by using search terms such as "armada" (navy), "ejercito" (army) " fuerza aera" (air force), along with the country's name. Just looking at these web sites will give you plenty of organizations, order of battle, unit names, and, many times, key abbreviations/acronyms used by these entities. Some of these web pages are also available in English.

Another great source, especially for naval units is **http://www.hazegray.org/worldnav**. This site has very accurate and up-to-date information on most of the world's navies. If you can get access to the famous Jane's *All the World* series they can provide you with accurate information on the world's military and even some good pictures.

Of course, there's the WUN list (**http://mailman.qth.net/mailman/listinfo/wun**), where there are current postings of many military nets. The WUN is also a good source of information. Just ask a question to the list and there's a very good chance that someone will have the answer or they can point you to a good resource in which to find your answer. The WUN web page at **http://www.wunclub.com** is also where you can find good information on ALE and download a copy of Charles Brain's PC-ALE program.

In this article I've talked exclusively about the South American military ALE nets that I have listened to. In addition, there are many Spanish-language voice (USB & LSB) nets that I have catalogued. Unfortunately my Spanish isn't good enough for me to have identified many of these nets, but I can tell by the use of callsigns and the communications procedures that they are military or paramilitary nets. I also believe that some of these Spanish voice nets belong to the narco-traffickers.

If I've sparked your interest in listening to these South American military nets I'd be glad to exchange information on what you've heard, especially on any Spanish language voice nets. I'd also be glad to answer any questions you may have on the nets that I have mentioned here. You can reach me at *rapbep@aol.com*.

Adios and Good Listening.


# Domestic Shortwave Broadcasting in Russia

By Bernd Trutenau

The 1990s brought a boom for domestic broadcasting on shortwave in Russia. Apart from the national program Radio Rossii, many regional programs appeared on SW, often transmitted via low power local transmitters.

This has its background in the network of jamming transmitters that had been built in the USSR since the 1950s. Every provincial capital had local groundwave jammers installed. A typical transmitter type was a 5 kW "Vyaz" model, designed for utility purposes. When the USSR stopped jamming of foreign broadcasts in 1988, these transmitters suddenly became vacant and in many places it was decided to use them for regular local programming.

Since these former jamming transmitters are of low power, the Russian telecom authorities over the years have tried to protect the coverage area by registering them internationally (e.g. High Frequency Co-ordination Conference, HFCC) with a higher power or for different locations. This has led to some confusion among DXers, if using reference lists like the HFCC operational schedule, since the details shown in these lists do not always match with reality.

The 1990s also were difficult years for the transmitter operators in Russia. The mixture of old and new structures, often working in parallel, caused frequent disturbances in the operation, including numerous electricity cut-offs because of unpaid bills, especially in the Russian Far East.



## New Regional Network

In 2000, a new national transmitter network operator was established – Russian Television and Radio Broadcasting Network (RTRN) which now owns most of the transmitters in Russia under a united roof and leases them (via its regional branches) to the national, regional and local broadcasters, both state-run and private. RTRN has a modern management and is striving for an efficient operation of its transmitter park.

Russia is a federal state (the full name is "Russian Federation"), consisting of 89 entities: 49 oblasts, 21 republics, 10 autonomous okrugs, six krays, two federal cities and one autonomous oblast. Each of the 89 entities has at least one regional state broadcaster. These regional state radio stations are financed in part by the federal budget; the other parts originate from the regional government and from income through advertising. This means that a station's budget can vary a lot. Some stations can afford to produce many hours of regional programming and rent many transmitters; others produce only a small output.

Regional broadcasters typically rent transmitters that are also used by one of the national networks, in most cases by Radio Rossii. In general, regional stations are relaying the Radio Rossii news on top of the hour even during the regional programming.

With the exception of NVK "Sakha" in the Republic of Sakha (Yakutia), no broadcaster owns its transmitters: all of them have to be leased from RTRN. Partly as an attempt to reduce operational costs, many regional broadcasters have meanwhile abandoned SW and even MW and are fully concentrating on FM distribution. This is especially the trend since RTRN started to transform the huge wired radio network and to replace it by small FM translators which usually are rebroadcasting Radio Rossii and the output of the regional state radio broadcaster. Polls have shown that the older generation of listeners still prefers to listen to MW, while the number of SW listeners has fallen considerably over the last years.

But there are still areas in Russia that can be reached effectively only by shortwave: especially the huge and scarcely populated territories in Central and Northern Siberia and the Russian Far East. Another important audience is the Russian merchant and fishery fleet. That is why many SW transmitters along the Russian coasts continue to operate as usual.

## Return to State Programming

The main customer for domestic SW has so far been the national state-run program Radio Rossii (RR). RR was renting a large number of transmitters that were distributing its programs on SW to all parts of Russia around the clock.

Even though the traditional winter frequencies were registered in advance at the last HFCC conference, most of these relays were switched off in November 2003 at the beginning of the B03 season. Affected was primarily the use of transmitters at the large transmitting centers that also carry SW transmissions for abroad – like Moscow, St.Petersburg, Krasnodar (Tbilisskaya), Samara, etc. Some few frequencies have been reactivated since then, and not all may be shown in the table below.

These days, SW in Russia is used almost exclusively by state-run programs. It was a different situation in the beginning of the 1990s, when independent broadcasters mushroomed on SW, thanks to low transmission rates and the widespread practice of "arranging" such trans-

missions through personal contacts or "special relationships."

Russia had just started to experience market economy and the society was overrun by waves of changes. All of these stations disappeared from the air after a while. Some religious broadcasters continued until 2002, but now only one station is left: Radio Studio in St. Petersburg. Radio Studio is actually a station run by the regional administration and thus not a "true" independent station. It is on the air in St. Petersburg on FM around the clock, and had received a license to also use SW. The costs for the 200 kW SW transmitter are considerable, and Radio Studio is limiting its output to a week of daily transmissions per quarter – the minimum amount that is required in order to retain the license.

**A) Ordinary regional services (state-run)**

A1) GTRK "Pomorye"
Address: ul. Popova 2, 163061 Arkhangelsk.
Email: pomorie@atnet.ru
Regional programs: W 0400-0500, 1500-1600 (Sat 1510); Sun 0500-0600.

A2) Permskaya GTRK "T-7"
Address: ul. Tekhnicheskaya 7, 614070 Perm.
Email: main@t7.ru
Regional programs: MF 0210-0300, 0310-0400, 1310-1400; Wed 1610-1700; Sat 0210-0300, 0810-0900; Sun 0410-0500.

**Operational SW schedule for the B03 season (winter 2003-2004)**

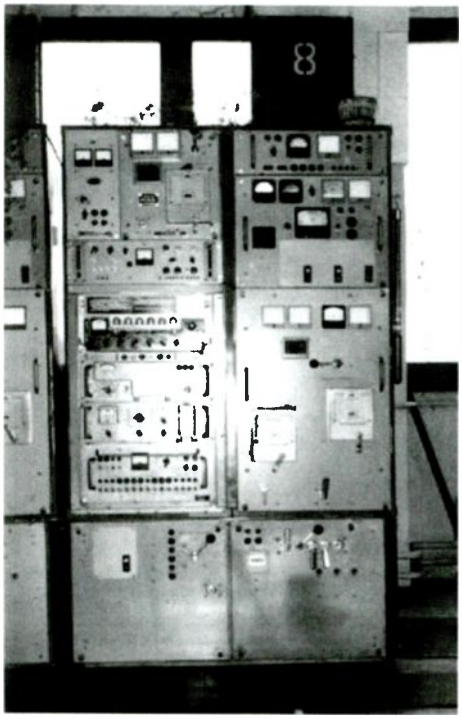
| No | kHz | kW | Schedule | Site | Program |
|---|---|---|---|---|---|
| A9 | 4040 | 5 | 2200-1800 | Tura, S | R. Rossii + Reg GTRK "Kheglen" |
| A8 | 4520 | 2.5 | 1800-1400 | Palana, FE | R. Rossii + Reg GTRK "Palana" |
| A3 | 4795 | 50 | 2200-1800 | Selenga, S | R. Rossii + Reg Buryatskaya GTRK |
| A5 | 4825 | 5 | 2000-1600 | Yckutsk, FE | R. Rossii + Reg NVK "Sakha" |
| RR | 5895 | 250 | 1830-2200 | Moscow, ER | R. Rossii |
| RR | 5925 | 250 | 0200-0500 | Moscow, ER | R. Rossii |
| RR | 5930 | 50 | 0200-2200 | Monchegorsk, E | R. Rossii |
| RR | 5940 | 100 | 1900-1500 | Arman, FE | R. Rossii |
| B3/4 | 6005 | 100 | 1800-1900 | Tbilisskaya, E | R. Maykop/R. Nalchik |
| A2 | *6030 | 5 | 2300-1400 | Perm, E | R. Rossii + Reg GTRK "T-7" |
| A10 | 6060 | 5 | 2000-1600 | Blagoveshchensk, FE | R. Rossii + Reg GTRK "Amur" |
| RR | 6075 | 100 | 1900-1500 | Arman, FE | R. Rossii |
| A4 | 6085 | 50 | 2200-1800 | Krasnoyarsk, S | R. Rossii + Reg GTRK "Tsentr Rossii" |
| A6 | 6100 | 15 | 2200-1800 | Kyzyl, S | R. Mayak + Reg GTRK "Tyva" |
| A5 | 6150 | | 2000-1600 | Yakutsk, FE | R. Rossii + Reg NVK "Sakha" |
| A2 | **6150 | 5 | 2300-1400 | Perm, E | R. Rossii + Reg GTRK "T-7" |
| A1 | 6160 | 40 | 0200-2200 | Arkhangelsk, E | R. Rossii + Reg GTRK "Pomorye" |
| C1 | 6235 | 200 | 1800-2100 | Krasnyy Bor, E | R. Studio |
| A5 | 7140 | 5 | 2000-1600 | Yakutsk, FE | R. Rossii + Reg NVK "Sakha" |
| A5 | 7200 | 100 | 2000-1600 | Yakutsk, FE | R. Rossii + Reg NVK "Sakha" |
| RR | 7310 | 250 | 1530-1800 | Moscow, ER | R. Rossii |
| RR | 7320 | 100 | 1900-1500 | Arman, FE | R. Rossii |
| A5 | 7345 | 5 | 2000-1600 | Yakutsk, FE | R. Rossii + Reg NVK "Sakha" |
| A2 | 11650 | 5 | 1405-1800 | Perm, E | R. Rossii + Reg GTRK "T-7" |
| A7 | #11840 | 20 | 1800-1400 | Yuzhnyy-Sakhalinsk, FE | R. Rossii + Reg GTRK "Sakhalin" |
| B1 | 11915 | 200 | 0900-1000 | Samara, E | Tatarstan dulkynynda |
| B2 | 11975 | 200 | 0000-0100 | Yelizovo, FE | Kamchatka rybatskaya |
| RR | 12075 | 250 | 0530-0800 | Moscow, ER | R. Rossii |
| B1 | 15105 | 200 | 0500-0600 | 0700-0800 | Samara, E Tatarstan dulkynynda |
| RR | 17600 | 250 | 0830-1500 | Moscow, E | R. Rossii |

E) European part of Russia; S) Siberia; FE) Russian Far East
*) Summer months; **) Winter months; #) USB
RR) Radio Rossii relay (without regional programming)
GTRK = gosudarstvennaya teleradiokompaniya ("state broadcasting company"); NVK = natsionalnaya veshchatelnaya kompaniya ("national broadcasting company")


A3) Buryatskaya GTRK
Address: ul. Erbanova 7, 670000 Ulan-Ude.
Email: office@bgtrk.ru
Regional programs: 2200-0500, 1100-1200.
**Notes: Programs in Buryat and Russian.**

A4) GTRK "Tsentr Rossii"
Address: ul. Mechnikova 44a, 660028 Krasnoyarsk.
Email: new@public.krasnet.ru
Regional programs: MF 2310-0100, 1110-1300; Sat/Sun 0000-0400.

A5) NVK "Sakha"
Address: ul. Ordzhonikidze 48, 677007 Yakutsk.
Email: radiotv@nbcsakha.ru
Regional programs: 0310-0500 (Tue-Thu), 0410-0500 (Fri), 0910-1300 (Mon-Fri), 2120-2400 (Sun-Thu), 2210-0455 (Fri/Sat).
Notes: programs in Yakutian and Russian. Each frequency has a different beam, some frequencies may not be in operation.



*A "Vyaz 2M-OP," a typical transmitter that was used in the USSR for local jamming until 1988. Power in AM mode – 2.5 kW, in CW, SSB and FM modes – 4-5 kW. Power consumption - 18 kW, frequency range - 3-24 MHz. In use for regular regional programming e.g. in Perm, Palana and other locations. Photo: Rimantas Pleikys*

ПЕРМСКАЯ ГОСУДАРСТВЕННАЯ ТЕЛЕРАДИОКОМПАНИЯ "Т7"
**ОБЛАСТНОЕ РАДИО**

A6) GTRK "Tyva"
Address: ul. Gornaya 31, 667003 Kyzyl.
Email: tv@tuva.ru
Regional programs: 2310-2400, 0010-0100, 1110-1200, 1210-1300.
Notes: programs in Tuvinian and Russian. Observed relaying both Radio Mayak and Radio Rossii.

Национальная Вещательная Компания

НВК

"САХА"

A7) GTRK "Sakhalin"
Address: ul. Komsomolskaya 209, 693000 Yuzhno-Sakhalinsk.
Email: romanov@gtrk.sakhalin.su
Regional programs: 2000-2100, 0210-0300, 0800-0815, 1120-1210.
Notes: on SW for ships in the Pacific Ocean.

A8) Koryakskaya GTRK "Palana"
Address: Obukhova 4, 684620 Palana.
Email: n/a
Regional programs: D 2000-2030, Tue-Thu 2145-2200, Tue-Wed 0115-0145, Sat 0700-0800.
Notes: programs in Koryak and Russian. May have left SW.

A9) Evenkiyskaya GTRK "Kheglen"
Address: ul. 50 let Oktyabrya 28, 663370 Tura.
Email: n/a
Regional programs: D 0100-0200, 0500-0515.
Notes: programs in Evenki and Russian. May have left SW.

A10) GTRK "Amur"
Address: per. Svyatitelya Innokentiya 15, 675000 Blagoveshchensk.
Email: vesty@tsl.ru
Regional programs: MF 2000-0000, 0300-0400, 0900-1000; Sat 2200-2300; Sun 0010-0100..
Notes: may have left SW.

**B) Special regional programming (state-run)**

B1) Tatarstan dulkynynda ("On the air waves of Tatarstan")
Produced by: TRK "Novyy vek"
Address: ul. Sh. Usmanova 9, 420095 Kazan.
Email: tnvpr@telebit.ru
Schedule: 0500-0600 towards Russian Far East & 0700-0800 towards Urals and West Siberia on 15105, 0900-1000 towards West Russia on 11915kHz.
Notes: A service in Tatar and Russian for the over 2.5 million ethnic Tatars living outside of Tatarstan in other parts of the Russian Federation.

B2) Kamchatka rybatskaya ("Kamchatka for fishermen")
Produced by: GTRK "Kamchatka"
Address: ul. Sovetskaya 62, 683000 Petropavlovsk-Kamchatskiy.
Email: gtrkotk@mail.iks.ru
Schedule: 0000-0100 in Russian on 11975kHz.
Notes: A service for Russian fishermen in the Pacific Ocean.

B3) Radio Maykop
Produced by: GTRK "Adygeya"
Address: ul. Zhukovskogo 24, 352700 Maykop.
Email: trkra@maykop.ru
Schedule: 1800-1830 in Adyghian on 6005kHz.
Notes: A service for Adygean expatriots living in the Near East. May include sequences in languages of the target area, like Arabic and Turkish.

B4) Radio Nalchik
Produced by: GTRK "Kabbalkteleradio"
Address: pr. Lenina 3, 360000 Nalchik.
Email: tvkbr@mail.ru
Schedule: 1830-1900 in Kabardino-Circassian and Balkar on 6005kHz.
Notes: A service for Circassian expatriots living in the Near East. May include sequences in languages of the target area, like Arabic and Turkish.

**C) Other broadcasters**

C1) Radio Studio
Address: Ligovsky prospekt 174, 192007 St. Peterburg.
Email: studiosw@metroclub.ru
Notes: on the air every three months for several days in the evening hours. Next transmissions planned for March 2004.

ГОСУДАРСТВЕННАЯ ТЕЛЕРАДИОКОМПАНИЯ "САХАЛИН"

***HF frequencies are supposed to be coordinated with other broadcasters to avoid interference, but real life broadcasting sometimes tells a different tale. Sometimes the clashes are only resolved when world politics undergo a radical change. Here are two such instances, one in the past and one in present day.***

# Tales of Two Frequency Clashes

By Rimantas Pleikys and Sigitas Zilionis

## U.S. versus Soviet Union

In 1950 under the Copenhagen frequency plan, Moscow was granted the long wave frequency of 173 kHz. However, during the Cold War, the American radio station in Erching near Munich in West Germany persisted in operating on the same frequency. It was on air from September of 1953 until February of 1963 and from September of 1968 until November of 1973.

The American station used a 1000 kW Continental 105B type transmitter and a 279 meter omnidirectional single mast antenna. Power was supplied from five diesel-generators, which consumed as much as 560 liters of fuel per hour.

In 1963-1968 and in 1973-1979 the station was off the air, because the USSR temporarily stopped jamming of the Voice of America, British Broadcasting Corporation and Deutsche Welle. In 1968 the station resumed transmission during the Czechoslovakia crisis. It closed down in 1973 with the Helsinki process beginning a new phase of East-West relations.

The Erching radio station transmitted the programs of VOA in Russian, Czech, Slovak, Hungarian, Polish, German and English languages, as well as the program of RIAS (Radio in the American Sector) in German. The broadcasts of VOA in Russian on 173 kHz were intended for the Soviet soldiers in East Germany and Czechoslovakia, but they were occasionally audible in the western part of the USSR as well. Moscow, Prague and East Berlin jammed the 173 kHz channel whenever RIAS and VOA broadcast in German, Czech and Slovak languages.

In 1979, the the Erching station officially started broadcasting of Deutschlandfunk on 207 kHz with the half power of 500 kW. The station went off the air forever in June of 1986 and was dismantled in 1990.

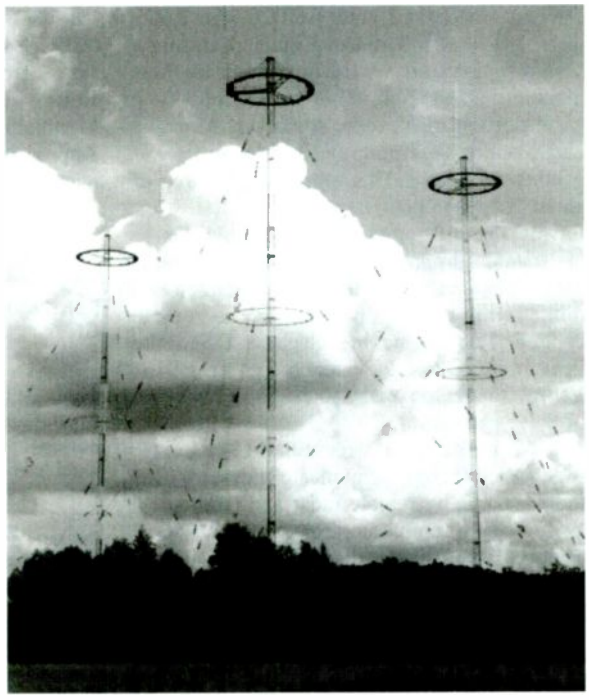
*Master control console of the Erching radio station. (Source: "Funkschau," 1979)*

## Russia versus Lithuania

In March of 2002 a Lithuania-based private broadcaster Radio Baltic Waves International was awarded a license to broadcast on 1386 kHz AM, using a 1000 kW transmitter (EIRP = 32.1 dBkW, or 1622 kW) with a nondirectional antenna. However, a high-power station at Bolshakovo in the Russian exclave of Kaliningrad, sandwiched between Lithuania and Poland, uses the same frequency to bring the programs of Voice of Russia to West Europe.

In the Montreaux (1939), Copenhagen (1948) and Geneva (1978) frequency allocation plans of the International Telecomunications Union (ITU), the "219 meter" and, later, a 1386 kHz medium wave channel was assigned to "Kaunas, Lithuania." In 1951, the Sitkunai radio station near Kaunas started operation on the assigned channel.

In 1974, Russians built a 2500 kW transmitter with an 8-mast SV4+4 type antenna near Kaliningrad and put it on the AM frequency of 1386 kHz. The new station was located 140 km away from Kaunas, where it was intended to be. According to the ITU rules, a move of a station more than 20 miles away from its registered location cannot be done without a new international coordination.



*Russian 8-mast antenna at the Bolshakovo radio center. Beam 275°, gain 12 dB. Photo courtesy of Bernd Trutenau*

In 1991, when Lithuania separated from the USSR, the Lithuanian and Russian telecommunication ministries signed a protocol on separation of functions and responsibilities. With this protocol, Russia declared recognition of frequency assignments to Lithuania. However, Russian broadcasts on 1386 continued to interfere with Radio Baltic Waves.

Finally, in September of 2003, the telecommunications administrations of Lithuania and Russia agreed upon a schedule of gradual reduction of operation by the Russian Bolshakovo station on 1386 kHz until the final cessation on November 1, 2007.

# Scanning Salt Lake Center ARTCC

By Jon Van Allen KF7YN


Salt Lake Center ARTCC (Air Route Traffic Control Center) controls a large area of the Intermountain West including all of Utah, all of southern Idaho, a good portion of Nevada, southwest Montana and western Wyoming and also a portion of southeast Oregon. This represents an area of about 200,000 square miles!

It is interesting as a scanning enthusiast to understand how an ARTCC controls such a large area of responsibility. The Federal Aviation Administration (FAA) operates several remote controlled radar domes in such places as Sawtelle Peak in the Island Park Idaho area near West Yellowstone Montana, some 300 miles north of Salt Lake City.

Air traffic controllers at Salt Lake Center watch aircraft and communicate with them over this vast area by remote radar and radio sites, all linked by remote control. Of course local airports usually have their own communications, but chances are the aircraft are in contact with Salt Lake Center ARTCC at some point along their flight paths.

## Good Listening

One advantage of airband scanning is that it is not limited to close proximity to airports. I always bring my scanner even while I'm camping, fishing or on the road, and I am almost always rewarded with airband scanning action. I can't recall how many times I discovered the purpose of the airplane or helicopter that just flew over in some unexpected area by scanning these airband frequencies.

Keep in mind that UHF mil-air frequencies are in a state of change across the entire US, so the UHF listings are not 100% accurate. I have corrected these frequencies where known. You may be surprised at the amount of UHF traffic to be heard in the Salt Lake ARTCC, but consider the number of military facilities located in northern Utah: Hill Air Force Base, Dugway Proving Grounds/Michael AAF, Eagle Range, Utah Test Range and Utah Air National Guard, plus Mountain Home AFB in Idaho.

You can get a feel for the enormous air space controlled by Salt Lake Center by the states represented in Table One. In addition to enroute traffic control for civil and military air traffic, Salt Lake Center also provides air traffic control services for approach to Billings, Boise, Great Falls, Helena, Spokane (Missoula), Mountain Home, Salt Lake City, and Twin Falls Approach; and for departure (tower) to Billings, Boise, Bozeman, Elko, Glacier (Kalispell), Great Falls, Hailey (Sun Valley), Helena, Hill, Idaho Falls, Jackson, Missoula, Mountain Home, Ogden, Pocatello, Salt Lake City, and Twin Falls.

If you're headed out west, chances are, you're going through ZLC-controlled airspace!

**Table 1**

**Salt Lake ARTCC (KZLC)**

| CITY | ST | VHF 1 | VHF 2 | VHF 3 | UHF 1 | UHF 2 | UHF 3 |
|---|---|---|---|---|---|---|---|
| Ashton | ID | 128.350 | 132.400 | 338.300 | 381.600 | | |
| Baker | OR | 128.050 | 387.150 | | | | |
| Battle Mtn | NV | 128.725 | 132.250 | 269.000 | 352.000 | 363.150 | |
| Big Piney | WY | 128.350 | 381.600 | | | | |
| Billings | MT | 127.750 | 351.900 | | | | |
| Blackfoot | ID | 128.350 | 381.600 | | | | |
| Bliss | ID | 118.050 | 128.550- | 363.000 | 397.900 | | |
| Boise | ID | 118.050 | 269.050 | | | | |
| Bozeman | MT | 132.400 | 338.300 | | | | |
| Bryce Canyon | UT | 133.600 | 269.250 | | | | |
| Burley | ID | 118.050 | 363.000 | | | | |
| Butte | MT | 132.400 | 133.400 | 285.400 | 338.300 | | |
| Cascade | ID | 121.050 | 399.000 | | | | |
| Cedar City | UT | 122.200 | 124.200 | 125.575 | 299.200 | 343.600 | 346.300 |
| Cedar City | UT | 127.350 | 135.250 | 135.550 | 381.450 | 398.900 | |
| Delle | UT | 128.550 | 132.025 | 380.050 | 380.550 | | |
| Delta | UT | 125.575 | 370.850 | 381.450 | | | |
| Elko | NV | 129.725 | 132.250 | 269.000 | 363.150 | 352.000 | |
| Ely | NV | 133.450 | 397.850 | | | | |
| Fairfield | UT | 133.900 | 370.850 | | | | |
| Francis Pk | UT | 119.950 | 127.700 | 135.775 | 257.700 | 377.150 | 387.050 |
| Glasgow | MT | 126.850 | 305.200 | | | | |
| Great Falls | MT | 132.425 | 133.400 | 285.400 | 319.000 | | |
| Green River | WY | 124.350 | 353.500 | 291.600 | | | |
| Hanksville | UT | 133.600 | 135.375 | 269.250 | 303.600 | | |
| Jackson | WY | 127.300 | 132.500 | 133.250 | 259.100 | 285.200 | 285.600 |
| Judith Mtn | MT | 126.850 | 133.400 | 285.400 | 305.200 | | |
| Lakeside | UT | 133.400 | 285.400 | | | | |
| Lovell | WY | 133.250 | 285.600 | | | | |
| Malad City | ID | 126.750 | 379.250 | | | | |
| Miles City | MT | 126.850 | 305.200 | | | | |
| Missoula | MT | 133.400 | 285.400 | | | | |
| Myton | UT | 119.950 | 135.775 | 257.700 | 377.150 | | |
| Rome | ID | 121.150 | 128.050 | 379.100 | 387.150 | | |
| Salmon | ID | 132.400 | 338.300 | | | | |
| Sheridan | WY | 127.750 | 351.900 | | | | |
| Squaw Butte | ID | 128.050 | 121.50 | 387.150 | 399.000 | | |
| Sunnyside | UT | 125.575 | 127.925 | 133.900 | 370.850 | 380.350 | 381.450 |
| Thermopolis | WY | 124.350 | 133.250 | 285.600 | 353.500 | | |
| Tonopah | NV | 125.750 | 127.900 | 132.050 | 291.700 | 319.800 | 377.100 |
| Tonopah | NV | 133.450 | 387.850 | | | | |
| Watford City | NV | 126.850 | 305.200 | | | | |
| Wilson Creek | NV | 127.950 | 133.450 | 134.525 | 278.100 | 380.350 | 397.850 |
| Winnemucca | NV | 132.250 | 363.150 | 380.050 | | | |

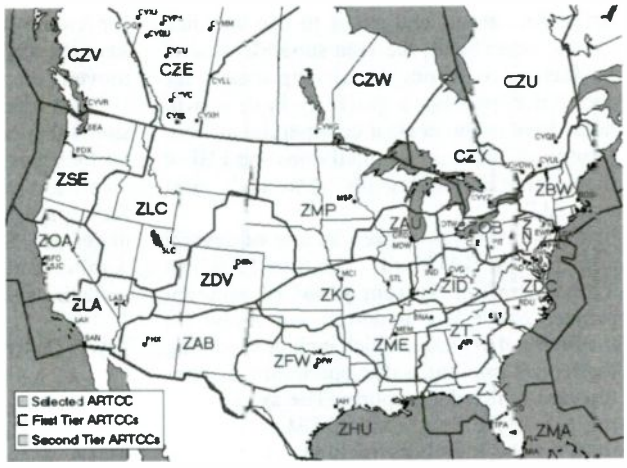
## Table 2

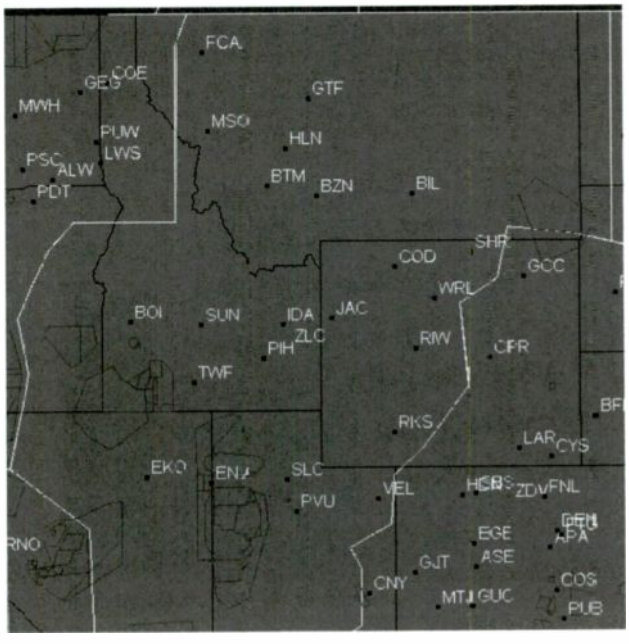
**Salt Lake City International Airport (SL Center)**

| VHF | UHF | | |
|---|---|---|---|
| 118.300 | 257.800 | SL Tower | Runway 35/17 |
| 118.450 | | Air Natl Guard | Clover Control |
| 119.050 | 257.800 | SL Tower | Runway 34/16 |
| 119.200 | | SLC Int Airport | Clearance/Delivery |
| 120.200 | | SLC Municipal #2 | Approach/Departure (App/Dep) |
| 120.900 | 257.200 | SLC Int | App/Dep S of 41N <8000' |
| 121.100 | 319.250 | SLC Int | App/Dep N of 41N <8000' |
| 121.500 | 243.000 | Nationwide | Emergency ELT, SAR |
| 121.600 | | Civil Air Patrol | ELT - Practice, SAR On Scene |
| 121.650 | | SLC Int | Ground Control E of 17/35 |
| 121.900 | | SLC Int | Ground Control W of 17/35 |
| 121.975 | | FSS Advisory | Private aircraft advisory |
| 122.000 | | SL Center | Delle/Francis Peak Comm |
| 122.100 | | SL Center | Wendover RCO (Remote Controlled Ops) |
| 122.200 | | SL Center | Common Enroute, Nationwide FSS |
| 122.250 | | Nationwide | Balloons |
| 122.400 | | SL Center | FSS (Flight Service Station) |
| 122.500 | | SL Center | Delle RCO |
| 122.700 | | Airport #2 | CTAF/Unicom |
| 122.725 | | Unicom | Private Airports |
| 122.750 | | Nationwide | Air to Air Comms |
| 122.850 | | Multicom | Uncontrolled Airports |
| 122.900 | | Multicom/Unicom | |
| | | Civil Air Patrol | Search Exercise |
| 122.925 | | Forest Service | Region 4 Fire Aircraft |
| 122.950 | | Unicom | |
| 123.025 | | Helicopter | Air to Air Comms |
| 123.050 | | Helicopter | University of Utah Air Med |
| 123.100 | | Civil Air Patrol | Actual Search Mission |
| 123.300 | | Unicom | Sailplanes |
| 123.500 | | Unicom | Sailplanes |
| 123.600 | | FAA Advisory | Uncontrolled Airports |
| 123.800 | | SL Center | Francis Peak Comm |
| 124.300 | | SLC Int | App/Dep 16L/34R, 16R, 17 <8000' |
| 124.750 | | SLC Int | ATIS |
| 124.900 | 284.600 | SLC Int | App/Dep 16L/34R >8000' |
| 125.400 | | SL Center | Comm |
| 125.700 | | SLC Int | Final Approach 16R |
| 126.200 | | Helicopter Pad | Airport #2 |
| 126.650 | | SLC Int | App/Dep 250-340 deg |
| 126.750 | | SL Center | Francis Peak comm |
| 126.800 | | SLC Int | VFR West Approach |
| 127.000 | | Airport #2 | Clearance Delivery |
| 127.300 | | SLC Int | IFR |
| 127.300 | 387.100 | SLC Int | Clearance Delivery |
| 127.475 | | Forest Service | Region 4 Air-to-Air Comms |
| 127.625 | | SLC Int | ATIS |
| 127.925 | | SL Center | Comm |
| 128.100 | | SLC Int | App/Dep 34L, 34R, 35 >8000' |
| 128.300 | | SL Center | Francis Peak comm |
| 128.550 | | SL Center | Francis Peak, Delle ARTCC |
| 128.875 | | SLC Int | Delta Airlines Company Freq |
| 129.425 | | SLC Int | UPS Company Freq |
| 129.500 | | SLC Int | United Ramp |
| 129.950 | | SL Center | Francis Peak comm |
| 130.025 | | ARINC | ACARS Secondary |
| 130.400 | | ARINC | Idaho Enroute |
| 130.600 | | SLC Int | Southwest Company Freq |
| 130.775 | | SLC Int | Delta Company Freq |
| 131.225 | | SLC Int | Delta Company Freq |
| 131.275 | | SLC Int | Delta Company Freq |
| 131.550 | | ARINC | ACARS Primary |
| 131.750 | | SLC Int | Skywest Company Freq |
| 132.025 | 385.550 | SL Center | Francis Peak, Delle ARTCC |
| 132.250 | | SL Center | Delle comm |
| 132.550 | | SL Center | |
| 132.650 | 336.400 | SL Tower | Runway 16R/34L |
| 133.025 | | SL Center | High Altitude EFAS |
| 133.250 | | SL Center | Francis Peak comm |
| 133.450 | 397.850 | SLC Int | SW of SLC |
| 133.650 | | SL Center | Ground 16R/34L |
| 133.900 | | SL Center | |
| 134.150 | | SLC Int | Delta Ramp |
| 134.350 | | SLC Int | TCA Approach Control(West) |
| 134.425 | | SLC Int | Automated WX AWOS-3 |
| 134.500 | | SL Center | Francis Peak comm |
| 134.525 | | SL Center | ARTCC |
| 135.500 | | SLC Int | App/Dep 340-110 deg >8000' |
| 135.550 | | SL Center | Francis Peak comm |
| | 284.600 | SLC Int | App/Dep |
| | 307.050 | SLC Int | App/Dep |
| | 322.300 | SLC Int | App/Dep |
| | 353.600 | SLC Int | App/Dep |

## Abbreviations & Symbols:

| | |
|---|---|
| ARINC | Aeronautical Radio, Inc. |
| APP/DEP | Approach/Departure |
| ARTCC | Air Route Traffic Control Center |
| ATIS | Automatic Terminal Information Service |
| AWOS | Automated Weather Observation System |
| CTAF | Common Traffic Advisory Frequency |
| Comm | Communications |
| CON | Control |
| Deg | Degrees (compass) |
| EFAS | Enroute Flight Advisory Service |
| ELT | Emergency Locator Transponder |
| FAA | Federal Aviation Administration |
| FSS | Flight Service Station |
| IFR | Instrument Flight Rules |
| Int | International |
| RCO | Radio Controlled Operations |
| SAR | Search And Rescue |
| SLC | Salt Lake City |
| TCA | Time to Closest Approach (Collision Avoidance) |
| VFR | Visual Flight Rules |
| WX | Weather |
| < | Less Than (Under) |
| > | Greater Than (Above) |
| ' | Feet |



# Save Your Local Airport!

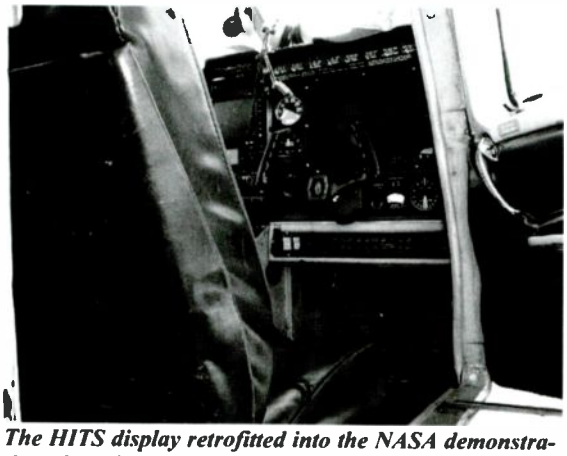
By Rachel Baughn
Monitoring Times Editor

The little Andrews-Murphy airport – not far from *MT* headquarters in North Carolina – is the perfect site for an ambitious project which hopes to revolutionize general aviation. Andrews is a small airstrip with no tower or radar, ringed by mountain ranges, and prone to bad weather. On the other hand, the area supports several businesses to whom the airstrip means the difference between a quick fly-in or a two-hour drive to the nearest commercial airport. (Not to mention occasionally hosting FBI or media aircraft looking for "America's most wanted.")

Andrews was chosen as one of several test sites for SATSLab – the Small Aircraft Transportation System proof of concept project. SATS is a wide-ranging vision for the future of aviation, which includes enabling higher-volume and safer operations at non-towered/non-radar airports. The system is a project of the Southeast SATSLab Consortium whose members include NASA, the FAA, state aviation authorities, aviation companies, aircraft manufacturers, universities and research organizations, avionics and software system companies.

Last October, the system was demonstrated to the public at the Andrews-Murphy airport's first airshow in thirty years, and Bob Grove and I were there for the media preview. First impressions are that this is an exceedingly imaginative and ambitious project – but one with very practical applications for remote areas such as ours. In fact, it could save the airport and the businesses that have moved here.

An article in *Popular Science* magazine stated that one small airport is being gobbled up by urban sprawl every two weeks. Or, if small airstrips don't lose to urbanization, they may just fade away from neglect and under-use. SATS would reverse the trend toward consolidation in air transportation and revitalize such local airstrips.



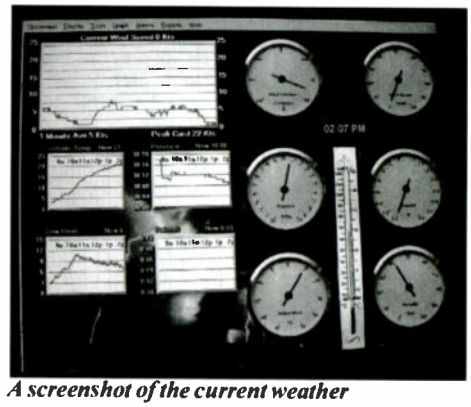
*The HITS display retrofitted into the NASA demonstration aircraft (Rachel Baughn)*

## The Demonstration

As we watched, a small aircraft made repeated approaches to the strip from all four directions (at least one of which involved a tricky maneuver between two mountains). The pilot performed all four approaches by following a 3-D virtual flight path display called Highway-In-The-Sky (HITS). We in the audience were able to observe on a large screen the same display the pilot was seeing in the cockpit.

In simple, easy to follow graphics and on-screen data, the pilot could see the plane and its relationship to the terrain and to the recommended flight path, as well as any other traffic, weather, or other obstacles. As long as the pilot kept the graphic which represented the plane's real-time position within the bracketed guide path he was on course to land. By following the path he could safely navigate the plane onto the landing strip from any direction, even at night with no lights or in fog or other low-visibility conditions. The display gives him virtual VFR conditions in graphics very similar to a video game.

An inconspicuous trailer houses the instrumentation and software. This is the Airport Communications Technology Trailer, a ground station consisting of servers that acquire information about weather and traffic from live FAA feeds. As the ground station and the pilot's onboard computer maintain constant communication, the data is integrated into a constantly-changing display of plane and terrain, always in relation to the guide path to the landing strip.



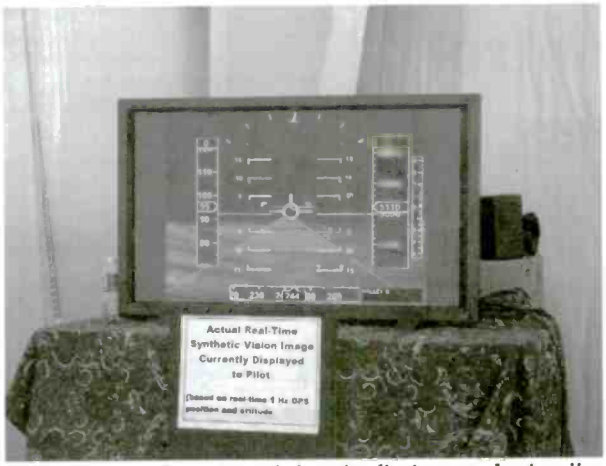
*A screenshot of the current weather*

The presenters acknowledged that this project is only now feasible with the graphic displays and software evolved by the video game industry, coupled with advancements in Global Positioning Satellite technology.

## The Frequencies

Posted in the trailer was a letter authorizing a number of frequencies for use by NASA Langley Research Center in the SATS program – and coordinated with the local area, of course.

Digital datalink
136.1750 MHz, VDLM2 - 14 kHz bandwidth
966.0000, UAT
VHF for voice control channel
AM: (air-ground voice comm)
123.1750 for outside 300 km of LFI
123.3750 for within 300 km of LFI
FM: (ground-ground voice comm)




*A large screen shows in real-time the display seen by the pilot as he follows the approach path (Rachel Baughn)*

166.1000
166.2250
167.8125
168.3500
171.0000
171.1500

VHF for DGP information transmission

162.8125
170.1250
170.3500
173.5500

Bob Grove noted the following frequencies in use at Andrews-Murphy airport (the digital data channel was not identified):

| | |
|---|---|
| 118.700 | Ground control |
| 122.800 | UNICOM |
| 123.175 | NASA |

## The Future

It was pointed out that 98 percent of the US population lives within 20 miles of a small airport. If these small strips can be made safer and more reliable for general aviation, they could become an integral part of a less centralized air transportation system with fewer bottlenecks. It could enable on-demand air transport of people, packages, medical services and more. As its purpose states, the goal of SATS is "a safe travel alternative, freeing people and products from transportation system delays by creating access to more communities in less time."

Ultimately, the vision is a computerized flight control network which would create a kind of virtual interstate system in the sky, populated by air taxis serving any of the more than 5,000 public-use airports which currently cannot handle commercial traffic. For this, the consortium members have begun to develop specially-designed small business jets. The 6-seat Eclipse 500 will be the first out, with others in development.

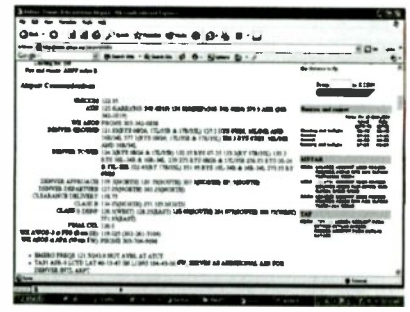
The SATS system is being tested between several airports in Florida. Five non-towered airports are being tested in North Carolina and one in Oklahoma. Other states such as Virginia may have their own test sites. The Great Plains states with their wide open spaces have a special interest in making their small airports safer and available to commercial traffic.

If you'd like to know more about SATS or see if there is a program in your area, visit **http://sats.erau.edu** or **http://sats.nasa.gov/** Help save your local airport!

*Communicating with the pilot from the ground control trailer (Bob Grove)*


# Air Traffic Control Simulcasting

By Iden Rogers



Listening to VHF / UHF aircraft communications can have a number of confusing aspects. If you are hearing the controller but not all the aircraft, you may be listening to an example of simulcasting. In simple terms, simulcasting is intentionally transmitting on more than one frequency when the microphone is keyed and, of course, listening on those same frequencies.

Only controllers will simulcast: Aircraft must transmit on only one frequency at a time when talking to controllers.

There are two basic circumstances when a controller will simulcast. One is when the controller is likely to encounter both civil (private, airliners, and cargo) aircraft as well as military aircraft in the same control area or airspace. The other is when, due to periods of reduced activity, adjacent areas are combined or related functions are combined. Let's explore these.

## Mixing in the Military

While on the ground or while flying over land, civil aircraft are restricted to the VHF aircraft band (118-137 MHz) for Air Traffic Control (ATC) communications. Military aircraft commonly operate in the UHF band (225-400 MHz) though they may use either band, assuming that a particular aircraft has equipment installed for both bands.

Some listeners new to aircraft listening may hear controllers on UHF talking to airliners and can falsely assume that the airliners are also on the UHF band. Maybe the following will help illustrate how this all fits together.

### The Air Traffic Control Network

In simple terms, the sky over land here in the U.S., is divided up into three-dimensional, irregularly-shaped geometric chunks of sky called "sectors." Controllers, at their scopes in rooms with low-level lighting and constant chatter, handle both civil and military aircraft in the respective sectors in their charge. If an aircraft is enroute – that is, between departure and approach roles – the pilot will be in contact with a controller for the particular Air Route Traffic Control Center (ARTCC) sector that the plane is in.

Each ARTCC has many high and low altitude sectors, each with its own VHF / UHF frequency pair. When a controller is talking to a civil aircraft on VHF, the same transmission is also sent out on the paired UHF frequency. Likewise, when a controller is talking to a military aircraft on a UHF frequency, it also goes out on the VHF frequency. You have to listen to both frequencies to hear all the aircraft.

Terminal Radar Approach Control (TRACON) facilities control air traffic during aircraft approaches to and departures from airports, and they, too, have VHF / UHF frequency pairs for each of their sectors. Besides ARTCCs and TRACONs, VHF / UHF simulcasting also exists at military airfields and a percentage of larger civil airports. Many smaller civil airports with a tower will have a UHF tower frequency for emergencies and occasional military landings on 257.8 MHz, but will not have multiple VHF / UHF frequency pairs.

### Frequency Pairs

Part of the fun of the hobby is to figure out all the VHF / UHF frequency pairs for the ARTCC, TRACON, military airfields, and airports in your listening area. AirNav.com can be of considerable help at **http://www.airnav.com/airport/** .

As an example, look at the information for Denver International Airport at **http://www.airnav.com/airport/KDEN**:

DENVER APPROACH: 119.3(NORTH) 120.35(SOUTH) 307.3(NORTH) 381.5(SOUTH)
DENVER DEPARTURE: 127.05(NORTH) 363.25(NORTH).

The VHF / UHF frequency pairs are easy to figure out in this example.

Again, the UHF frequencies exist at some civil airports for any military aircraft that use those airports. A controller probably could configure his or her console to transmit on VHF to civil aircraft and transmit on UHF to military aircraft, but by simulcasting, it helps all pilots in a given sector or control area to be more aware of what is going on around them and to know when the controller may be busy talking to an aircraft on the other band.

## Temporary Consolidation

The other instance of simulcasting occurs during periods of low air traffic at which time, for example, two or more TRACON sectors may be combined. One controller will handle what two or more controllers cover at busier times. If three sectors are combined, you are likely to hear the same controller simulcasting on three VHF frequencies and three UHF frequencies. To hear all the aircraft in contact with him or her, you will need to monitor all six frequencies.

If you hear a TRACON controller and not the aircraft, it's time to explore for the frequencies you are not monitoring that are part of the simulcast group. As the day gets busier, the sectors will once again be broken up into independently-operating sectors with separate controllers and continuing with the frequency pairs unique to each.

The more familiar you become with a particular facility, the quicker you will be to recognize when sectors are combined and when they are not. You will hear controllers who are controlling more than one sector say "Contact me now on my freq xxx.xx." In other words, he is handing off the aircraft to another sector, but yet to himself, since he is controlling that sector as well. Aircraft must communicate on the frequency that is assigned to the sector it is in, even if sectors are combined and it's the same controller.

Another common consolidation during periods of low activity is to combine Clearance Delivery, Ground Control, and Tower. That is, one controller will accomplish all three functions that, at other times, might be handled by three people separately. Sometimes Clearance Delivery and Ground Control will be combined, but the Tower will remain separate.

When we look at Sacramento International Airport (**http://www.airnav.com/airport/KSMF**) as an example, we see:

CAPITOL GROUND: 121.7 256.7
CAPITOL TOWER: 125.7 256.7
CLEARANCE DELIVERY: 121.1 256.7

If you were to listen on one of these frequencies during a time when they were simulcasting, you would hear the controller, but only some of the aircraft. Note that the UHF frequency is the same for all three functions. If this civil airport had more frequent military traffic, it would have additional UHF frequencies.

Of course, all the above assumes that you are within receiving range of an airport or ATC facility. As distance from the transmitter increases, the aircraft on the ground are the most difficult to hear, followed by the ground stations, leaving the aircraft in the air as the easiest to hear – particularly those at higher altitudes.

Aircraft listening is more enjoyable when both sides of the conversations can be received. This isn't always possible, but understanding simulcasting and then learning all the frequency pairs can go a long way in helping you to hear both sides. Another important factor in hearing both sides is the type and height of your receiving antenna(s). This can be a topic for later discussion. Watch for the new "plane" component of *Boats, Planes, and Trains* coming next month, and send your aero questions and contributions to the author at *idenrogers@monitoringtimes.com* or in care of this magazine.

For simplicity, this article doesn't differentiate between Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) and how that relates to air traffic control.

# SERVICE SEARCH

Larry Van Horn
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# Highway Maintenance Service

This month's *Service Search* column will be taking an in-depth look at the new highway maintenance service frequency allocations currently being licensed by the Federal Communications Commission. Scanner listeners should be listening for newly allocated splinter channels (VHF 7.5 kHz/UHF 6.25 kHz) to become active in their areas.

With the increased inclement winter weather we are now experiencing, these highway maintenance allocations can be exciting frequencies to monitor road construction/snow removal operations.

| | | |
|---|---|---|
| 33.02 | Base or mobile | One-way paging on secondary basis |
| 33.06 | Base or mobile | One-way paging on secondary basis |
| 33.10 | Base or mobile | One-way paging on secondary basis |
| 37.90 | Base or mobile | |
| 37.92 | Base or mobile | |
| 37.94 | Base or mobile | |
| 37.96 | Base or mobile | |
| 37.98 | Base or mobile | |
| 45.68 | Base or mobile | |
| 45.72 | Base or mobile | |
| 45.76 | Base or mobile | |
| 45.80 | Base or mobile | |
| 45.84 | Base or mobile | |
| 47.02 | Base or mobile | State/Local only secondary basis to work with state |
| 47.04 | Base or mobile | State/Local only secondary basis to work with state |
| 47.06 | Base or mobile | State/Local only secondary basis ta work with state |
| 47.08 | Base or mobile | State/Local only secondary basis ta work with state |
| 47.10 | Base or mobile | State/Local only secondary basis to work with state |
| 47.12 | Base or mobile | State/Local only secondary basis to work with state |
| 47.14 | Base or mobile | State/Local only secondary basis to work with state |
| 47.16 | Base or mobile | State/Local only secondary basis to work with state |
| 47.18 | Base or mobile | State/Local only secondary basis to work with state |
| 47.20 | Base or mobile | State/Local only secondary basis to work with state |
| 47.22 | Base or mobile | State/Local only secondary basis to work with state |
| 47.24 | Base or mobile | State/Local only secondary basis to work with state |
| 47.26 | Base or mobile | State/Local only secondary basis to work with state |
| 47.28 | Base or mobile | State/Local only secondary basis to work with state |
| 47.30 | Base or mobile | State/Local only secondary basis to work with state |
| 47.32 | Base or mobile | State/Local only secondary basis to work with state |
| 47.34 | Base or mobile | State/Local only secondary basis to work with state |
| 47.36 | Base or mobile | State/Local only secondary basis to work with state |
| 47.38 | Base or mobile | State/Local only secondary basis to work with state |
| 47.40 | Base or mobile | State/Local only secondary basis to work with state |
| 150.995 | Base or mobile | |
| 151.0025 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 151.010 | Base or mobile | |
| 151.0175 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 151.025 | Base or mobile | |
| 151.0325 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 151.040 | Base or mobile | |
| 151.0475 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 151.055 | Base or mobile | |
| 151.070 | Base or mobile | 25 kHz bandwidth authorized |
| 151.085 | Base or mobile | |
| 151.0925 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 151.100 | Base or mobile | |
| 151.1075 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 151.115 | Base or mobile | |
| 151.1225 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 151.130 | Base or mobile | |
| 151.1375 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 156.045 | Mobile | |
| 156.0525 | Mobile | Bandwidth not to exceed 11.25 kHz |
| 156.060 | Mobile | |
| 156.0675 | Mobile | Bandwidth not to exceed 11.25 kHz |
| 156.075 | Mobile | |
| 156.0825 | Mobile | Bandwidth not to exceed 11.25 kHz |
| 156.105 | Base or mobile | |
| 156.1125 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 156.120 | Base or mobile | |
| 156.1275 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 156.135 | Base or mobile | |
| 156.1425 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 156.165 | Base or mobile | Assignment for licensees other than the state |
| 156.1725 | Base or mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 156.180 | Base or mobile | Assignment for licensees other than the state |
| 156.1875 | Base or mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 156.195 | Base or mobile | Assignment for licensees other than the state |
| 156.2025 | Base or mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 156.225 | Base or mobile | Assignment for licensees other than the state |
| 156.2325 | Base or mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 156.240 | Base or mobile | Assignment for licensees other than the state |
| 156.2475 | Base ar mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 158.985 | Mobile | Assignment for licensees other than the state |
| 158.9925 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.000 | Mobile | Assignment for licensees other than the state |
| 159.0075 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.015 | Mobile | Assignment for licensees other than the state |
| 159.0225 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.045 | Mobile | Assignment for licensees other than the state |
| 159.0525 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.060 | Mobile | Assignment for licensees other than the state |
| 159.0675 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.075 | Mobile | Assignment for licensees other than the state |
| 159.0825 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.105 | Mobile | Assignment for licensees other than the state |
| 159.1125 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.120 | Mobile | Assignment for licensees other than the state |
| 159.1275 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.135 | Mobile | Assignment for licensees other than the state |
| 159.1425 | Mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
| 159.165 | Base or mobile | Assignment for licensees other than the state |
| 159.1725 | Base or mobile | Assignment for licensees other than the state/Bandwidth not to exceed 11.25 kHz |
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| 159.1875 | Base or mobile | Bandwidth not to exceed 11.25 kHz |
| 159.195 | Base or mobile | |
| 159.2025 | Base or mobile | Bandwidth not to exceed 11.25 kHz |

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# Tuning the FM Band: The Basics

MT reader Bernice Bernotat recently wrote, "I'm a life-long radio listener who never paid much attention to what radio I was using because I lived in areas where there was no problem with reception. Now, however, I live in a canyon...180 miles south of Seattle (which is where the nearest NPR station is located) and would love to find a way to listen to radio without all the interference. I'm currently using a Quasar GX3636 with which I can hear NPR pretty well in the morning-with lots of background noise....What would you recommend in my situation? Also, I wouldn't mind spending a little more and getting SW too..."

## ❖ A Tale of Two Bands

Although nearly all radios have both AM and FM tuning ranges, the two bands couldn't be more different. The AM band dwells in a very low frequency range 530-1700 kHz and the FM band is in the very high frequency range 88-108 MHz. Not only that, but the transmission modes are completely different, as are the characteristics of their respective bands.

AM waves are very long and can "bounce" along the layers of the ionosphere for a thousand miles or more while FM waves are very short and are "line of sight," meaning that your antenna must be able to "see" the tower in order to collect a signal. Of course, there is some slight signal refraction, but, it's not much.

Reception on the FM band varies greatly depending on where you live. For instance, most people live in an urban or suburban environment where FM stations are closely packed on the band and powerful transmitters are perhaps only 10 miles from your radio. These locations can suffer from receiver overload where the signal swamps the receiver. Anything more than a small whip antenna only increases the problem. But, for rural folks, like Bernice, reception of any FM signal is a big challenge.

## ❖ Three Tuning Options

Being an Easterner I had to ask Bernice what she meant by "living in a canyon." She obliged by sending several great photos of the view from various directions at her house. If you've ever seen the movie *"A River Runs Through It"* you can imagine where she lives. In fact, she says, "...I just found out that this area here was the last one in the entire U.S. to have the mail delivered on horseback...until 1956 when they finally brought electricity down here..." She says her elevation is 1,500 feet but the canyon walls are 3,000 feet and that her neighbors up there have no problem with radio reception.

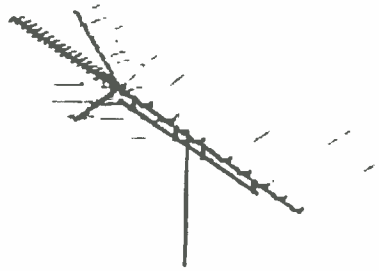
Having seen the pictures I have to say it's a miracle she can get any reception at all and I have no idea what the folks living at the bottom of the canyon are doing for reception. Of course, the reason her neighbors get such good reception is that they have a better line-of-sight to the transmitting antenna. However, I've come up with three ways to solve the problem of poor FM reception which should be applicable to most readers' situations.

## ❖ The Outdoor Antenna Option

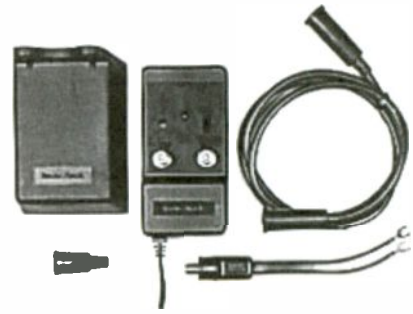
The first option is to install an outdoor FM antenna with a mast-mounted pre-amplifier. You can get all the parts for this at Radio Shack. There are FM antennas available which are designed just for the FM band, but since the FM band is located between VHF TV channels 6 and 7, I recommend using a TV antenna because this means you'll get improved over-the-air TV reception as a bonus.

Bernice lives in what's called a "fringe" reception area – that's the limit to which an FM signal can travel and still be reliably received. For this, Radio Shack's VU-190 XR FM/TV:UHF/VHF antenna (about $100) is recommended. If you live in an area within 60 miles of the station, a lesser antenna can be used with acceptable results.

To this I suggest adding the high-gain antenna mounted signal amplifier (RS#15-1109 $70) and enough 75 ohm coax cable to go from the antenna to the place in the house where your radio is located. I recommend RG/6 coax because it has less loss at VHF frequencies per hundred



*One-stop antenna: FM/TV:UHF/VHF. Radio Shack's VU-190 for fringe reception. It's great for FM and you get improved TV as a bonus! (Courtesy Radio Shack)*



*Radio Shack's high-gain mast-mounted antenna amplifier makes the most difference in signal quality. (Courtesy Radio Shack)*

feet of run, and with antennas, any time you can limit loss you're ahead of the game.

While reception will be improved with the antenna alone, you'll find the preamp makes a tremendous difference. When you use the antenna-mounted preamp you're amplifying the signal at the antenna before it has a chance to get lost in the lead-in.

A preamp of any kind is *not* recommended if you live in a suburban area because such an increase in signal could result in receiver overload which will, in turn, result in decreased signal quality. There are many mast-mount preamps on the market, so look for the one which offers the most gain in the frequency range most important to you. Gain is usually expressed in dB with the higher number offering the most gain.

The next thing you'll need is the hardware to support the antenna. In most applications you can use one ten foot mast (RS#15-863 $15) attached to the gable end of the house using a set of 4- or 8-inch wall mounts (RS#15-886 $11), depending on the overhang of your roof.

If you tend to listen in only one direction, simply point the antenna in that direction, rotating it by hand for strongest signal and locking it down. If you need to tune stations from different directions you'll need an antenna rotator (RS#15-1245 $70). In this case you'll need an additional 5 or 10 foot section of mast as the rotator sits atop one section and the second mast is mounted into the rotator with the antenna mounted atop that.

## ❖ The New Receiver Option

In general, a high quality stereo receiver/amplifier will have a better FM tuner and yield better reception. Today these receivers have a lot of extras such as remote control, digital tun-

*JVC-RX-318BK Stereo receiver tunes FM band at a reasonable price. (Courtesy JVC/ Crutchfield)*

ing with 10 or more station presets and also give you great audio for a CD/DVD player or your VCR. The big drawback is that you'll need external speakers. But, prices on good quality receiver/ amps are fairly low. You will find that popular models such as the Sony STR-DE185 ($185) or the JVC RX-318BK ($180) will do nicely.

Your local Circuit City, Best Buy, Tweeters or similar consumer electronics store will have them at competitive prices. If you don't have such a store near you, try Crutchfield, the national catalog electronics outlet. Call 800-955-6000 to order a catalog or view their available models and prices on-line at **http://www.crutchfield.com**. It pays to shop around because prices on these items vary widely and they're often on sale.

## FM Antenna Installation Tips

A word of caution: antennas and antenna masts are great conductors of electricity. DO NOT install an antenna anywhere near electrical wires. When doing outdoor antenna work try to have another person help you. You may need someone to hold a ladder steady or tell you if the signal's coming in well or to hand up tools.

If you have a set of FRS radios you'll find them of great value when orienting the antenna for best reception. Most radios have just a stereo light as a signal strength indicator, so you'll have to do it by ear. Tune for the least amount of hiss on the weakest stations.

Use plastic cable ties to secure the coax to the mast to keep it from flopping around in the wind. Use a plastic "through-wall" tube to bring the lead-in into the house above the baseboard. Use extreme caution when drilling through walls to avoid hitting live electric house wires. Always form a drip loop with lead-in wires to avoid rain entry into the house.

TV antennas are big and exert a great deal of torque in the wind. Avoid using a brick or masonry chimney as a support. Over the years the antenna will actually crack the mortar in such chimneys, requiring extensive repair.

Drive a ground rod under the antenna mast and connect the two with a heavy ground wire. This is not a guarantee that your antenna won't be struck by lightning. In the event of an electrical storm, disconnect the antenna from the radio and unplug the antenna amplifier from the wall. Physically isolate the antenna from your equipment and the house wiring.

Properly installed, you should get 10, 15 or even 20 years service from your antenna. If you notice degraded reception, the most likely cause is the cable fitting at the antenna. Be sure to use the supplied weather boot on the coax fitting when doing the installation.

*Sony STR-DE185 looks expensive but is moderately priced. (Courtesy Sony/Crutchfield)*

If you're also interested in tuning in the shortwave bands, as is Bernice, I recommend, instead, a portable shortwave receiver such as the Sangean ATS909 ($240-260) or the Sangean ATS505P ($110-130). You can check out these models at C Crane (800-522-8863 **http://www.ccrane.com**) or Grove Enterprises (800-438-8155 **http://www.grove-ent.com**). When attached to the above antenna, the receiver will give you vastly improved FM reception, and the built-in whip antenna will give you moderate reception on the big international shortwave broadcasters. These radios provide moderate reception on all bands and they are reasonably priced.

*Sangean ATS505P shortwave receiver has an adequate FM tuner built-in and you get shortwave as a bonus! (Courtesy Sangean/Grove)*

### The Ultimate Solution

And that brings me to the ultimate option: Sirius satellite radio. I've been subscribing to both Sirius and XM for nearly a year and I prefer Sirius over XM. Here's why: Sirius offers three channels of public radio (NPR News, NPR Talk and PRI). XM has none. Sirius has more balanced political talk channels including Sirius Right (for conservatives) and Sirius Left (for liberals). It has all the usual ABC talk radio channels, but it also has Radio Amiga which carries Free Speech Radio and Democracy Now. On the shortwave side, Sirius offers BBC World Radio News and World Radio Network (WRN) with its line-up of shortwave broadcasts from around the world on a rotating schedule. And, when it comes to music, Sirius wins again: 60 channels of commercial-free music, which is the main reason I want to listen to music on satellite.

OK, there's a price for all this great programming. It will cost $12.99/month for Sirius ($3 more than XM). So, you have to figure out just how important this type of programming is to you. The equipment to receive Sirius is not that expensive and is consistently coming down. Again, check the big consumer electronics stores and you'll find plenty of discounts and mail-in rebates.

Typically, a tuner can be bought for under $100 and a home docking station for $60 or less. The advantage of having both a home and car docking station is that you can just pop the tuner out of one and pop it into the other. Reception at home or in the car is excellent and it's really easy to become addicted.

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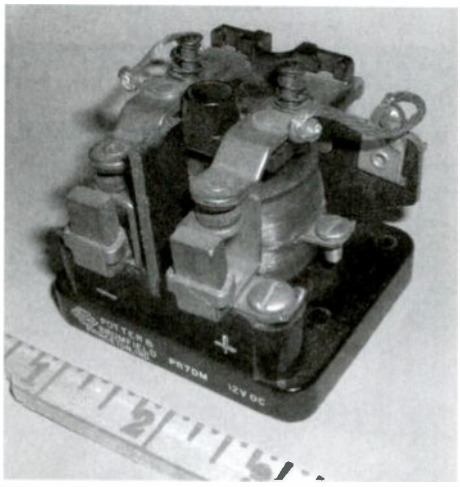
### ❖ More on AC vs. DC relays

In our December column, I was a little too sloppy in saying that you can use an AC-rated relay on DC. My explanation was essentially correct, but sharp-eye reader Tom Lamb, K8ERV, advised the following:

Alternating current (AC) continuously switches polarity (+ or-) 60 full cycles every second. When a relay opens during the zero-crossing phase (momentarily there is no voltage present), there isn't even a spark. If you open the contacts under direct current (DC; the current and voltage remain constant), there can be quite an arc drawn which can weld or destroy the contacts.

Certainly there are relays for DC, but they have more substantial contacts to dissipate the heat during the break than are required for AC. In addition, some DC relays employ "blow out" magnets near the contacts to help extinguish the arc.

Thanks, Tom.



*Q. Why do drop-outs occur on cell phones? Is it only because of poor signals? (Mark Burns, Terre Haute, IN)*

A. Minimum quality standards must be observed in commercial telecommunications equipment. If weak signals start causing erratic conversations, the system cuts you off until you are in a better location where you can redial, or receive a more reliable call.

But if the next cell (tower) is already fully loaded with users, you may be refused or cut off there as well.

*Q. I have a Yacht Boy 400 which suddenly stopped receiving all AM stations and left only a background static hiss. All other functions including FM and shortwave work fine. With the external antenna plugged in it works fine, but on removing the external antenna it returns to a background hiss. What would you suggest as to the cause and the cure? (Bill Rickman, Edina, MN)*

A. Sounds as if the antenna jack is not making connection to the internal loop when you pull out the jack. This is the result of frequent in/out plugging gradually stretching the little spring contact in the jack away from its other contact point. Try wiggling the little spring contact with a small needle or other object to see if that makes and breaks the signals.

If that's the culprit, you have two choices:

(1) With a stiff steel wire, probably bent into a right angle at the intruding end, bend the spring contact back to the place it's touching (or raise the place it's touching to the spring contact, or both!).

(2) Replace the jack.

*Q. I would like to built a simple vertical wire antenna for mounting on a pole 30 feet tall for SWLing the different bands. Any ideas? (Greg Gilbert)*

A. The simplest vertical is a wire suspended from a high tree branch, raised by a cord attached to a rock or an arrow projected, then used to pull up the wire. It's a good idea to attach a ground rod out there as well, although the roots pose a problem, so the rod can be sunk a little farther away. The purpose of the ground rod is to reduce electrical static; it will not make signals stronger.

I once made a very effective vertical using two or three sections of TV mast pipe bracketed to the side of the house and attached to a coax lead-in at the bottom with a bolt in a drilled hole. Again, it's a good idea to put the ground rod under it.

Another gimmick is to set the bottom of the mast pipe over the top of a thick-walled, glass beverage bottle buried to its neck alongside the house; you only need one bracket a few feet higher to keep the mast-pipe vertical from falling.

Yet another possibility is to use lightweight electrical conduit for the vertical, securing it to a PVC roof vent with two wraps of plumbing strap. The coax center conductor can be attached to a screw and nut run through one of the holes in the strap.

The Coast Guard once demonstrated that they could receive all communications from 3-30 MHz with a six-foot whip, so as you can see, the length is not critical. Sure, the impedance is very low, but all that means is that the signals as well as the noise (background hiss) will both be lower than if you had a resonant system, but who cares? If you want higher signal and noise, just turn up your volume control!

*Q. I just built an RF preamplifier kit that is powered by a nine-volt battery. The instructions say it draws 15mA, so how long can I expect the battery to last? Is there an easy way to check the battery without actually opening the case? (Ed Bixby, El Segundo CA)*

A. The functional lifetime of a battery is dependent not only on the current drain, but the minimum voltage to which the battery can drop before it affects performance. Assuming that the preamp can probably continue to operate down to 7 volts or so, a fresh alkaline battery should last for a good many hours.

While it would be difficult to predict what observable effects you would notice on your preamp from a battery that has dropped voltage too low, they would most likely include signal weakening, and could also include increased intermodulation (signal overload) interference.

You can't tell what the voltage is without actually measuring it, but if the device is equipped with an external power jack, it's just possible that you can measure the voltage there. Some designers use a circuit-breaking contact to avoid applying external power to the internal battery, however; so that's something you will have to check. If it has that fail-safe precaution and you know you will avoid frying batteries by removing them before plugging in an external power supply, you may wish to rewire the jack so that the battery remains connected when a plug is inserted into it to measure the voltage.

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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8 Reader Allen Lutins sent this: "I'm an avid reader of your *Bright Ideas* column in ***Monitoring Times***. I have an alternative suggestion to your labeling methods. I buy 'full sheet labels' which consist of 8-1/2" x 11" sheets that are covered in a single, large label. I then print my labels of whatever size, including outline box, onto the sheet, and then cut them out. Formatting conventional labels, precisely centered, etc., can be quite tricky, and you can always print a few projects' worth of labels on a single sheet." Thanks, Allen!

9 I never throw anything away. At least not until I have a chance to cannibalize, and disassemble all the spare parts. Cords, screws, wires, resistors, etc. Remember to ask neighbors, and friends to save their broken down electronic gizmos. Cell phones usually come with several re-usable parts, especially the old bag phones (battery). Alternatively, the cellular phones can be donated to domestic violence programs where their 911 feature may save lives.

I keep all these odds and ends in a large plastic see-through bin. A real diamond is the soft foam used in packing computers, TVs, and other large fragile items. You can cut and mold this material for a variety of projects. I just carved out a custom radio stand for my desktop. This foam also provides custom padding protection for packing your radio into travel bag.

10 Looking for a sturdy outdoor or mobile VHF (150-165.MHz) antenna? West Marine Supplies has many radio related items for the harsh marine environment. Their antennas are made for the NOAA Weather and Marine channels in that frequency range. Look up **http://www.westmarine.com/** for their store locator. Not cheap, but they will stand up to just about anything but a tornado.

11 Do you ask yourself, why me? It seems that most everything I own eventually breaks. The knobs fall off, the plastic foot breaks off, the pin falls out of my BNC antenna. You can probably guess that superglue is a good friend. I use a toothpick to transfer the glue in the correct amount to the right place.

This morning the hinged cover on my RS voltmeter fell out. It was held in place by two small pins, one of which had disappeared. I used to cut off the end of a safety pin or paper clip for these types of repairs. But I remembered I had just put away the Christmas ornaments. What about those little hooks for the ornaments on the tree? I cut one to size, and it worked perfectly. And I saved the safety pin for a bigger job!

12 For Super Bowl Sunday, we went through lots of chips. When I cleaned up, I noticed the chip dip came in a small glass jar. I find many uses for these jars, such as a holder for small parts. I also used another to hold my AA batteries: one for those already charged, and another with those waiting to be recharged. Yes, I labeled the jars.

13 I recently worked with some Red Cross volunteers to assist them in earning their ham licenses. They felt they needed more hands-on knowledge. So I cleared off the kitchen table and invited about six newbies over to my house. I was amazed at how much they learned. We were all so happy with the process, they came back two weeks later for another session. This session included soldering some simple power cords and speakers.

Do you have some radio knowledge to share? Why not invite some new hams or monitoring enthusiasts over to your house for an elmering session? If you are the person who needs some help, find someone willing to teach you the basics, and perhaps even the advanced stuff.

14 Speaking of the Red Cross, our Spokane chapter just took possession of a new Emergency Communications Response Vehicle, the E-CRV. This is no toy. Built on a Ford Excursion chassis, it features a 52 foot telescoping mast with camera and antennas, a DSS and VSAT system, and 13 radios! An 800 watt AC Aura generator is under the hood powered by a massive diesel engine. I will save the details for a feature article I am writing. SEE PHOTO!

15 On a whim, I decided to look up the ham callsigns of some old friends – a quick and easy process at **http://www.qrz.com**. Sure enough, a few of them needed to renew their ham licenses. A couple had actually expired, but were within the two year grace period. So if you know of any inactive hams, check the database. Their interest in ham radio may have drifted away, but remind them to renew their license. They will thank you for it. They can do so for free at the FCC website or contact the ARRL.

16 I love "road trips." I like to spend a minimum of 24 hours in an area. I purchase a local map, usually at Wal-Mart (look for maps near the checkout counters). While listening (researching) the local frequencies, I use the map to connect street names with the frequency, and it helps in confirming the agency using the frequency.

I use a "table" in my word processor to record all the frequencies, and PL, or DCS tones. My Pro 92 and 2067 do a great job at instantly identifying the tone. I use these scanners with my preprogrammed public safety pool of all available VHF low and high and UHF frequencies. The radio technicians occasionally make my task interesting because they may use one PL for the repeater input, and a different one for the repeater output. Heck, in Idaho they even use uncommon frequencies, like 465.475 as the input and 460.275 as the output. Strange, but confirmed, if you know what I mean. I love this game!

Speaking of road trips, see you in Kulpsville!

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# Sharing the Cost of Connectedness

New trunked radio systems are expensive. Costs in the millions of dollars are the norm, even for relatively small municipalities. This month we'll take a look at some jurisdictions that are saving money by working together to share infrastructure and network costs and wrap up with a couple of systems that aren't quite meeting their performance expectations.

## ◆ James City and York Counties, VA

The Virginia Peninsula in southeast Virginia is home to two counties that are working together to implement a $20 million Motorola public safety radio system. Located in the Williamsburg area along Interstate 64 east of Richmond, York County covers 108 square miles and has a rapidly growing population of more than 56,000 people. James City County, just west of York County, covers 144 square miles and is home to more than 49,000 people.

James City County began their planning process eight years ago when it recognized the need to replace a number of aging radio systems. The county declared that the old systems were "unreliable, inadequate and incapable" of meeting present and future needs and could not even meet standard coverage performance (95 percent reliable 95 percent of the time for street or in-building operation). In addition, greater than half of the fielded equipment is now more than 15 years old and much of that is more than 20 years old. Such "vintage" equipment creates a difficult and expensive situation for maintenance and repair, often requiring used and worn replacement parts and quite a bit of down time.

On top of that, the police and fire departments each had only two radio channels, leading to congestion and delays during busy times of the day. Such separation also makes it difficult for police officers, firefighters and paramedics to communicate directly with each other.

At the same time, York County was facing similar problems with inadequate coverage, limited capacity and old radio equipment. The two counties decided to work together to find a replacement for each of their systems.

M/A-Com and Motorola both submitted proposals. At the end of 2003 both counties accepted the Motorola bid for a mixed analog and digital system with nine repeater sites and 20 radio channels. The system is expected to be completed late this year and should allow police, fire and other emergency personnel to communicate directly with each other. The selection of a Motorola system will also ease the task of communicating with other nearby cities including Newport News, Richmond and Virginia Beach.

Initially as many as 1,600 users are expected to join the system, with another 400 coming on after the system is fully operational. The plan specifies nine repeater towers, which will need to be built out and connected via microwave links to dispatch centers in both counties.

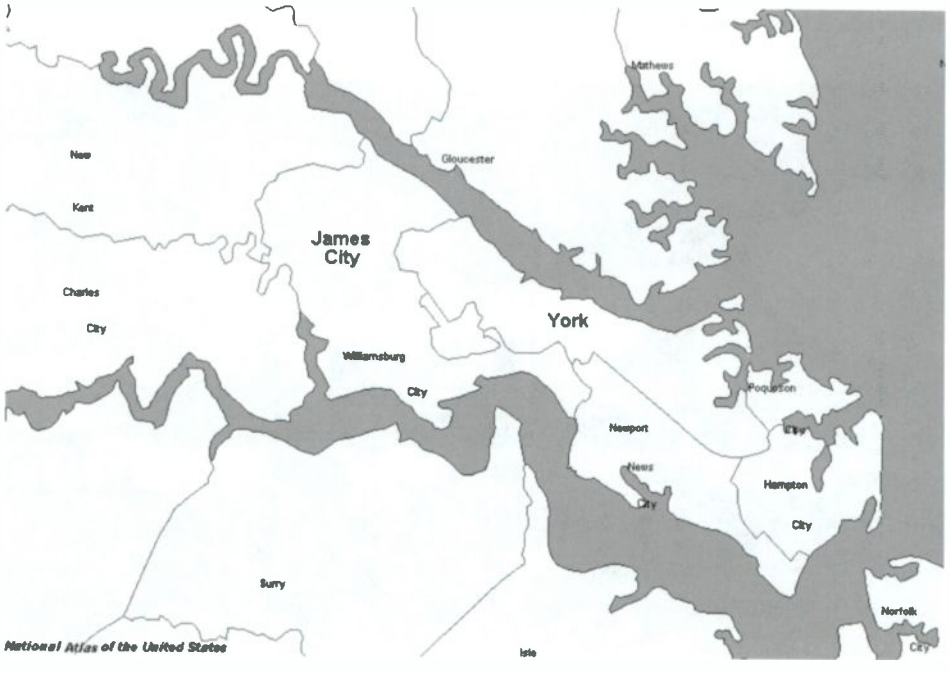
The joint network will be the first radio system in that area of Virginia to use APCO Project 25 protocols. Project 25 is a set of standards that allows public safety radios to communicate with each other regardless of equipment manufacturer.

Financial estimates indicate that the counties will save at least $2.5 million compared to what it would have cost each county independently to set up an equally capable system.

York County has three sites in the FCC database (one in Williamsburg, two in Yorktown) on the following frequencies: 866.2500, 867.2625, 867.3250, 867.3500, 867.7750, 867.8750, 867.9500, 868.5250, 868.5375, 868.6625, 868.8000 and 868.8125 MHz. In James City County there are three sites (one in Toano and two in Williamsburg) assigned to 867.1250, 867.1750, 867.3750, 867.6000, 867.8500, 867.9000 and 868.3625 MHz.

Until the new system is up and running, you can find James City County Police dispatching on 453.100 MHz and also using 453.250 MHz. Fire dispatch is 154.355 MHz and mobiles also use 154.070 MHz. Over in York County, the Sheriff's Department is on 453.150 MHz while Fire dispatch is on 154.010 MHz. Fireground is listed as 154.400 MHz.

The Williamsburg/James City School System operates a Logic Trunked Radio (LTR) system on the following four frequencies: 866.3750, 866.5125, 868.6375 and 868.7750 MHz. Reported traffic, as you might expect, is mostly to and from school buses. Listening to buses on cold, snowy days can often be helpful to keep track of road conditions and to know when your children



need to be at the bus stop.

The Virginia State Police uses 159.165 MHz on the Peninsula.

The nearby city of Norfolk operates a Motorola Type IIi trunked radio system on 852.1625, 853.1625, 855.2375, 855.4875, 855.7375, 856.2375, 856.9875, 857.2375, 857.9875, 858.2375, 858.9875, 859.2375, 859.9875, 860.2375 and 860.9875 MHz. Fire dispatch is on a Type II talkgroup of 64784 (hex FD1) and Emergency Medical Services on 64752 (FCF), but I don't have current information for police operations.

## ◆ South Dakota

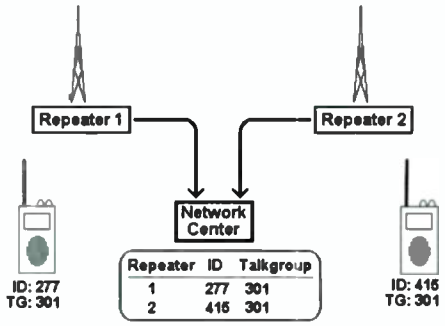
While most new digital systems can be found in the 800 MHz band, South Dakota has built a statewide system operating in VHF (Very High Frequency) around 150 MHz. It was launched in October of 2002 and now has more than 8,000 users across 500 local agencies and departments. Traffic now exceeds one million calls a month.

The system implementation plan includes 35 initial repeater sites and seven expansion sites to cover each of the 66 counties in the state. Each repeater site is connected via microwave link to a network center in the state capital of Pierre.

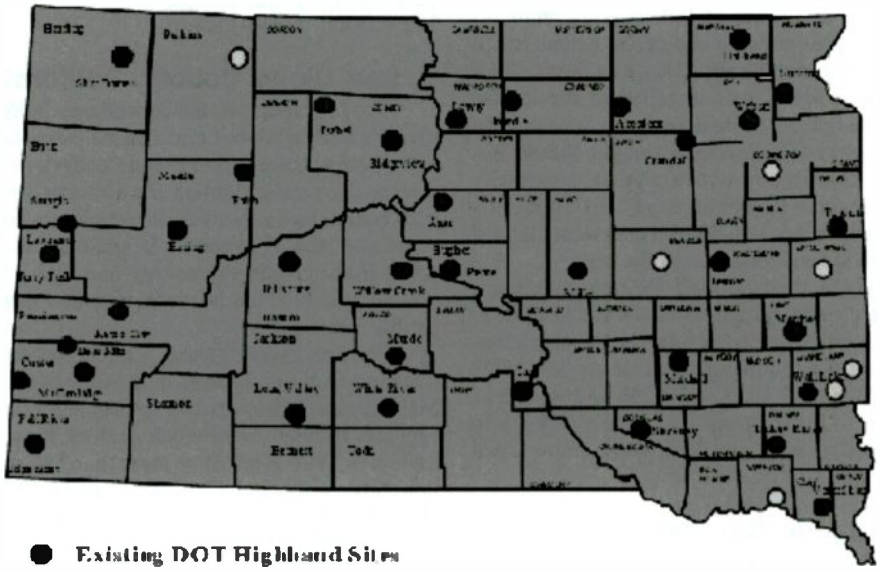
The digital radios used in South Dakota each have a unique identification number. Each radio is also programmed with one or more talkgroups that specify those conversations in which the radio may be used.

When a radio is first powered on it registers with the nearest repeater in a process called *affiliation*. The affiliation message includes the radio ID and the talkgroup the user has selected. That message goes to the network center where a database keeps track of where each radio is located and which talkgroup the user selected.

When a user begins talking, the voice traffic is transmitted to the nearest repeater and sent to the network center. The network center then relays the voice traffic to every repeater that has a radio registered for that talkgroup. This allows any user to communicate with any other user anywhere in the state as long as they are both in the same talkgroup. This capability also allows messages to be broadcast to all parts of state, for alert and other urgent messages.




**Network Database of Radio Affiliations**



● Existing DOT Highband Sites
● Additional Sites Added to System
○ 6 additional proposed sites


National Atlas of the United States

While most sites will continue to repeat traffic on that channel until those users are transitioned to the new network.

The cost of the system has grown from $22 million to $31 million, in part to provide more complete coverage found necessary after initial testing. For instance, Minnehaha County, located in the southeast corner of the state, was supposed to be able to get by with two repeater sites. It appears now that the county needs five sites in order to provide solid coverage inside buildings and basements. Out on the western side of the state the hilly geography is causing some counties there to take a closer look at their coverage and make requests for additional repeater towers.

The additional $9 million dollars is coming from Homeland Security funds and other grants from the federal government that will help cover these additional costs.

Unlike some other states, South Dakota provides free access to the network and has provided free radios to nearly all local public safety radio users. The network will be maintained by the state, including the towers and repeater equipment. The users are responsible for maintenance and repair of their own radio equipment. This type of arrangement is expected save local users the on-going mainte-

nance costs of operating their own network, which on a statewide basis could be as much as $10 million.

Federal agencies are also making use of the system, including the Departments of Interior and Justice. Future federal users are expected to include the Bureaus of Indian Affairs, Bureau of Land Management, National Park Service, the U.S. Marshals and the Department of Energy.

Because all radio traffic is expected to be carried by this network, the various agencies will have the ability to interoperate – they can communicate directly with each other rather than having to relay messages between incompatible radio systems. For instance, police, fire and emergency medical services can all be coordinated from a single dispatch center rather than from three different locations.

With so many repeater sites and frequencies for this system, it would be easier to go to my web site at **http://www.signalharbor.com** and look up specific county information there. In the meantime, nearly every repeater has the frequency 155.475 MHz and most sites have 156.015 MHz, so you could try checking those.

The talkgroup 4784 (hex 12B) is a statewide fire group. The Highway Patrol in the Sioux Falls area use talkgroups 3824 (hex 0EF) and 3920 (hex 0F5) for car-to-car communication. The Custer County Sheriff uses talkgroup 20592 (hex 507). More talkgroup information is welcome!

## ❖ Glendale, Arizona

The city of Glendale, a suburb of Phoenix, is the first municipality in Arizona to go fully digital. Their new $9 million radio system was turned on in December, replacing a 15-year-old analog system that officials said had inadequate coverage and poor voice quality. Glendale is the 4th largest city in Arizona with more than 230,000 residents.

The new system is provided by Motorola and uses the APCO Project 25 standard; you will need one of the new digital scanners in order to monitor the system. Nearby jurisdictions, like Phoenix and Mesa, have radio systems with a mix of analog and digital traffic.

The main users of the system are the police and fire services.

The Glendale Police Department has more than 350 officers. Besides the standard dispatch traffic you may hear references to "Shot Spotter." This is an automated system that determines the location of random gunfire in specific areas of the city. Audio sensors triangulate the location of the sound to within 25 feet and report that location back to the dispatch center. More than 200 instances of gunfire were identified in 2002. Not all traffic will come across the radio, however, since every patrol car is now equipped with a mobile data computer.

Glendale has seven fire stations, numbered 51 to 58. Most of their call-outs are for emergency medical service, but they also respond to several thousand fire calls each year.

The FCC database reports two repeater sites, one on 19th Avenue and the other off Glen Harbor Boulevard by the airport. The eight frequencies in use are 856.4375, 856.7125, 857.4375, 857.7125, 858.4375, 858.7125, 859.4375, 859.7125, 860.4375 and 860.7125 MHz.

| DEC | HEX | Description |
|---|---|---|
| 301 | 12D | Police A (Patrol) |
| 303 | 12F | Police B |
| 305 | 131 | Police C |
| 307 | 133 | Police D (Car to Car) |
| 309 | 135 | Police E |
| 311 | 137 | Police F |
| 503 | 1F7 | Utilities |
| 507 | 1FB | Streets and Signals |
| 513 | 201 | Sanitation |

The old Glendale trunked radio system had six police channels, A through F. The A (Adam) channel was identified as patrol and D (David) was car-to-car. The police talkgroup layout above is a guess as to how the new system might be using those same talkgroup names.

## ❖ Boone County, Indiana

If you're monitoring activity in Boone County, northwest of Indianapolis, your receive signal strength should be better than it was a few months ago. This past December a 257-foot tower was installed at the Boone County Jail in Lebanon, replacing a older 150-foot tower. The increased height should improve coverage in outlying areas. Eventually the tower will become part of Indiana's "Project Safety," an 800 MHz system planned to provide coverage across the state.

Until then, Boone County's existing trunked radio system will continue to provide public safety and county services communication on the following frequencies: 866.2625, 866.7375, 867.1625, 867.8250 and 868.7375 MHz. Unfortunately, I don't have any talkgroups, so if you have some please send them in!

## ❖ Atlantic City, New Jersey

Police and fire radios in Atlantic City, New Jersey, are apparently not working as well as local officials had hoped. The city uses a Motorola 800 MHz system for public safety that was installed a couple of years ago at a cost of more than $2 million. An investigation is underway after some well-publicized failures, including a recent fire at the Tropicana. Apparently the system works well out in the open but has problems in buildings, and especially inside some of the larger casinos.

As with Washington, D.C. and other cities, one suggestion was to install signal repeaters on emergency vehicles in order to provide better in-building coverage.

Atlantic City switched from an old UHF/VHF system to 800 MHz in 2002. The current system has both analog and digital APCO 25 voice traffic on the following frequencies: 853.3625, 856.7625, 857.7625, 858.7625, 859.7625, 860.4375 and 860.7625 MHz.

Analog Talkgroups

| DEC | HEX | Description |
|---|---|---|
| 48016 | BB9 | Fire All Talk Groups |
| 48048 | BBB | Fire Dispatch |
| 48080 | BBD | Fireground 2 |
| 48112 | BBF | Fireground 3 |
| 48144 | BC1 | Administration |
| 48176 | BC3 | Fire Prevention |
| 48208 | BC5 | County Fire 1 (patch to 154.310 MHz) |
| 48240 | BC7 | County Fire 2 (patch to 154.355 MHz) |
| 48272 | BC9 | Patch to 154.355 |
| 49616 | C1D | Beach All Talk Groups |
| 49648 | C1F | Beach Patrol Dispatch |
| 49680 | C21 | Beach Patrol Tactical |
| 49712 | C23 | Marine Channel (patch to 156.800 MHz) |
| 49744 | C25 | Atlantic County Police Department (patch to 156.210 MHz) |
| 51216 | C81 | Emergency All Talk Groups |
| 51248 | C83 | Emergency Ops 1 |
| 51280 | C85 | Emergency Ops 2 |
| 51312 | C87 | Emergency Ops Tactical |
| 51344 | C89 | Emergency Administration |

Digital Talkgroups

| DEC | HEX | Description |
|---|---|---|
| 16 | 001 | Police All Talk Group |
| 48 | 003 | Police Dispatch |
| 80 | 005 | Administration |
| 112 | 007 | Investigations |
| 144 | 009 | Scene Tactical 1 |
| 176 | 00B | Scene Tactical 2 |

## ❖ San Diego County, California

The fires from last fall in southern California are having a fall-out effect on the perception of the performance of San Diego County's radio system. Personnel fighting the October wildfires complained repeatedly about gaps in coverage and lack of capacity. In addition, assistance from outside the county had difficulty providing mutual aid because of radio incompatibilities.

The San Diego/Imperial County Regional Communications System is a Motorola 800 MHz trunked radio network serving nearly 200 agencies through 11 dispatch centers. It came on-line in 1998 at a cost of more than $40 million and currently provides service for more than 16,000 mobile and portable radios. It covers almost 9,000 square miles of varied terrain, everything from valleys below sea level to hills of more than 6,500 feet.

One of the primary goals of the system was to provide interoperability between local, state and federal agencies in situations exactly like the recent fires. However, many state and federal public safety departments are not yet part of the system and therefore have difficulty communicating on short notice.

The system has 18 repeaters operating as two simulcast zones (north and south) along with 29 stand-alone repeaters. Together these repeaters make use of more than 150 frequency pairs. Despite such a large number of frequencies, fires in 2001 and 2002 resulted in overloads when large numbers of firefighters tried to use the system.

As a result of these problems, the performance of the system is under review and recommendations are expected that can improve coverage and capacity.

That's all I have for this month. More information these and other topics are available on my web site at **http://www.signalharbor.com**. I welcome your questions, comments and frequency lists via electronic mail to *danveeneman@monitoringtimes.com*. Until next time, happy scanning!

# Scanning Canada

*John David Corby, VA3KOT*
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*OBRY locomotive - The Pride of Orangeville*

## Scanning the Railhead

### The Orangeville and Brampton Railway

About seventy five kilometers northwest of the City of Toronto, the Queen's highway encounters a steep upward gradient. At this point the lowlands surrounding the city give way to the highlands of the Niagara Escarpment. The Niagara Escarpment is a World Biosphere Reserve and stretches 725 kilometers from Niagara Falls in southwest Ontario up to Tobermory on the Bruce Peninsula.

The road from Toronto heads up toward what is called "Headwaters Country" (several rivers find their origins in this area). It passes through the City of Mississauga, home of Canada's oldest mayor (the octagenarian "Hurricane" Hazel McCallion), then on through the City of Brampton and up the escarpment into the Towns of Caledon and Orangeville.

It is a very pleasant drive that takes travelers past scenic pleasures such as the "Devil's Pulpit." Actually there are two Devil's Pulpits. On the west side of the road lies the steep slope of the hill bearing that name, while on the east side lies the exclusive and private Devil's Pulpit golf club.

Running roughly parallel to the road is one of Canada's smallest independent railroads – the Orangeville and Brampton Railway (OBRY). This line is quite different to the many steam preservation society private lines to be found all across Canada. The OBRY is a live, working freight line with diesel locomotives, but not a single passenger car is to be found in its inventory of rolling stock. The line was formerly the Owen Sound subdivision of the CPR (Canadian Pacific Railway) until the Town of Orangeville purchased a 55 km stretch of the line that connects it with the CPR tracks in Mississauga.

The OBRY line is managed by the Orangeville Railway Development Corporation (ORDC) and serves a number of local industries through the Orangeville-Brampton Rail Access Group (OBRAG). OBRAG members include Geon Canada Inc., The Clorox Co. of Canada Ltd., Symplastics Ltd., Performance Packaging Inc., Vulsay Ltd., and Holmes Agro Ltd. The line is operated by a Manitoba-based company called Cando Contracting Ltd (Cando) on Tuesdays and Thursdays when it delivers resource materials to OBRAG members.

*Scanning Canada* is going to ride the rails to monitor the frequencies to be found alongside this short, but very scenic rail corridor. This month we start at the top of the line in Orangeville.

A search has not turned up any frequencies for the members of OBRAG except Clorox which can be found on 451.1875 and 464.6875 MHz. The following railway frequencies are licensed to Cando Contracting in Ontario: 151.055 160.665 160.935 160.965 161.115 161.415 and should reveal traffic on the line every Tuesday and Thursday!

The Orangeville area is an interesting target territory for its large community of scanner owners. Rooftops in the town reveal a larger than average number of scanning antennas. One home has four ground plane antennas and one discone on the roof. (If this is your home, we have to meet!)

#### Frequencies in the Orangeville Area

**Emergency Services:**
Province of Ontario (GMCO)
149.440 152.000 411.7375 419.4125
Town of Orangeville Police
142.830 (verified as still non-trunked analog)
Dufferin-Caledon Healthcare Corp
(Orangeville Hospital and Air Ambulance)
31.420 153.275 460.6875 465.8125 467.7750 467.8500 467.8750 467.9000
Town of Erin Fire and Emergency Services
141.330 150.100 153.770 154.070 154.130 154.160 158.640
Town of Orangeville Fire Department
148.655 151.385 154.070 154.130 154.370 154.800 158.955
Township of Adjala-Tosorontio Fire Department
158.235

**Municipal Services:**
(good monitoring during winter road maintenance):
Town of Orangeville Works Department
154.445 154.555
Township of Amaranth
159.120 163.860
Dufferin County Roads Dept, Township of East Garafraxa,
Township of Mono Roads Dept 163.860
Township of Adjala-Tosorontio
Roads Department 165.705
Town of Caledon
Roads Department 169.155 169.755
Regional Municipality of Peel
952.84375

**Utilities:**
Note that the old Ontario Hydro microwave repeater system has been dismantled, but at least two of the abandoned repeater stations remain in the Orangeville area.
Hydro One Networks Inc
49.170 72.420
Orangeville Hydro Limited
168.105
Ontario Power Generation Inc.
172.725 416.1375
Enbridge Gas Distribution Inc.
(Large transmitter tower in Orangeville)
451.8125 452.6375 452.9750 454.6375 456.8125 460.0125 464.1625 464.3125 943.4250

**Schools:**
Laidlaw Transit Ltd (School Buses)
167.415
Upper Grand District School Board
464.7375 464.9375

**Recreation:**
Hockley Valley Resort (Skiing/Golf)
172.980
Town of Orangeville Tony Rose Sports Centre (Hockey) 151.085
Tim Horton Donuts (Drive-thru)
30.580000 464.0125
Kentucky Fried Chicken (Drive-thru)
30.840000

**Amateur Radio Repeaters:**
VE3MAP 444.500/224.760, VE3ORX 444.025, VE3DRC 442.925

Next month our rail trip moves down the line as we follow the tracks down the Caledon Mountain past waterfalls and hairpin bends in the road, to the base of the Niagara Escarpment and into the Greater Toronto Area.

### ◆ Two Great Countries Divided by Two Megahertz

When two large nations like Canada and the United States share a common border, there will inevitably be situations in which the different radio regulations do not resolve a potential user conflict when it comes to frequency allocation. This column has discussed cross-border cooperation in recent months. This month we revisit the issue to discuss how Canada and the United States have resolved the different allocations for the 220-222 MHz sub-band.

In the United States, these frequencies are allocated to fixed and mobile services, while in Canada it is exclusively allocated to amateur radio use. Representatives of the two countries met as recently as 1999 to hammer out a policy for cooperation. The result is a rather convoluted and complex regulation affecting use of frequencies between 220 and 222 MHz. The intent is to avoid interference in the sub-band by restriction power levels and antenna heights in the border region.

The Canadian 220-225 MHz band is not particularly popular with hams and, in Ontario at least, repeaters are all near the top end of the band. So, if you are monitoring between 220 and 222 MHz, unless you hear ham callsigns being exchanged, you are probably hearing a cross-border transmission from a US station. *Scanning Canada* thanks reader Jerry None for prompting a discussion of this topic.

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# Oceanic Radiolocation: Weird Things Afloat

Some of the most mysterious noises on the radio come from the various locator devices used at sea. These tend to congregate on the low and high ends of the typical "short wave" radio dial. Let's look at a few:

## ❖ Medium-Wave Radionavigation

Radionavigation is defined as radiolocation (radar, to oversimplify slightly), and radiodetermination, which includes passive receivers obtaining positions with directional or phase information from fixed radio beacons. For medium-frequency (MF, 300 to 3000 kilohertz), we're talking mostly about the second case.

After LORAN (Long Range Navigation) departed 1800-2000 kilohertz (kHz) in the early '60s, this and surrounding spectrum saw newer systems like Sea-Fix, HydroTrac, Hi-Fix, and finally HyperFix. "HyperFix" refers to the "hyperbolic" grid formed by intersecting groundwaves from a "master" transmitter and a number of phased "slaves." It's very accurate, but of course it's rapidly losing out to the satellite-based Global Positioning System (GPS).

Until fairly recently, Hyperfix was offered by Racal on contract to offshore oil platform operators. This part of Racal, though, is now Thales Geosystems, and it's converting to differential GPS (DGPS). DGPS uses the precisely known position of a terrestrial receiver (the reference) to generate corrections in the user's DGPS-capable receiver (the rover). This improves accuracy to 1-2 meters, or even better. In the Thales version, called DeltaFix, MF radio beacons at the receive sites pass binary data over dedicated, two-frequency, diversity pairs.

DeltaFix beacons can sound a bit like teleprinting, although they are not. Remaining Hyperfix beacons repeat groups of continuous-wave beeps that are often mistaken for Morse code. The enhanced mode (Hy-Link) transmits additional information or even DGPS corrections in something sounding like frequency-shift keying.

Meanwhile, listeners all over the United States often pick up a "mystery" single-tone modem, with the distinctive short bursts of "packet radio" or the similar modes used by aircraft. A new one is on 1775.5 kHz, though others have been heard for years, all over North America. Whoever knows what they are is not talking.

## ❖ Fish Net Beacons

Other mysterious-sounding signals come from the radio buoys used on long fishlines or drift nets. A long line is a buoyed wire many miles long, with hanging hooks. It's come into favor as a means of discouraging the indiscriminate use of drift nets, which are also miles long and do greater harm to the environment.

Either setup is deployed and left to the winds and currents for a certain amount of time, then located again by use of standard radio direction finding (DF) gear. Lost equipment and catch is disastrous for the boat, not to mention the millions of sea creatures unnecessarily killed by long-lost "ghost" nets. These drift until full, then sink.

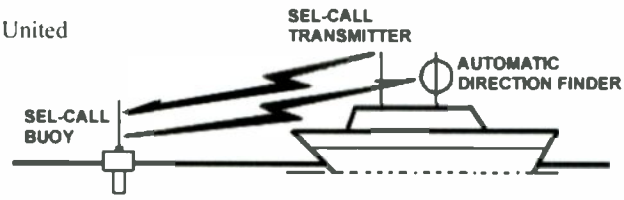
Any drifting fishing gear must therefore be marked by radio buoys. These are made mostly in Asia. They consist basically of a float weighted down by a watertight canister with batteries and electronics, topped by a waterproof whip antenna for medium-frequency or high-frequency (HF, 3 to 30 megahertz).

The simplest buoys endlessly repeat a 4-character Morse code identifier, using 8-10 watts in straight CW (continuous wave). Others transmit four minutes on and four off, to save batteries. Occasionally, Cyrillic Morse characters are heard, indicating Russian ownership.

These things can have a surprising range over salt water. Seagoing poachers were starting to DF buoys that weren't theirs, stealing the catch and equipment. Therefore, newer buoys use selective calling, known as "sel-call" in that industry. They listen before they squawk. The transmitters keep quiet until a special transmitter sends a field-programmed, encrypted code to turn them on.

Needless to say, we're also starting to see GPS receivers in these, too. They don't need DF'ing, because they broadcast their position, again using encryption. Signals sound nothing like Morse, but more like data telemetry.

Classically, these have always used the same radiolocation frequencies mentioned above. One manufacturer lists the following carrier frequencies (all kHz): 1715, 1981, 1985, 1989, 1735, 1982, 1986, 1755, 1983, 1987, 1775, 1984, and 1988.




However, there is another type of buoy, again mostly Asian, which is more likely to use frequencies above 28 megahertz, perhaps as high as 32 MHz. Most, though, seem to be right in the CW end of the 10-meter amateur band, from 28000 up to maybe 28420 kHz. Many send shorter Morse strings, and are mistaken for Russian single-letter markers or amateur propagation beacons.

These, too, can get out nicely over water, but also there's the skip problem when solar conditions allow. A few watts is plenty for global coverage with 10 meter skip, and these signals turn up regularly in the US, Australian, Japanese and European amateur bands, where they get written up as intruders by the ever-vigilant hams. Strange place, 10 meters.

## ❖ Correction Time!

One good thing about this column is how knowledgeable its readers are. When they spot mistakes, we all learn.

John Klos has written to say, quite correctly, that the "Big A" airline callsign mentioned in the November 2003 column is Arrow Air, a cargo-oriented carrier with scheduled freighters to New York, Miami, Central America, and South America. Their planes do indeed have a big "A" on their tails. It is not a military charter and has nothing to do with Kalitta-AIA (American International Airways), another freight line. A bit of a red face here, since of course it's correct in my own callsign file!

Ken, N4SO, wants to correct a frequency that appeared in the September 2003 Utility Logs. It was shown as 23523.0 kHz, for weather FAX from JMH, Tokyo, Japan. The licensed frequency is actually 23522.9. Of course, frequencies in the logs are provided by the person making the logging. While it's nice to hit the exact channel center, there are so many differences in radios, computers, off-frequency transmitters, and pesonal ears that differences of a tenth or so on FAX and digital modes are typically left unchanged. As usual in HF, your mileage will vary.

Keep finding good stuff, and see you next month.

# Utility World

# Utility Logs

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## ABBREVIATIONS USED IN THIS COLUMN

| | |
|---|---|
| AFB | Air Force Base |
| ALE | Automatic Link Establishment |
| AM | Amplitude Modulation |
| ARQ | Automatic Repeat Request teleprinting system |
| CAMSLANT | Communication Area Master Station, Atlantic |
| CAMSPAC | Communication Area Master Station, Pacific |
| Coq-8 | Coquelet, French teleprinting system |
| CW | Morse code telegraphy ("Continuous Wave") |
| DEA | US Drug Enforcement Administration |
| E3 | British "Lincolnshire Poacher," Cyprus |
| EAM | Emergency Action Message |
| EOC | Emergency Operations Center |
| FACSFAC | Fleet Area Control and Surveillance Facility |
| FAX | Radiofacsimile |
| FEC | Forward Error Correction teleprinting system |
| FEMA | US Federal Emergency Management Agency |
| HF-GCS | High-Frequency Global Communications System |
| JSTARS | Joint Surveillance Target Attack Radar System |
| LDOC | Long-Distance Operational Control |
| LSB | Lower Sideband |
| MARS | Military Affiliate Radio System |
| Meteo | Meteorological |
| MFA | Ministry of Foreign Affairs |
| NORAD | North American Aerospace Defense Command |
| PACTOR | Packet Teleprinting Over Radio |
| PR | Puerto Rico |
| RSA | Republic of South Africa |
| RTTY | Radio Teletype |
| SAM | Special Air Mission (Distinguished Visitors) |
| SITOR-A | Simplex Teleprinting Over Radio, ARQ mode |
| SITOR-B | Simplex Teleprinting Over Radio, FEC mode |
| TISCOM | Telecom & Information System Command |
| UK | United Kingdom |
| Unid | Unidentified |
| US | United States |
| USS | United States Ship |

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.

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301.0 "TH"-CW non-directional navigation beacon, Villacoublay Military Airport, France, at 2130. (Patrice Privat-France)

1677.0 OFK-Turku Radio, Finland, safety warnings in English and Finnish, at 2230. (Privat-France)

2252.0 "Y-4-Q"-US Navy, calling Giant Killer (FACSFAC, VA), at 2356. (Rick Baker-OH)

4014.0 ZRH-South African Navy, Silvermine, FAX weather chart at 1038. (Bob Hall-RSA)

4213.7 IDR2-Italian Navy, Rome, RTTY channel availability marker and marine safety warnings at 2128. (Hall-RSA)

4363.0 3AC-Monaco Radio, calling vessel FT2798, at 1959. (Privat-France)

4372.0 "N-6-V"-US Navy Link-16 coordination net with "E-2-W" and "U-7-S," at 0045. (Mark Cleary-SC) *[Improved version of Link-11 with greater throughput. -Hugh]*

4408.5 Unid-Passible French Navy, testing at 1955. (Privat-France)

4449.9 FDI8-French Air Force, Nice, CW marker at 1601. (Day Watson-UK)

4469.0 Southeast Region-Civil Air Patrol, calling Mockingbird 4 and 7, at 0100. (Perron-MD)

4555.2 DLVY-German Customs, vessel *Hamburg ZB*, calling Cuxhaven in SITOR-A, at 0745. (Privat-France)

4718.0 Kinloss Rescue-Air Rescue Coordination Center, Scotland, came from 5680 for Rescue 131, at 2309. (Baker-OH)

4721.0 Reach 1193-US Air Force Air Mobility Command, ALE-initiated patch to Hilda Meteo, (Scott AFB, IL), at 0147. (Cleary-SC)

4724.0 Offutt-US Air Force, Offutt AFB, NE, with a 28-character EAM, simulcast on 6739, 8992, 11175, and 11244, at 2215, again at 2218. Sigonella-US Air Force, Italy, with a 28-character EAM at 2230. Offutt, 22-character EAM, also 6739, 8992, 11175, and 11244, at 2233. Offutt, with Skyking broadcast, also 11175, at 2256. (Steve O'Connor-NJ)

4739.0 Tally 711-US Air Force, went to secure voice for "Salinas" (probably HF-GCS, PR), at 0046. (Baker-OH)

5367.0 FDI8-French Air Force, Nice, RTTY "voyez le brick" test loop at 1045. (Privat-France)

5680.0 Kinloss Rescue-Air Rescue Coordination Center, Scotland, working Rescue 137 at 2306. (Baker-OH)

5696.0 CAMSLANT, working "D-4-F" at 2231. (O'Connor-NJ) Rescue 2131-US Coast Guard, working CAMSLANT in a search, at 2343 (Baker-OH)

5708.0 Reach 631-US Air Force Air Mobility Command, ALE-initiated call to Scott AFB, IL, for a patch to Dover AFB, at 2258. (Cleary-SC)

5717.0 Halifax Military-Canadian Forces, setting radio guard with Rescue 306, secondary 6694, at 0105. (Baker-OH)

5732.0 Service Center-US Customs, diverting 15C to a sinking vessel, at 0022. (Cleary-SC)

6249.5 Golf Whiskey-US Navy, probably the USS George *Washington* battle group training in the Atlantic, working Golf Bravo at 2317. (Baker-OH)

6348.0 FUE-French Navy Brest, testing in RTTY at 1329. (Watson-UK)

6496.0 CFH-Canadian Forces, Halifax, NS, weather in RTTY, simulkeyed on 10536, at 2149. (Hall-RSA)

6697.0 Sea Spray-US military, with a 28-character EAM, simulcast on 8992 and 11244, at 1934. (Jeff Haverlah-TX)

6761.0 Gasser 40-US Air Force tanker, working Kansas 69 at 0013. (Baker-OH)

6800.0 6138-Possible Turkish intelligence, sounding in ALE at 1734. (Watson-UK)

6833.0 Unknown-US military, EAM from station with uncopyable trigraph identifier, on old US Navy Hicom (High Command) frequency, at 2258. (Haverlah-TX)

6834.0 GYA-UK Royal Navy, Northwood, with out-of-sync weather FAX for the middle east, at 1856. (Watson-UK)

6900.0 LECAIRE-French Embassy, Cairo, Egypt, working CER41, Paris MFA, in ALE at 1820 and 1825. (Watson-UK)

7527.0 Omaha 670-US Customs Service, working Service Center and Hammer (March ARB, CA), at 1418. (Cleary-SC)

7535.0 Norfolk SESEF-US Navy Ship Electronic Systems Evaluation Facility, VA, testing with USS Trenton at 1314. Norfolk SESEF, working the new USS *Ronald Reagan* (CVN-76), at 1427. (Baker-OH)

7633.0 Army Base-Unknown military, testing a data mode with Army Air on "channel 4," at 1815. (Perron-MD)

7635.0 Head CAP 45-Civil Air Patrol National Chaplains Net, working Head CAP 49, then giving daily devotional message, at 2200. (Perron-MD)

7646.0 DDH7-Hamburg Meteo, Germany, with RTTY weather and bulletins at 1012. (Watson-UK)

7740.0 AMMAN-French Embassy, Amman, Jordan, calling Abu Dhabi in ALE at 1734. AMMAN, calling CER41, Paris, ALE at 1808. (Watson-UK)

8060.0 PAR-Rockwell-Collins, Paris, France, sounding in ALE at 1653. (Watson-UK)

8298.0 VTP-Indian Navy, Vishakhapatnam, weather in RTTY at 2220. (Hall-RSA)

8475.0 RFVIE-French Navy, Le Port, RTTY test loop at 2153. (Hall-RSA)

8511.7 DAO-Kiel Radio, Germany, CW identifier in 3-tone PACTOR-III markers on a private KielMail channel, company web site lists channel center of 8511.9, at 1100. (Watson-UK)

8582.0 PWZ33-Brazil Navy, Rio de Janeiro, poor copy on RTTY weather and news in English, at 2130. (Watson-UK)

8731.0 KLB-Seattle Radio, WA, weather, simulcast on 8806 by WLO, at 0003. (Baker-OH)

8740.0 SVO-Olympia Radio, Greece, working a vessel then back to marker, at 0152. (Baker-OH)

8743.0 SVW42-Olympia Radio, Greece, voice synthesized traffic list at 2350. (Baker-OH)

8912.0 Foxtrot 12, working CAMSPAC and Service Center, at 2218. (Cleary-SC)
8971.0 Trident 42-US Navy, working Goldenhawk (Brunswick, ME) and Trident 21, at 0004. (Cleary-SC)
8983.0 Coast Guard 1503-US Coast Guard aircraft in Ecuador, working CAMSLANT at 0011. (Cleary-SC)
8992.0 Navy PJ 642-US Navy, patch via McClellan HF-GCS to Whidbey Island, WA, at 1202. Havoc 26-US Air Force, patch via McClellan for weather at Guantanamo Bay, at 1214. Leg 21-US P-3C, ops-normal patch via Andrews HF-GCS to Joint Interagency Task Force-South, at 2347. (Cleary-SC)
9025.0 CICLON-Mexican Army ("Cyclone"), calling HURACAN ("Hurricane"), in ALE at 0317. AED-US Air Force, Edwards AFB, CA, calling HIK, Hickam AFB, HI, at 1206. HURACAN calling CENTELLA ("Sparkles"), ALE at 1216. (Perron-MD) Foxtrot 40-Probably US Coast Guard, making ALE-initiated patch to Cape Cod Air after being diverted to a search-and-rescue, at 2226. (Cleary-SC)
9031.0 Ascot 836-UK Royal Air Force, working Architect (RAF Flight Watch), at 0900. (Privat-France)
9120.0 Navy 511-US Navy, patch via Andrews HF-GCS at 2114. (Cleary-SC)
9227.0 AAA-Israeli Air Force headquarters, sounding in ALE, then on 10614, both at 1328. (Watson-UK)
9987.3 Unid-Station calling F52HAC in PACTOR-I, at 1533. (Watson-UK)
10242.0 Coast Guard 1502-US Coast Guard, enroute to Ecuador, working Service Center at 2131. Coast Guard 1503, responding to distressed fishing vessel *Atlanta*, working CAMSPAC at 2227. (Cleary-SC)
10493.0 WGY 908-FEMA Region 8 and alternate net control, Denver, CO, simulcasting on 5211 LSB, working a MARS station in LSB, at 0030. (Hugh Stegman-CA)
10900.0 T8N-Unknown Moroccan station, working T2P in ALE, then calling K6T at 1205, 1327, and 1331. (Watson-UK)
11053.5 Golf Bravo-US Navy, net control with Golf Whiskey in the *George Washington* battle group training, at 0005. (Baker-OH)
11175.0 Base Run-US military, patch via Offutt to "Maintenance," at 2137. (Haverlah-TX) Reach 2018-US Air Force Air Mobility Command, calling Mainsail, raising Andrews for a radio check at 2221. (O'Connor-NJ) Turbo 16-US Air Force Reserve tanker, working HF-GCS Puerto Rico for an exercise message at 2337. (Baker-OH)
11220.0 Andrews-US Air Force, calling SAM 6638, a distinguished-visitor flight, at 2210. (Cleary-SC)
11232.0 Sentry 06-US Air Force Airborne Warning And Control System aircraft, patch via Trenton Military to Tinker AFB, OK, followed by Sentry 42 and Sentry 52, also AWACS, all starting at 1936. (Cleary-SC) Shado 64-US Air Force C-130, patch via Trenton to Kirtland AFB Meteo, at 2130. (Perron-MD)
11244.0 Offutt-US Air Force HF-GCS, NE, garbled messages to "all stations," then finally, "Emergency station securing operations, time 14[unintelligible]" at 1414. Fireship-US Strategic Command, three EAMs also on 8992 and 13155, and one minute of music, at 1617. Glassware-US military, kicking Sled Dog to Z320 (24828? nothing heard), and later Z280 (18387, nothing heard), starting at 2037. Clemency, relaying 4-character messages from stations with uncopyable calls to Skymaster, at 2255. (Haverlah-TX) *[All this weirdness sounds like the annual fall exercise. -Hugh]*
11250.0 Halifax Military-Canadian Forces, giving weather info to unheard aircraft at 1726. (Perron-MD)
11491.0 OC1-US Federal Bureau of Investigation, working DL1 (Dallas), in ALE at 1121. (Watson-UK)
11492.0 6138-Possible Turkish intelligence, ALE sounding at 1237, 1338, and 1438. (Watson-UK)
11494.0 Coast Guard 1503-US Coast Guard, patch via Service Center (US Customs) to Lantarea Command regarding distressed fishing vessel *Atlanta*, at 0115. (Cleary-SC)
11494.0 CS9-US Customs Service, possibly SC, ALE sounding at 0715, 0845, and 0930. (Privat-France)
12170.0 LECAIRE-French Embassy, Cairo, Egypt, calling Khartoum in ALE, at 1007. AMMAN-French Embassy, Amman, Jordan, working CER41, Paris MFA, in ALE at 1439. (Watson-UK)
12603.0 Lincolnshire Poacher-British intelligence "numbers" (E3), jingle and callup "14364," strong signal at 1805. (Privat-France)
12710.5 PWZ-Brazilian Navy, Rio de Janeiro, warnings and weather in Portuguese and fast RTTY (200/850), at 0420. (Hall-RSA)
12903.0 VTP1/5/7-Indian Navy, Bombay, RTTY test loop at 1626. (Hall-RSA)
13089.0 CAMSLANT-US Coast Guard, VA, radio checks with Cutter *Biscayne Bay*, at 2157. (Cleary-SC) CAMSPAC Point Reyes-US Coast Guard, CA, "Perfect Paul" synthesized weather voice at 2327. (Baker-OH)
13155.0 Geranium-US military, strange time-stamped message (not an EAM?), also on 8992 and 11244, at 0415. (Haverlah-TX)
13200.0 Evac 50237-US Air Force, patch via Puerto Rico HF-GCS to Andrews, at 0143. (Cleary-SC)
13257.0 Canforce 2211-Canadian Forces, working Trenton Military for weather, at 1745. (Cleary-SC)
13291.0 Gander-North Atlantic air route control, Canada, working Reach 698, a US Air Force C-5A, at 1438. (Perron-MD)
13330.0 Houston-Probably Houston Universal LDOC, working Big A 574 enroute to El Salvador, at 2214 (Perron-MD)
13370.0 GYU-UK Royal Navy, Gibraltar, RTTY test loop at 1635. (Watson-UK)
13375.0 Lincolnshire Poacher-British MI6/SIS "numbers" (E3), jingle and callup 59564, at 1705. (Privat-France)
13886.0 Unid-Moscow Meteo, clear FAX weather chart at 1615. (Hall-RSA)
13927.0 RAZOR 33-US Air Force E-8C JSTARS, patch via Air Force MARS station AFA3HS to Peachtree, Robins AFB, GA, at 1544. Corso 76-PR Air National Guard C-130, patch via Air Force MARS to Shaw AFB meteo, at 2255. (Cleary-SC)
14422.0 MAE-Algerian MFA, Algiers, calling GAO, Garoua, then passing a command string in ALE, at 1643. (Watson-UK)
14780.0 ERMRIO-Brazilian Navy, Rio de Janeiro, calling FBOSIS (Frigate *Bosisia*), also on 12370 and 15932, at 0118. (Perron-MD)
14842.0 PWZ33-Brazilian Navy, Rio de Janeiro, very slow PACTOR traffic in Portuguese, at 0940. (Hall-RSA)
16806.5 L2C-Argentine Coast Guard, Buenos Aires, SITOR-B marine safety warnings in Spanish, at 1000. (Hall-RSA)
16976.0 PWZ33-Brazilian Navy, Rio de Janeiro, RTTY marine safety warnings in English, at 0500. (Hall-RSA)
16984.0 PWZ33-Brazilian Navy, Rio de Janeiro, very slow PACTOR traffic in Portuguese, at 1805. (Hall-RSA)
17940.0 Iberia Operations-Iberia Airlines LDOC, working a flight in Spanish at 1733. Houston Radio-LDOC, working "3378" at 1738. (Perron-MD)
17988.0 NMC-US Coast Guard CAMSPAC, Pt. Reyes, CA, sounding in ALE at 1959. TISCOM-US Coast Guard, VA, sounding in ALE at 2001. (Perron-MD)
18223.7 kdakrfn-Egyptian MFA, Cairo, ARQ message in Arabic to many embassies, at 1640. (Hall-RSA)
18571.7 Unid-Tunis diplomatic, Tunisia, SITOR-B operator chatter and 5-letter code groups at 2031. (Hall-RSA)
19036.4 Unid-Algerian MFA, Algiers, exchanging Coq-8 messages with Dakar, Senegal, at 1003. (Watson-UK)
19066.7 Unid-Egyptian diplomatic, location unknown, poor copy on Arabic SITOR-A traffic at 1525. (Watson-UK)
19103.5 001-Probably US Navy, PR, sounding in ALE at 1435 and 1801. (Perron-MD)
19414.7 Unid-Egyptian MFA, Cairo, ARQ message to unknown station in Arabic, at 1619. (Hall-RSA)
20400.0 LLANOS-Venezuelan Navy vessel *Los Llanos*, calling vessel *Capano* in LSB ALE, at 1613. (Perron-MD)
21866.0 TX6-FEMA Texas State EOC, Austin, calling NM6, New Mexico EOC, in ALE at 1703. (Perron-MD)
23150.3 WPC-Sailmail, NJ, identifying in CW every 3 minutes during PACTOR-III markers, at 1448. (Watson-UK)

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# Receiver Matters

Prompted by a few letters to *Digital Digest* over the past few months, we turn our attention to the radios we use to listen to digital utility stations.

## Which Receiver's Best?

A letter from StormChaser in Alabama asks "Dear Mike, I am constantly intrigued by the amazing stations reported in *Monitoring Times*. In fact, I've finally resolved to spend my pennies for a receiver to start listening myself. There seem to be a lot of receivers to choose from and I'm bewildered by features like IF Shift, BWC, DSP and memories. What advice can you give for someone with a modest budget?"

StormChaser is quite correct in that today's receivers do seem to have an incredible array of wonderful features; many, as she/he points out, have very technical-sounding names. How can we unravel all of this and arrive at a good choice?

First, let's discount most scanners and consumer broadcast-oriented radios as unsuitable. Scanners, even wide band expensive models with HF coverage such as Yaesu's VR5000, do a relatively poor job at HF and are not well suited to the demands of digital utility listening. As in life, there is always an exception to the rule and in this case the Icom ICR8500 does a very good job at HF and VHF/UHF frequencies. Consumer models like Grundig's Yacht Boy series, while excellent for AM broadcast listening on the shortwave bands, are also generally poor for serious HF digital work.

For the time being, let's lay aside all of the amazing features that are made possible by today's microprocessor technology — DSP, memories, scanning, dual watch, priority channels, etc. Many are luxuries that we can often do without and which may indeed distract us from some more important features that tell us much about the basic performance of the radio.

Let's look at the four S's — sensitivity, selectivity, stability, steps — all of which are important in choosing a receiver for digital utility listening and which can usually be found by consulting the receiver's detailed specifications.

### Sensitivity

The first "S", sensitivity, is the measure of a receiver's ability to hear weak signals. Sensitivity used to be very important in times gone by, but now practically any modern HF receiver (once we've discounted those broadcast and wideband models mentioned earlier) has sufficient sensitivity for digital utility listening and this measure can therefore generally be counted upon to be fine for our purposes.

### Selectivity

Our second "S", selectivity, is the measure of a receiver's ability to discriminate between two signals that are close together in frequency. We frequently have to deal with this problem in listening to HF utility stations and need to isolate a single signal from other interfering or close-by transmissions. If the radio under consideration has a single filter, look for one with a final IF bandwidth of 2.4 kHz or less. Such a filter is wide enough to pass most high-speed digital signals like MIL-STD-188-110A and STANAG4285 and comfortable enough for voice listening while being narrow enough to decode most other systems when not close to other signals.

More expensive receivers will offer a selection of smaller bandwidth filters, as standard or as an option. Top-of-the-range radios will have either infinitely variable filters (like JRC's NRD545, which calls this feature BWC or Band Width Control) or offer a wide range of filter widths (like the WJ HF1000, Ten Tec RX340). If a selection of filters is available, a narrowest filter of 500 Hz width is ideal for listening to most narrow band signals like SITOR, PacTOR and CW.

### Stability

Our third "S", stability, is a measure of a receiver's ability to stay tuned accurately to the frequency of choosing and not drift as components warm-up or as external temperatures change. As with sensitivity, during the days of tube technology and in the early days of transistors, stability was a significant problem. Even today, the problem with many cheaper receivers is that they will drift appreciably and often move an accurately tuned signal out of the decoder's center frequency, rendering it unintelligible.

Look for receivers with a few parts per million (ppm) stability — the lower the better. Nowadays, a TCXO (Temperature Controlled Crystal Oscillator) is also a relatively inexpensive option for keeping a receiver rock-solid on-frequency.

### Steps

Finally, look for a receiver with minimum tuning steps of 50Hz or smaller. Any larger steps, if accompanied by an adjustable BFO (sometimes called a clarifier) is a good second-best. Tuning stuff accurately with anything less than this specification is a pain.

So, what do we find if we examine our choices among dedicated HF receivers that fit our first-pass criteria?

| | |
|---|---|
| Icom R75 | $550 |
| AOR7030 | $1,500 |
| Drake R88 | $1,500 |
| Icom R8500 | $1,450 |
| JRC NRD545 | $1,800 |
| TenTec RX350 | $1,200 |

Also, a number of amateur HF transceivers have excellent general coverage receivers and shouldn't be discounted for receive-only use:

| | |
|---|---|
| Icom IC718 | $450 |
| Icom IC746Pro | $1,350 |
| Yaesu FT847 | $1,550 |
| Kenwood TS570 | $1,100 |

Finally, for a real splurge, take a look at Ten Tec's semiprofessional RX340 for a cool $3950.

## Luxury Items

Now that we have examined our basic receiver criteria, let's briefly return to some of those technical-sounding "luxury" items that make the most sense from the standpoint of operating convenience:

### Memories

Most receivers nowadays offer storage and recall of at least a hundred or so favorite frequencies, together with operating mode and other receiver parameters.

### Scanning

It's useful to be able to scan memories listening for activity on known or favorite frequencies or to be able to scan from one dial frequency to another.

### Dual VFOs

We frequently swap between the "A" and "B" VFOs on our radio in order to quickly check two frequencies, determine whether each is carrying the same broadcast or for switching quickly between the "go" and "return" frequency on a duplex system.

### Automatic Notch

The automatic notch on our radio immediately identifies any annoying whistles close to the main receiver frequency and knocks them out.

Most, if not all, of the receivers listed above have these features and more. As you can no doubt see, the average price of a good, dedicated HF receiver equipped for serious digital listening is around $1250, with the Icom R75 the cheapest option by far with a price of around $550. As with any large purchase, though, our advice is to visit your local dealer or someone nearby that owns the radio and give it a thorough "test drive" yourself.

Next month, we will look at some of the best places to search for digital utility stations on the HF dial with your new radio. Until then, enjoy your listening and please keep the letters and e-mails coming.

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# Voice of Mediterranean Suddenly Closed

Anker Petersen, Denmark reports: Secretary General of the European DX Council Luigi Cobisi told me that the Managing Director of VOM, Richard Muscat, informed him that Libya no longer can support the VOM financially. From the website of the EDXC, **http://www.edxc.org** –

VOM, the shortwave radio station set up 20 years ago, is to close down on December 31 after the Libyan government informed Malta that "it no longer sees a function for this kind of station" – a joint venture between the Maltese and Libyan governments who each contribute (about $500,000) to keep it running. But the Libyan government's payments have not been regular for the past six years and it still owed about $2,758,700. We say: Malta really need a better partner for this; altho the transmissions via Italy and Russia were hard to hear in North America.

France Vossen on RVi *Radio World* reacts: "It's all very sad, especially for those who, like me, were in Malta for a Forum at the end of October, extremely well organized by the Voice of the Mediterranean. I do not think I have ever been so well received at any of the many stations I visited in my career. Warm, southern hospitality and generosity is how I would describe it."

Muscat was accused of wrongdoing, since the internet company running the VOM website employed his son; but auditing showed nothing untoward, notes Andy Sennitt in his *Media Network* blog. The webcasts closed quickly Nov 28, but SW continued for a while longer, perhaps until the end of 2003, say Alan Pennington and Dave Kenny, BDXC-UK and via Jean-Michel Aubier, France. More endangered stations: DENMARK, IRELAND, NETHERLANDS, SWITZERLAND, ZANZIBAR

***AUSTRALIA*** R. Australia waited until Nov 17 to revise its schedule for B-03; NAm morning listeners in the morning were shocked to find reliable 9580 closing at 1400, but it resumes at 1800. A new frequency next to it, 9590, runs from 0800 to 1600. In the 1600-1800 gap, perhaps useful in WNAm, are 5995, 6080 and with two transmitters, 7240; starting at 1700 are 9710 and 11880 (from a partial schedule via Ian Johnson, ARDXC)

R. Australia abruptly canceled *Feedback* in November; on the final edition, it was said to be getting too little response from primary targets As and Pac, and too much from NAm and Eu! Actually it was more about new media than a mailbag. A different show for listener contact only was predicted for early in 2004, at different times with a different sound (gh)

From 1 December, ARDS replaces our system with a 1/2 wavelength dipole array. This should give target area in Arnhem Land a good signal but people such as yourself will probably no longer hear our signal. Thanks for the audio clip (that was my voice) and I will send a postcard (we do not have QSL cards) to identify that you have received our signal (Dale Chesson, Media Services Manager, ARDS, Box 1671, Nhulunbuy NT 0881 **http://www.ards.com.au** via Walter (Volodya) Salmaniw, MD, Victoria, BC, *DX Listening Digest*) ARDS could hardly be more difficult to DX, but I daresay you can't control SW signals that precisely, so don't give up. It's on 5050v, best chance around 0900-1000 (gh)

***BHUTAN*** BBS increased airtime, opening 7 days a week on 6035 at 0100, a better chance for DXers to catch them! (Anker Petersen, DSWCI *DX Window*) Heard every night here from 0055 with gongs, fade around 0120, best in mid-winter (Giampiero Bernardini, Milano, Italy, *dxing.info*)

***BOLIVIA*** On 5952.47, Emisora Pio XII, 0948 a beautiful signal, reading lots of names between instrumental Andean music breaks, then reception literally smashed at 0957 by the triumphal +50dB overblaring trumpets of Family Radio on 5950, the perfect metaphor for the state of the world these days (Mark Mohrmann, VT, *World Of Radio*)

***CHINA*** [and non] CRI greatly expanded its relays via Canada for B-03, we have observed, lacking any specific info from CRI or RCI! 1100-1200 UTC on 5960 kHz with *Real Time Beijing*; 1300-1500 9755 and 13675; 2300-2400 6040 and 13680; 0100-0200 9790; 0400-0600 6190 and 9560. Cuban relays are also on other frequencies at some of the same times, but run a couple seconds behind, with poor modulation. Thanks for schedules and monitoring by Bob Thomas, Mick Delmage, Joe Hanlon, gh. In mid-Dec, we found 7405 again in use at 1400-1600, presumably direct, and clashing in the first hour with Martí and Cuban jamming. There are also additional CRI relays in Chinese via Canada, such as 1600 on 17735. If it were made public, the complete schedule would be shockingly long.

Meanwhile, European monitors, mainly Wolfgang Büschel, Noel Green and Dave Kenny, were hearing western classical music tests on numerous SW bands, which with the help of Victor Goonetilleke in Sri Lanka, were biangulated to a new site in extreme western China, Kashi, or Kashgar. Below 40°N latitude, and at 76°E longitude, it is further south than Ankara or Madrid, and further west than New Delhi. It's the most effective location within China for CRI broadcasts to Europe, the Middle East, and South Asia. CRI is expanding services, so more and more targets can hear it both in the local morning and evening. Test frequencies included 21850, 21730, 21460, 17480, 15730, 15670, 13860, 13625, 13570, 12065, 11940, 11640, 11460, 9410, 7010 (gh)

***COLOMBIA*** R. Súper, Cali, heard at 1045 not only on its MW fundamental 1199.93 but also on 2nd, 3rd and 4th harmonics with Mexican music: 2399.86, 3599.79, 4799.72. I could not trace the 5th harmonic (Björn Malm, Ecuador, *SWB América Latina*)

Strong signal varying around 10282 at 2355, clear ID for HJKS, La Voz del Llano, Villavicencio, perhaps harmonic from MW 1020 variable (Björn Malm, Quito, Ecuador, *SWB América Latina*) Not to be confused with XERMX, also varying around here. At first I thought it was the XERMX blobmitter, but peaking about 10315, extremely distorted screaming preacher until 2300, then Colombian national anthem, and commercial-sounding DJ show. Could be Llano. Next day at 2242-2334, was on 10325-10340 and also 10445, with RCN – Radio Cadena Nacional – IDs fitting Llano (Glenn Hauser, OK, *DXLD*) La Voz del Llano, 6113.02, at 1040, reactivated! Had not been heard for a long time near its nominal 6115. Stable with good sound quality but very weak. LLanera music and clear IDs, 1100 Colombian anthem (Björn Malm, Quito, Ecuador, *SWB América Latina*)

La Voz de Tu Conciencia is about to be authorized to operate on 5910 to avoid international interference on 6010, but this does not mean it will abandon 6010 completely, since mare than 500 solar-powered radios fix-tuned to that frequency have been distributed. 5910 will have a difference purpose. It's also negotiating to take over LV de la Pampa in Maicao, which would make it possible to apply for more frequencies in the 31m band (Rafael Rodríguez, Bogotá, Canexión *Digital*)

***COSTA RICA*** Must-reading on the RFPI website is a point-by-point rebuttal of UFP's position as expressed in a press release:

http://www.rfpi.org/UpazPR.pdf
http://www.rfpi.org/UpazPR.doc

James Latham estimated it would take less than $10,000 to put RFPI back on the air, covering upgrading the hydro plant to power the 10 kW transmitter at the new site, and initial building construction. This could be accomplished in 6 to 12 months. If 7445 cannot be licensed, frequency would likely be in the 6 MHz range. However, everything depends on: a) Obtaining partners who will make a long-term commitment. b) Obtaining a steady income that will sustain RFPI during and after reconstruction. The $10,000 figure does not include income needed for RFPI staff salaries, and other expenses, such as licensing (via Franklin Seiberling, *Copy Exchange* and *DXLD*)

A sad note: RFPI's mascot, Paz The Cat, disappeared about the time RFPI staff had to evacuate their building. So far searching for her has been to no avail; hope is that

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; B-03=winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

the cat found a new home, tho guards at UPaz have been known to shoot dogs in the area (James Latham, RFPI) Maurice Strong, Canadian environmentalist and diplomat, has won the Public Welfare Medal, from the National Academy of Sciences in the U.S., for his role in organizing global conferences (Tim Harper, *Toronto Star* via Carlos Coimbra, Ont.) Not for closing down RFPI ??

***CUBA*** Month after month, at least one SW transmitter here has been badly undermodulated, but emitting a constant squeal. Some of these affect Radio Habana itself, such as 9820; or the CRI relays, on 17720, 9790, for instance. Steve Waldee, retired radio transmitter engineer and audio processing specialist, San José, CA, analyzed the squeals and concluded they are most likely the result of a maladjused studio-transmitter link. Read (and hear) all about it at:

**http://home.earthlink.net/~srw-swling/RHC/index.html** (gh) I created a tiny URL for this; you should do this more often: **http://www.tinyurl.com/wsby** (George Thurman, TX, *DXLD*)

Bubble jamming heard at 2040-2130 on 13630 QRMing CRI via Mali in English; from Cuba? Why would they do that? (Mark Taylor, WI, *DXLD*) R. Martí was on 13630 in the A-03 season, but the *dentrocubanos* had not caught on yet that it moved away in B-03, so their good Chinese friends, who also jam, were getting jammed! Shhh, fewer jammers on a real Martí frequency. More under USA (gh)

Radio Martí boosted its news schedule Dec 1, so that each newscast lasts two hours instead of one, requiring rescheduling; *Cubanola* musical nostalgia moved to Sat 1800 on 17670, 15330, 13820, 11930 (Dino Bloisse, FL, *DXLD*)

***DENMARK*** Danmarks Radio planned to cease all SW broadcasts on 31 Dec. It broadcast only to Danish expatriates; says interest in SW service has been falling. From 15 Dec 2003, DR extended its Internet service by offering streams of all regional programs and national networks. And from 1 January 2004, Danish expatriates can subscribe to a free service offering a CD every 14 days containing 10-20 hours of radio programs (Andy Sennitt, *Media Network* blog)

WMR, World Music Radio's new offices and studio will be ready in January. New 10 kW SW transmitter expected late Jan and official relaunch planned for Feb on 5815, 15810, and Internet (**http://www.wmr.dk** via Dave Harries, England, *hard-core-dx*)

***ECUADOR*** Radio Centinela del Sur, Loja, reactivated, heard at 1055 on 4772.86 kHz, ex-4770.07. Very good strength, ads and local news (Björn Malm, Quito, *SWB América Latina*) Then shifted to 4773.6, sign-off around 0013 (Michael Schnitzer, Germany, *dxing.info*; Dave Valko, PA, *Cumbre DX*)

Radio Panamericána, Quero, MW 1589.27, also heard at 0100 on 2nd, 3rd and 4th harmonics, 3178.55, 4767.81, 6357.11. Was heard by a Swedish DXer years ago on 4767 (Björn Malm, Quito, *SWB América Latina*)

***FRANCE*** [non] RFI relays in English via Merlin B-03: 1200-1227 17815 Ascension 250 kW 027°; 1600-1657 9730 S Africa 250 kW 005°; 1600-1657 15160 S Africa 250 kW 328° (Observer, Bulgaria)

***GREECE*** VOG's *It's All Greek to Me* music show presented in English would have shifted to 1900 UT Sun on 17705 via Delano, but in Nov this was covered by sports, and *IAGTM* appeared instead Sun at 1105-1200, before the Delano relay on 9690 starts, but available direct on 15630, 11645 (John Babbis, *DXLD*) The only other weekly English hour on 17705, *Hellenes Around the World* is Sat at 1700, but also subject to preëmption by ball games (gh) Foreign language service, no longer called *Orientations*, 1200-1600 on 15650, 1600-2000 on 12105: many languages include direct relay of BBC news, and can be paralleled with BBC frequencies then on air. These include Arabic 1400 // 15180 13660, Russian 1500 off-line?, Romanian // 6050 at 1607, Turkish - 1656 // 5875, Serbian 1703 // 6050, Bulgarian off-line? at 1754, Albanian at 1801 (Noel Green, UK, *DXLD*)

***GUATEMALA*** R. Tezulutlán not heard at my receiver for years, although it is still listed in *PWBR* 2004 on 3370 and 4835. Anyone hearing them? (Hans Johnson, Naples FL, *Cumbredx*) Father Bernadine Ness, who lives in Cobán, reports that Radio Tezulutlán has abandoned HF in favor of FM. I have not heard them in Minnesota since the fall of 2002 (Mike Gorniak, *DXLD*)

***GUYANA*** Voice of Guyana, 3291.3 at 0945, strong. Color commentary of sporting event, not a rare catch, but sounds like it is 100% modulated again after a couple of years of very weak audio. Solid copy, with usual adjacent frequency interference (David Hodgson, TN, *DXLD*)

***IRAN*** Some English transmissions of VIRI are now called "Voice of Justice," such as 0130-0230 on 6120 and 9580 (Dave Kernick, UK, *DXLD*) They usually announce the wrong frequencies and/or times. 0130 also loud and clear in Moscow on 9580, not "9835 and 6035" (Sergei Sosedkin, Russia, *DXLD*) Payback for R. Farda? They certainly bumbled into it, with no publicity – and no doubt virtually no listenership in the US (gh)

0030 and 0130 broadcasts ID as The Voice of Justice; I listen not on SW but on satellite, T5/Ku 11830 MHz/SR 20781/H. Islamic orientation to the core, anti-Zionist; but American progressives frequently heard, such as Molly Ivins, Michael Moore; reading from Al Gore's lecture "Freedom and Security." Can't tell if announcers, especially on mailbag, are native or expatriates, but their English quite good; names given on air indicate former. What on earth is the world coming to when one of my favorite media outlets has become VIRI/VJ? – Recognizing that some of their utterances are deficient in credibility; a situation not unique to them (Loren Cox., Jr., KY, *DXLD*)

[non] Voice of Iran, in Farsi at 1630-1830 had been via France but B-03 moved to Tashkent, 100 kW, 256°, on 11520, very strong here but with spurs +/- 46v/92v/138v kHz. Shortly later moved again, to 7580, excellent, no spurs, unID site (Observer, Bulgaria)

***IRELAND*** [non] In late Nov and early Dec, instead of regular programming, RTE was running a loop asking SWLs to contact them at sw@rte.it for they were "reviewing" their SW services. Asked if we have internet or satellite radio access. Sounds like another station about to leave SW (Chris Campbell, OH, and Mick Delmage, AB, *DXLD*) Reply said: "the messages will inform our future SW strategy" (Lennie Kaye, Technical Operations Manager, RTE, via Kraig Krist, *DXLD*) Well, it has been just an automatic pickup of a certain half hour of the domestic service, not properly produced for SW (gh) Check if they're still to be heard at 0130 on 6155, 1000 on 15280, 1800 on 9850, 1830 on 13640, 21630 (via Observer, Bulgaria)

***KENYA*** KBC Nairobi, 4915, heard at 1830 in local language and Afro music, fading at times well over Ghana. Sign-off at 1905 after National Anthem (Jari Savolainen, Finland, *World of Radio*) The only active SW frequency in Kenya, M-F only at 0300-0700, 1300-1905 (Chris Greenway, *ibid.*)

***KUWAIT*** Some of R. Kuwait's English Programs, 0500-0800 on 15110 to S&SE Asia, Au & NZ; 1800-2100 on 11990 to Eu, NAm, CAm: 0505 and 1802 *The G.C.C. March* [= regional anthem? Gulf Coördination Council]; 0515 & 1815 *Islam The Religion of Truth & Justice;* 0600 & 1830 *News;* 0540 & 1900 *Kuwait Land of Prosperity;* 0615 & 1930 *Theatre in Kuwait;*2030 *Care of the Handicapped in Kuwait & Social Welfare*. Days of week not specified (R. Kuwait B-03 printed folder, via Richard Lemke, Alberta)

***KYRGYZSTAN*** Kyrgyz State Radio, on **http://www.ktr.kg** includes multilingual news block in Kyrgyz, Russian, English, M-F 0100-0120 and 0300-0320, on 4010, maybe also 4795 (Bernd Trutenau, Lithuania, *DXLD*)

***LAOS*** 7145 is back with the International Service: 1130 Thai, 1200 Vietnamese, 1230 Khmer, 1300 French, 1330-1400 English. Modulation a little weaker than before (Victor Goonetilleke, Sri Lanka, *BC-DX*) 6130, Lao National Radio, Vientiane, 1150-1215, light Asian music, 1158 "dreamy" Asian flutes and strings, several gongs similar to BBC hour chimes, all the same tone, brief presumed ID, then orchestral / flutes anthem, news (Roger Chambers, Utica, New York, *DXLD*)

***MÉXICO*** XERMX blobmitter one evening at 0040-0100 was on 10325, a huge blob of noise, not NBFM, blocking India on 10330 (Tim Hendel, AL, *DXLD*) At 1445 I found it at 10450-10475, yes, covering 25 kHz, and by 1500 had drifted down to 10435-10460. At least India 10330 was in the clear. Next day at 1512 check, the blob covered 10430-10445 or so, not so strong, only trashing 15 kHz. Another day at 1513 centered around 10355, fortunately far enough away from India 10330. Not to be confused with COLOMBIA, q.v. (Glenn Hauser, OK, *DXLD*) Very distorted classical and jazz around 0300 on 10359, tentatively XERMX (Björn Malm, Quito, Ecuador, *SWB América Latina*) More recently around 1400 in the 9425-9440 area (gh)

***MONGOLIA*** Domestic SW system was completed last summer with US$10 million from the Japanese government. Operates 2200-1600 with weather, news and Mongolian music, essential to nomadic people who move almost every week. There are three stations:

Ulaanbaatar, opened Sep 8, 2003. One 50 kW transmitter servicing E. Mongolia and metropolitan area on 7260, with alternate frequencies 4850 and 9590.

Altai, opened Aug 8, 2003. Two 10 kW transmitters servicing SW Mongolia on 4830, alternates 6170 & 9530.

Murun, opened Jul 26, 2003. Two 10 kW transmitters servicing NW Mongolia on 4895, alternates 6190 & 9560. Koji Yamada visited Mongolia and obtained this information (JSWC)

***NETHERLANDS*** In Nov and Dec, RN faced a series of threats from the government of further major cuts, coupled with bad press in newspapers such as *NRC Handelsblad*. Follow the ups and downs of this in postings in the archives of the Media Network blog **http://medianetwork.blogspot.com/** Examples:

"Radio Netherlands Director General Lodewijk Bouwens says that the organisation will do everything in its power to prevent the Dutch international service being destroyed by State Secretary Medy van der Laan." Andy Sennitt opines: "Radio Netherlands is being treated by this government as just another branch of domestic broadcasting, with no special consideration being given to the unique needs of an international broadcaster – high transmission costs, the need to maintain a 24 hour live news service, etc. Someone has to grasp the nettle and ensure that Radio Netherlands is not dismantled piece by piece like the broadcasting equivalent of Lego. That should be the Ministry of Foreign Affairs, where the guarantees of the long-term future of Radio Netherlands lie." And later:

"A full session of the Lower House of the Dutch parliament has adopted a motion requiring that State Secretary Medy van der Laan consult with the Ministries of Foreign and Economic Affairs concerning her proposals for further cuts in RN's budget from 2005, before bringing revised proposals before the House" (via gh)

***NEW ZEALAND*** RNZI sked revised 21 December, until 28 March: 1751 11980, 1951 15265, 2238 17675, 0400 15340, 0800 9885, 1100 15530, 1300 9870 (via Paul Ormandy, ZL4PW, *DXLD*)

***PARAGUAY*** A profile of ZP30, La Voz del Chaco Paraguayo, the Mennonite station on MW 610 in ten languages including English, mentions that it is "accessible" on 6884-USB, but this may mean for two-way contact rather than broadcasts, as it follows their phone numbers. **http://www.zp30.com.py/zp30/Espanol1.htm** (via Arnaldo Slaen, Argentina, *Conexión Digital*)

**PERÚ** R. Libertad, in the Cajamarca region, heard on 1999.26v at 1030, a sesqui-harmonic from 1332.85v, where also heard, starting *Alegría en Los Andes* (Björn Malm, Ecuador, *SWB América Latina*)

R. Uno, Chiclayo, quite good at 1115 on 2550v, drifting 2545 to 2560, 2 x 1280v, with religious program \\ R. Imperio, Chiclayo on 4386.6 and another day with birthday greetings and local IDs.

Radio Cielo, Chiclayo, 5628.80v, reactivated in mid-Dec; at 2355 ID, good signal but distorted audio (Björn Malm, Ecuador, *SWB América Latina*) 2 kHz lower next day at 1110, multiple IDs with echo, overmodulated and muffled (John Sgrulletta, NY, via Malm)

**ROMANIA** RRI *Letterbox* replied to a reception complaint that they are considering Sackville and/or other relay sites to improve reception in NAm (Kraig Krist, VA, *DXLD*)

**RWANDA** Since Slovakia quit 6055 after 1900, R. Rwanda has clear channel at 1912 in vernacular until close down at 2100 (Noel R. Green & Ray Browell, UK, *Cumbredx*)

**SLOVAKIA** RSI mothballed one of three transmitters Dec. 1, leaving these in English: 0100-0127 N/SAm 5930, 9440; 0700-0727 Au 13715 15460; 1730-1757 & 1930-1957 WEu 5915 7345 (*Observer*, Bulgaria)

**SOLOMON ISLANDS** I've returned from two weeks on Guadalcanal helping SIBC repair their 10 kW MF transmitter and getting 9545 back on air. I was working on restoring the 9545 daytime channel which, like 5020 will actually run 24 hours, so it should get across the Pacific from time to time. It will be 10 kW into a simple, low dipole at first; then I'll build a slightly more advanced four element collinear to optimise the azimuth and elevation patterns for the Solomon Islands. Site is about 12 km out of Honiara on an old military air field about half-mile from Bloody Ridge. Still signs of the war all about (Nigel Holmes, Radio Australia, via George Poppin, *World of Radio*)

**SOMALIA** R. Gaalkackyo has shifted back to its former frequency 6980 from 7335 which it had been using recently. A nice signal here in Nairobi, more-or-less on-channel and operating in DSB mode (Chris Greenway, Kenya, *World of Radio*)

**SUDAN** [non] 15530, Sudan R. Service, via Woofferton UK, *1500-1700*, opening and closing ID in six languages, address in Nairobi, news in English at 1515 and 1615; second hour may be a repeat (Anker Petersen, Denmark, *DSWCI DX Window*)

**SURINAME** R. Apintie reactivated, 4990, at 0210 with same DJ in English heard in the past (Dave Valko, PA, *Cumbre DX*) As early as 2230, as late as 0450, partly in Dutch, no official IDs on hour but in passing. Better than before and no longer off-frequency. Their old unit was a 50 watt Phillips to a 1000 watt Sunair amplifier (George Maroti NY, *Cumbre DX*) We are pleased to hear that our new Omnitronix 1000 watt transmitter is giving a better signal, on the air since 12 December at 500 watts for testing (Charles Vervuurt, R. Apintie, via Maroti, *Cumbredx*)

**SWEDEN/VIETNAM** R. Sweden reported in *MediaScan* that its 1300 Swedish broadcast to Asia on 9920 was being jammed by Vietnam, despite Sweden having given aid to Vietnam broadcasting! This was because FEBC Philippines has a service in Vietnamese minority languages also on 9920 until 1245, and the jammers were not being turned off promptly (gh)

**SWITZERLAND** Every time I open the envelope from swissinfo I feel a bit sad, remembering what a great station Swiss Radio International was (especially for Italians abroad, as Rai always suffered reception problems). Now these leaflets, mainly promoting **swissinfo.org** seem like casualty bulletins to me. Shortwave broadcasts will end for good in less than one year. But even satellite broadcasts are not in good shape, and SwissMix on Eutelsat HB3 for Europe and Worldspace for Asia, will disappear March 31 (Stefano Valianti, Southern European Report, Dec BDXC-UK *Communication*)

Swissinfo/SRI is expected to lose 35 out of a total of 147 full time jobs when the government reduces its annual subsidy from the current 18 million Swiss francs to just 5 million in 2005. From 2006 the subsidy is due to be removed completely. German, French, Italian and English services will be the worst hit, with little or no impact on other languages (Andy Sennitt, *Media Network* blog)

**TANGANYIKA** R. Tanzania, Dar es Salaam, 5050, real pleased to log this at 2031-2101*, talks and music, tentative ID, anthem at sign-off (Scott R. Barbour, Jr., NH, *DXLD*) see also ZANZIBAR

**TATARSTAN** The program *Tatarstan Dulkynynda* (*Na volne Tatarstana*), formerly Voice of Tatarstan, winter schedule: 0500-0600 and 0700-0800 on 15105, 0900-1000 on 11915. Considerable QRM at 0700-0730 from co-channel Romania in English (Dmitri Mezin, Kazan, *DSWCI DX Window*)

**TURKEY** At 2305 on 9655, a station seemingly in English but unless listening carefully, would take it for Chinese from the intonation, and slurred silibants! Wonder if the VOT announcer is really from China or that's just her peculiar way of expressiveness. Flutter fading added to the effect (Glenn Hauser, OK, *DXLD*)

**U S A** VOA is going to bombard Pakistan from January with 24-hour broadcasts made up mostly of pop American and Pakistani music, news, interviews and commentary. VOA is even going to change its name in an obvious effort to de-emphasise the fact that it is owned and operated by the US government. The new name for the jazzed up 24-hour service is *'Radio Aap Ki Dunya.'* Why Pakistan has been chosen for this special saturation-style coverage, no one at VOA is prepared to say.

Meanwhile, AFGE, Local 1812, the union representing many VOA employees, has lodged a strong protest at what it considers the dismantling of a service set up in 1942 as part of American public diplomacy. The Arabic service of the VOA has already been abolished and is now known as Radio Sawa, broadcasting music and light entertainment, and the Persian service goes out as Radio Farda. It also accuses VOA of shedding its universally known and recognized brand name. A union member said the White House has sent its "well-paid undertakers" to gradually kill VOA and bury it forever. Money saved will be spent on fueling the war machine.

Urdu would be on air from 0400 to 1600 UT on SW; 24-hour broadcasting was expected to start from January 1 on MW with the aid of a new transmitter the US has been able to establish in Tajikistan. Target audience of the pop-oriented programming is the age group 19-39. VOA has already hired seven relatively young people, all Pakistanis or of Pakistani origin, to convert the Urdu broadcasts into FM style musicals for round-the-clock broadcasting. Among those hired are Ms. Nafisa Hoodbhoy, sister of Pakistani physicist Dr. Pervez Hoodbhoy, as well as a former Radio Pakistan broadcaster Asad Nazir (Khalid Hasan, *Pakistan Daily Times* via Mike Terry) Aap *ki Dunyá* means "Your World" (Swopan Chakroborty, Kolkata, India; Jose Jacob, Hyderabad, India; Tim Hendel, AL, *DXLD*)

Worker unrest at the Voice of America — not just cutting English by 5 hours a day, but irradiating food, size of cubicles, etc.: **http://www.afge1812.org/** (gh)

Cuba is jamming not only R. Martí, heavily, but also VOA, at least lightly, since VOA has a show called *Ventana a Cuba*, daily at 0100-0130; bubble jamming is heard on all five frequencies, 9480, 9560, 9885, 11700, 11990. Trouble is, the jamming continues after 0130, marring VOA's Spanish service to all the Americas for another half hour, and may even stay on later blocking other broadcasters such as RKI via Canada in English at 0200 on 9560 (gh, John Carver, IN)

The two 100 kW transmitters (one for KVOH) purchased from FEBA Seychelles arrived in mid-Dec. They are huge, industrial requiring massive water pipes and everything. It will be quite some time before we get them on the air (Morgan Freeman, WJCR, *World of Radio*)

WBCQ, 5105.2, put out a slightly distorted, wobbly spur on 4846.6v at 0330-0400+ (Brian Alexander, PA, Mechanicsburg PA, *DXLD*)

WWCR has a new two-hour musical program in Tamil, *Ragam*, Sun 1300-1500 on 12160. It was on the Dec schedule, but expected to start in Jan (gh)

WWRB is testing on various frequencies and times full digital broadcasting. The AOR ARD 9800 on the market for $500 or less can decode the WWRB digital signal. WWRB is testing full carrier AM, also SSB. The upper sideband will be analog with the lower side band digital. WWRB is seeking individuals to help evaluate this mode. Please contact WWRB via our web page E mail button. We are using an AOR 9800 Encoder to produce the digital signal. This off the shelf today technology is very inexpensive, easily obtained requiring no modifications to shortwave radios in the field. It is plug and play; Requires 12 volts DC + headphone audio; check it out at **http://www.aorusa.com** This could be a very exciting mode of operation for Hams and SWLs and Content listeners. Our transmitters can produce 600 kW peak pulse power at 80 percent duty cycle, so we can produce a very potent digital pulse signal. A ham buddy in Oklahoma City heard us loud and clear, no static and full quieting, on 6890 (Dave Frantz, WWRB, *DXLD*) Not to be confused with DRM (gh)

Full DRM membership is or was $10,000 per year. Associate membership is free, if you qualify. The NASB has been an associate member for years, and we pay nothing. Furthermore, DRM is non-proprietary and there are no license fees as far as I am aware. There are three or four NASB members (including WRMI) that are actually interested in transmitting in DRM from their own facilities, and we are working with the FCC to establish some technical standards and administrative procedures. One of the big drawbacks is the cost of the few DRM exciters that are available commercially to convert analog transmitters. But there could be more competition in the near future and perhaps lower costs, and some stations might even be able to build their own. The next couple of years could be very interesting (Jeff White, WRMI/NASB, *DXLD*)

**VENEZUELA** [non] *Aló, Presidente* Sundays from 1400 or later, via Cuba heard on five frequencies matching those on RHC website: 11670, with heavy co-channel at first; 11875, 13680; best on 13750 and 17750 (gh)

**VIETNAM** [non] Voice of Khmer Kampuchea-Krom in Khmer: 1400-1500 Tuesdays on 11550, Vladivostok 250 kW, 230° (*Observer*, Bulgaria) This placement is not a mistake: it's for Cambodians in Vietnam

**ZANZIBAR** No trace of 11734, normally a nightly guest (Wolfgang Büschel and Thorsten Hallmann, Germany, late Nov, *BC-DX*) Zanzibar not heard here in several days on 11734.1 (Steve Lare, MI, *DXLD*) I can confirm that Zanzibar does indeed seem to be off the air on 11734. Nothing heard on that frequency here in Nairobi. Still going on 585 MW. But 6015 is missing too (Chris Greenway, Kenya, *DXLD*)

**ZIMBABWE** ZBC is now on 6045, apparently a move from 5975. Rather a weak signal, not nearly as good as nearby Zambia on 6165 (Chris Greenway, Nairobi, *World of Radio*) Besides spending gigadollars-Z to monitor and censor the Internet, Pres. Mugabe plans to start a 24-hour propaganda SW service (*Media Network* blog)

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

# Global Forum

# Broadcast Logs

*Gayle Van Horn*
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**0013 UTC on 2390**
MEXICO: Radio Huayacocotla. Spanish news items to banda music. Station identification at 0025. SINPO 24332. (George Maroti, NY/ NASWA Flash Sheet).

**0045 UTC on 4985**
BRAZIL: Radio Brasil. Portuguese news text to lively Braz pops. Brazilian's audible, **Radio Difusora Roraima** 4875, 0258 (Stewart MacKenzie, Huntington Beach, CA). **Radio Aparecida** 9630, 2102-2115 (Arnaldo Slaen, Buenos Aires, Argentina) **Radio Rural** 4765, 0113-0122 (Scott Barbour, Interval, NH/HCDX) **Radio Aparecida** 6135, 2255-2302+. (Harold Frodge, Midland, MI) **Radio Nova Visao** 11735, 0855-0925. (Rich D'Angelo, PA/NASWA Flash Sheet) **Radio Guaruja Paulista** 5045, 0750. (Jerry Berg, MA/DX Window)

**0130 UTC on 5055**
COSTA RICA: Faro del Caribe. Poor to weak signal at tune-in. Discernible ID to religious text. (Tom Banks, Dallas, TX) **Radio Exterior de Espana**, Costa Rican relay 3350, 0534-0601*. (Frodge, MI)

**0223 UTC on 4780**
GUATEMALA: Radio Coatan. Music program of soft vocals and Spanish talk by male with IDs. Closedown identification to "echo-effect" sign-off announcements at 0238, accompanied by instrumental music at 0240. No national anthem. Poor to fair signal. (D'Angelo, PA/NASWA) **Radio Verdad** 4052.53, 1122; **Radio Kekchi** 4844.94, 1230-1240; **Radio Cultural** 4780, 1235-1240. (Robert Wilkner, Popano Beach, FL/ HCDX)

**0305 UTC on 5070**
USA: WWCR. Bob Padula's EDXP program, followed by *Real Living* with Allan at 0317. DRM and DAB news updates; 15825, 2059-2158. 9475 freq shift to interval signal and Spanish identification. **WRMI** 7385, 0330; **AFRTS** 5446, 0107; **WINB** 9320, 0230. (MacKenzie, CA)

**0308 UTC on 4250.8**
CLANDESTINE: Voice of Strugglers of Iranian Kurdistan. Symphonic music to Kurdish ID, "aira Khabati Kurdistani Irana." Political talk about Iran to brief talk. Farsi identification at 0343 and talk. Additional Clandestine's observed; **Voice of Komala** 3928.3, *0326-0440 Kurdish; **Voice of Iranian Revolution** 3880.6, *0330-0340 Kurdish; **Voice of Iranian Kurdistan** 3970, 0330 Kurdish; **Voice of the People of Kurdistan** 4025.8, 0345-0410; **Voice of the Conservative Party of Kurdistan**. (Anker Petersen, Denmark/DX Window)

**0320 UTC on 4800**
LESOTHO: Radio Lesotho. Fair audio level during local talk in presumed Sesotho. Regional music and announcements to clear station identification. Heard on subsequent evenings. (Banks, TX; Van Horn, NC)

**0340 UTC on 4949.98**
ANGOLA: Radio Nacional. All nite-program of easy-listening music. Station ID at 0400 to brief Portuguese local news items and magazine format program. Signal best at tune-in but still solid and in the clear at 0420. (Al Quaglieri, NY/DX Window)

**0523 UTC on 3279.55**
ECUADOR: La Voz del Napo. Spanish Catholic mass with muted male announcer at 0530. (Frodge, MI)

**0616 UTC on 6139.82**
COLOMBIA; Radio Melodia. Spanish text to musical program. Station identifications for shortwave and AM freqs. Best to monitor in LSB. (Nicholas Eramo, ARG/HCDX) Colombian, **LV del Guaviare** 6035, 1026-1039. (Barbour, NH/HCDX)

**0840 UTC on 5906.19**
PERU: Radio Melodia. Spanish. Tecnocumbias tunes to "Melodia en los Andes" ID. Local time check and public service announcement. SINPO 34333; **Radio Altura** 6479.45, 0000-0012 (Slaen, ARG) **Radio Imperio** 4386.7, 1015 Spanish text presumed to be religious, 1025 identification. (Frank Hillton, Charleston, SC) **Radio Victoria** 6020.2, 0206-0235. (D'Angelo, PA/NASWA) **Radio Libertad** 5039.26, 1030 identification. (Wilkner, FL/HCDX)

**1245 UTC on 15390**
AUSTRALIA: HCJB, Kunnunura. English commentary at tune-in. Contemporary religious music to "HCJB Voice of the Great Southland" identification. Poor to fair signal quality amid deep fades. (Steven Vincent, Omaha, NE)

**1503 UTC on 21500**
CHILE: Christian Voice: Portuguese DX program, Altas Ondas. Announcer's mentian of Dxer Claudio Rotolo de Moraes from Florianopolis, Brazil. SINPO 44444. (Slaen, ARG) 21500, 1748-1802+. (Frodge, MI) 21500, 1933 (MacKenzie, CA) Chile's **Radio Parinacota** 6010, 0840-0850. (Slaen, ARG)

**1639 UTC on 7385**
TIBET: Xizang PBS, Lhasa. English/Tibetan talks on extended schedule. SINPO 43433, heard // 4905, 4920, 6110, 5240. Chinese service 4820, 1645-1656 with All India Radio noted underneath. (Petersen, DNK/DX Window) **Xizang PBS, Urumqi** 4480, 1707-1721 Chinese // 5060. (Carlos Goncallves, Portugal, DX Window; Barbour, NH/NASWA) **Xinzang PBS, Lhasa** 4920, 2340. (Slaen, ARG)

**1730 UTC on 21470**
ASCENSION ISLANDS: BBC relay. Press Review & Focus segment with African items of interest. Public service announcements to BBC identification and sports roundup. (Frodge, MI) Audible 17885, 1950, // 15105; 17830, 2000, // 15400. (MacKenzie, CA)

**1802 UTC on 21645**
FRENCH GUINEA: Radio France Int'l relay. Spanish new to 1809. Sports update and "RFI" identification into *En Focus* commentary on Venezuelan President Chavez. Weak signal and rumble interferences. (Frodge, MI)

**1910 UTC on 9525**
SWAZILAND: TWR. English/Vernaculars. Station Ids with mention of Swaziland to religious sermon segment and gospel hymns. Fair signal quality. (Banks, TX) 7235, 2214-2227*. (D/Angelo, PA/NASWA)

**1925 UTC on 9535**
THAILAND: Radio Thailand. Announcer's talk to south east Asian instrumentals. Various program sound bites and economic updates. Poor signal qualiy with rough copy. (Barbour NH/HCDX)

**1942 UTC on 17895**
MOROCCO: VOA relay. Interview with artist *Earth, Wind and Fire* about their classic tunes, // 15240, // 15580 via Greenville, NC. (MacKenzie, CA)

**1955 UTC on 13735**
SAO TOME: VOA. French service including soul/blues tunes. Station ID at 2000, followed by jazz selections. SIO 353+; 6035, 2217-2221+ English. (Frodge, MI)

**2000 UTC on 17895**
BOTSWANA: VOA relay. Time check, to identification for African Service. Report on Liberia to news update. (William McGuire, Cheverly, MD)

**2020 UTC on 17735**
RWANDA: Deutsche Welle relay. Two announcer's Portuguese chat to DW identification at 2021, // **Rwanda** 9875 German, 13,780, 2325, // 17860, // 11955 **Antigua**, 11690 **Canada**, 9545 **Germany**. (MacKenzie, CA)

**2054 UTC on 15110**
SPAIN: Radio Exterior de Espana. Spanish text to ID, followed rock tunes. (MacKenzie, CA)

**2105 UTC on 11760**
CUBA: Radio Habana. Newscast at tune-in to sports roundup. Station ID to *DXers Unlimited* by Arnie Coro. French service 9505 at 2130. (Sam Wright, Biloxi, MS) Cuba's **Radio Rebelde** 5025, 0053 with Cuban music and Spanish text. (MacKenzie, CA).

**2300 UTC on 6165**
BONAIRE: AWR. Spanish musical jingles to ID "Radio Mundial Adventista." Program, *Hogar Feliz* with councils for the family. (Slean, ARG)

**2316 UTC on 4845**
MAURITANIA: Radio Mauritanie. Arabic news and commentary including items on Iraq and Saudi Arabia. Recitations 2321-2333. Signal weak with utility QRM. (Frodge, MI) Audible 0037 and 0253 with extended Ramadan programming. (MacKenzie, CA)

**2330 UTC on 11690**
CANADA: Deutshe Welle relay. German service including IDs and national news, to topics covering Africa. (McGuire, MD)

*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.*

*Gayle Van Horn*
*gaylevanhorn@monitoringtimes.com*

# More Holiday QSLing

So, how did your National Holiday DXing for January go? In February, we celebrate President's Day on the 16th to honor President's Lincoln and Washington. The carnivale season kicks off this month. Look for stations from the Caribbean and Brazil to extend their broadcast hours, for their respective rivalry, anytime from the 20th. Tuesday, the 24th, is Mardi Gras Day (Fat Tuesday) in New Orleans, Louisiana. Coverage begins early on WWL 870 kHz AM from host, Bob Del Giorno. Don't miss this day-long madness!

Don't forget to check these worldwide February holidays for DXing opportunities on amateur, medium wave and shortwave frequencies.

Sri Lanka Independence Day, Feb. 4
New Zealand Waitangi Day, Feb. 6
Tokelau Waitangi Day, Feb. 6
Grenada Independence Day, Feb. 7
Iran Revolution Day, Feb. 11
Lithuania Independence Day, Feb. 16 (from Austria, Germany, Prussian and Russian occupation)
Gambia Independence Day, Feb. 18
St. Lucia Independence Day, Feb. 22
Guyana Republic Day, Feb. 23
Estonia Independence, Feb. 24 (from Soviet Russia)
Kuwait National Day, Feb. 25
Dominican Republic Independence Day, Feb. 27

**AMATEUR RADIO**

Cayman Islands (Grand Cayman)-ZF2AH, 20 meters SSB. William AWild Bill@ Beyer N2WB, DXpedition. Full data phata card received in 33 days via Joe Hypnarowski-W6VNR, 3785 Mt. Blackburn Avenue, San Diego, CA 92111. (Larry Van Horn, NC)

Chesterfield Islands-TX0AT, 20 meters SSB. Full data phata card received in six months for twa US dallars, plus a Eura nested envelape. Received via QSL Manager Alessio Rama-IZ0CKJ, Sterpara 43, 03023 Ceccana, Italy. DX#166. (Van Harn, NC)

Montserrat (NA-103)-VP2MWB, 17 meters SSB. William AWild Bill@ Beyer N2WB, DXpedition. Full data color card received in 20 days via Robert W. Schenck-QSL Manager-N2OO, P.O. Box 345, Tuckerton, NJ 08087. (Van Horn, NC)

Montserrat (NA-103)-VP2MDO, 10 meters SSB Robert Adamitis, K9MDO, DXpedition, 10 meters SSB. Received in 36 days via Jack Nienhaus-, W9NJB-QSL Manager. 5045 Oak Center Drive, Oak Lawn, IL 60453. 10 meter country # 146. (Van Horn, NC)

**AUSTRIA**

FEBA Radio via Moosbrunn, 9465 kHz. Full data card signed by Mike Proctor, plus station sticker. Card notes, AThis is a legacy Seychelles QSL card, sent with the compliments of FEBA=s Spotlight program Production Department. With the closure of Seychelles, we no longer have a QSL Secretary.@ Received in 14 days for an English report. The postal address for the Spotlight Production office is: P.O. Box 57000, Limassol CY-3509, Cyprus. Email: se@feba.org.cy. (Rich D=Angelo, PA/Cumbre DX)

**BELARUS**

Radio Minsk, 7210 kHz. Full data handwritten QSL folder, stamped and signed by Stas Lokush-Editor, plus souvenir postcard and station sticker. Received in eight weeks for a taped report, souvenir postcard and one IRC. Station address: Chryvouaya Str. 4, Minsk 220807 Belarus. (Ben Loveless WB9FJO, MI)

**DOMINICAN REPUBLIC**

Radio Amanecer, 6025 kHz. Full data verificotion letter signed by Lic. German Lorenzo-General Manager. Received in six months for a Spanish report. Station address: Apartado 1500, Santo Domingo, Dominican Republica Dominicana. (Arnaldo Slaen, Buenos Aires, Argentina)

**ISRAEL**

Kol Israel (kHz?). No data letter from Sylvio Rapoport-English News, which stated, AUnfortunately your report connot be verified because our engineers no longer use listeners reports.@ However, the enclosed station card noted AYaur report has been checked and agrees with our log.@ Received in ane manth for an English report and ane US dallar (returned). Station address: P.O. Box 1082, Jerusalem, 91010 Israel. (Brian Rogers, Melvindale, MI) *Interesting concept, saunds like the left hand daesn=t knaw what the right hand is daing. This will keep DXers tatally confused! - GVH*

**JAPAN**

Radio Tampa, 6055 kHz. Full data globe/music sheet card unsigned. Received in 13 days for a taped repart and twa IRCs. Station address: 9-15 Akasaka 1-chome, Minato-ku, Tokyo 107-8373, Japan. (Bill Wilkins, Springfield, MO)

**MEDIUM WAVE**

KBSU, 730 kHz AM. Full data card signed by Steven B. Johnston-Director of Engineering, plus personal letter and station sticker. Received in eight days for an AM report. Station address: KBSU-Boise State University, 1910 University Drive, Boise, ID 83725-1915. (Patrick Martin, Seaside, OR)

KEZX, 730 kHz AM. Full data verification letter signed by Sam Wallington-Director of Engineering. Received in 23 days for an AM report. Station address: EMF Broadcasting, 5700 West Oaks Blvd., Rocklin, CA 95765. (Martin, OR)

KKOB, 770 kHz AM. Full data verification letter signed by Mike Langner-Chief Engineer. Received in 12 days for an AM report. Station address: 500 Faurth St., N.W., Albuquerque, NM 87102-2102. (Patrick Griffith, N0NNK, Westminster, CO)

KMMZ, 1640 kHz AM. Nice verification letter from Hiram Champlin-Owner. Received in seven days for an AM report. Noted they are still in the testing mode at 10,00 watts day and 1,000 watts night. Very pleased with thisl Station address: 316 E. Willow, P.O. Box 952, Enid, OK 73702. (Martin, OR)

WRLL, 1690 kHz AM. Full data QSL card from *Real Oldies 1690*, signed by Len O=Kelly KB9ZCX. Received in 16 days for a taped report. Station address: Cleor Channel Communications Chicago, 233 N. Michigan Avenue # 2800, Chicago, IL 60601. Website: **http://www.realoldies1690.com**. (Loveless, MI) *Ben, I was listening to this station=s online audia link while I typed this column...great oldies! - GVH*

**PIRATE**

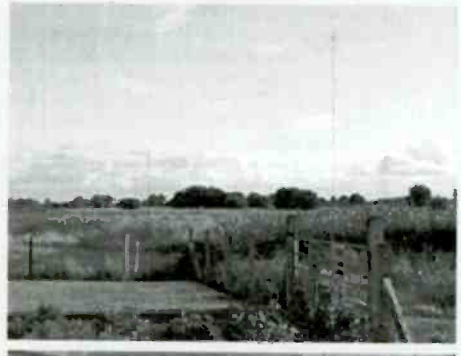
Argentina, Radio Bosques, 6192.73 kHz. Full data card unsigned. Received in 27 days for an email report to radiobosques@yahoo.com.ar. (Nicholas Eramo, Buenos Aires, Argentina/HCDX)

KIPM, 6950 kHz. Full data glossy photo quality Golden Age of *KIPM* certificate, signed by AMax.@ Received in three months. QSL maildrop: P.O. Box 69, Elkhorn, NE 68022. (John Wilkins, Wheat Ridge, CO/Cumbre DX)

**UTILITY**

Ireland; Shannon VOLMET, 5505 kHz SSB. Full data card signed by Denis Cannolly-Operations Manager, plus station brochure. Received in 20 days for a taped utility report and ane IRC. Station address: Irish Aviation Authority, Shannon Aeradia, Ballygirreen, Newmarket-an-Fergus, Co. Clare, Republic of Ireland. Website: **http://www.iaa.ie** (Laveless, MI)

USA; WLO, 8731 kHz SSB. Full data color computer-generated QSL card, unsigned. Received in two weeks for a utility report, one US dollar and address label (used for reply). Station address: LLC/WLO, 7700 Rinla Avenue, Mobile, AL 36619. (Wilkins, MO) *Bill says he=s been trying for five years ta verify WLO. Congrats! - GVH.*



*Shannon Aeradio courtesy of Irish Aviation Authority*

*John Figliozzi*
*johnfigliozzi@monitoringtimes.com*

# Culture and the Arts

One of the key attractions of listening to international radio is the opportunity to gain insight into other cultures. "The Arts" serve as a window into cultures, for artists – whatever their chosen medium – seek to bring greater awareness to life as it is lived in each of its unique experiences.

Several international radio stations offer excellent arts and cultural programs. This month's column provides a small survey.

*[Refer to the time and frequency section of MT's Shortwave Guide. Times in bold are direct shortwave transmissions; those in italics are to other regions but may offer reception here. All programs are also available via live stream and on-demand from the station web sites.]*

**Spotlight**
**R. Canada Int.**
***S/W 2132,*** M/H 0232
**http://www.rcinet.ca**

One of the bright spots lately within international broadcasting has been the quiet revival of sorts taking place at *Radio Canada International*. *RCI* seems to be finding itself again, reincarnating the station as the place to go to for information about Canada across a wide spectrum of experiences.

One of these experiences is the arts, and **Spotlight** is the weekly *RCI* program that places a keen watch on Canadian culture and the artists and artistic performances that seek to illuminate it.

The *RCI* web site lists Marc Montgomery as the host of the program; but over the last few weeks I've been listening (in December as this is written), Carmel Kilkenny has been the presenter. Both do a fine job moving the program along and bridging the various segments, although I prefer Kilkenny's more traditional, low key style.

*Spotlight* uses a well-balanced mix (in-house productions, as well as items prepared by the domestic *CBC*) of interviews, reports and discussions to illuminate Canadian literature, visual arts, cultural traditions, music, theatre and cinema. A nice touch to this weekly program is a global calendar of events highlighting where Canadian artists are performing or cultural events are being held around the world.

The uninitiated quickly learn that Canada has a pervasive, though much understated, role in the arts internationally – and this includes in the U.S. – that belies the country's small population.

**The Ticket**
***BBC World Service***
M 0206 **(Americas stream)**
***A 1106* (E. Asia); *A 1806* (E. Africa); *A 2106* (W. Africa)**
**http://www.bbcworldservice.com**

If the previous program has a strictly provincial view, **The Ticket** has a sharply contrasting worldwide one.

Mark Coles presents an omnibus arts program that literally travels the globe and actively pursues the arts from all cultural perspectives. Each week, this hour features a big name interview, a live performance, reviews of the latest cinema releases from Hollywood, Bollywood and everywhere in-between, a quiz and reports from a band of regular cultural reporters scattered among the continents

This is a very pleasant, fast moving and accessible program that effectively mixes coverage of the popular arts with the more sophisticated, (for want of a better term) "higher" cultural activities that used to be the sole staple of *BBC* arts programs. By way of illustration, a December program interviewed author Amy Tan about her new memoirs; carried a report on the re-opening of *La Fenice*, a Venice opera house which burnt to the ground in 1996; included a live performance by Spanish musicians *Radio Tarifa*; and took a look at the work of Kyoichi Tsuzuki, a Japanese photographer with a penchant for snapping fashion-mad monks. The weekly screen section reviewed the final part of the *Lord of the Rings* trilogy – *The Return of the King*, and described the re-emergence of the Afghan film industry with a powerful new movie about a girl who disguises herself as a boy in order to go to school.

**The Ticket** is one of the "new breed" of *BBC World Service* programs. It is far and away the best of all of them to date.

**Spectrum**
***R. Sweden***
A 1330, 1430; S 0230, 0330
***(fortnightly, 1st & 3rd weekends of the month)***
**http://www.sr.se/rs/**

Of all the international broadcasters, *Radio Sweden* may be the most underappreciated and unrecognized. Its consistently crisp, smart and well-produced programming always provides the listener a pleasant and informative half-hour and this record is just as keenly on display in its bi-weekly arts program, **Spectrum**.

Longtime *Radio Sweden* producer and presenter Bill Schiller covers the cultural scene in Sweden. Drawing on activities, events and personalities in Swedish theatre, film, art, literature and music, Schiller mixes interviews, documentaries, reports and soundscapes that show just how vibrant the arts are in Stockholm, Sweden's other cities and regions and – on occasion – different corners of Scandinavia.

**Arts on the Air**
**Deutsche Welle**
***T 0530, 1030, 1930, 2130, 2330***
**http://www.dw-world.de**

This finely crafted magazine-style program's brief is the European arts scene, but its first focus is on the arts in Germany. Whether it's the Berlin Film Festival or Bayreuth's Wagner Festival, the listener can count on full coverage from a variety of perspectives.

The presenter is Breandain O'Shea, an Australian born musician who enthusiastically interviews, reports on and introduces performers and performances, events and festivals, cultural ideas and attitudes. A recent program profiled Bechstein, one of Germany's leading piano manufacturers, on it's 150th anniversary; violinist Frank Peter Zimmermann; and The Norwich Puppet Theatre, known internationally for its imaginative puppetry.

**Arts on the Air** was the winner of the Gold Medal for Arts Programs at the 2002 New York International Radio Festivals. (The 2130 broadcast to West Africa is the one best heard in at least the eastern half of North America, as *DW* no longer targets the continent on shortwave.)

**Vox Humana**
***R. Netherlands***
S 1230, 2000; M 0030, 0130, 0430
**http://www.rnw.nl**

This is a fascinating, but somewhat peculiar, new offering from *Radio Netherlands*. It is described in *RN*'s "On Target" newsletter as "a celebration of the Human Voice" and represents a combining of the perennial award-winning efforts of producers Michele Ernsting, Dheera Sujan (**The Sound Fountain**) and David Swatling (**Aural Tapestry**).

Happily experimental in nature ("Imagining Farm Machinery" was a recent offering), **Vox Humana** is definitely a new take on the meaning of culture. It emphasizes stories over drama, dreams over ideas, songs over symphonies and poetry over prose. It seeks to get to the core of culture by examining emotions and the intimate, the ordinary and the extraordinary, misfits and heroes. At the root, though, is speech – that "human voice." It seems such a natural place for radio to be.

# How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

## Convert your time to UTC.

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

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

## Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. 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**

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John Figliozzi, Program Manager, johnfigliozzi@monitoringtimes.com
Mark Fine, VA, markfine@monitoringtimes.com


## Program Highlights

John Figliozzi

### From the BBC

We don't often highlight *BBC World Service* programs in this space. The Beeb already has quite a public relations machine of its own—not the least of which is its excellent program guide magazine *BBC On-Air*, to which we assume most of you are already subscribed. However, there are two interesting new offerings that we would like to bring to your attention.

**Age of Empire** is a timely series wherein the BBC's Defence Correspondent Jonathan Marcus examines America's place in the modern world, in light of recent events and from a number of perspectives. **Passport Please** examines national identity in a globalizing world. The last three parts look at Peru, China and Iran.

### From Voice of Russia

The *Voice of Russia* has introduced some new programs. Several are devoted to the city of St. Petersburg. In the **Musical Portraits** series, *Musical Tales of St. Petersburg* features outstanding musicians who at various times lived in Russia's northern capital. *Musical Treasures of St. Petersburg* is a series of twelve monthly programs within **Music and Musicians** featuring famous musicians, prominent events, glorious premieres and utterly unknown music discovered in the city's archives. *St. Petersburg: Three Glorious Centuries*, within the weekly feature **Russia: People & Events**, is about the city's rich history, cultural and spiritual life.

Other recent additions include: **Ladies of Character**, which features local glamorous personalities with original life philosophies; and **Moscow Calling**, which highlights the latest pop and rock releases and includes interviews, guest speakers, and all you wanted to know about the Russian rock scene.

### From China R. Int.

*CRI* is one big broadcaster that is so obviously bucking what some people seem to think is a trend toward the downsizing of shortwave operations. At press time, *CRI* was experimenting with shortwave delivery in North America of **Realtime Beijing**, at 1100 on 5960. **Realtime Beijing** is a daily magazine—originally broadcast only domestically for an English speaking audience—that looks at Chinese politics, society, economics and culture.

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

| | | | | | |
|---|---|---|---|---|---|
| 0000 | 0007 | | Sierra Leone, SLBS 3316do | | |
| 0000 | 0015 | vl | Cambodia, National Radio Of | 11940as | |
| 0000 | 0015 | | Japan, Radio 13650as | 17810as | |
| 0000 | 0030 | | Egypt, Radio Cairo 11725na | | |
| 0000 | 0030 | | Thailand, Radio 9680af | | |
| 0000 | 0030 | | UK, BBC World Service | 3915as | 11945as |
| | | | 17615as | | |
| 0000 | 0030 | | USA, Voice of America | 7215va | 9890va |
| | | | 11760va 15185va | 15290va | 17740va |
| | | | 17820va | | |
| 0000 | 0045 | | India, All India Radio | 9705as | 9950as |
| | | | 11620as 11645as | 13605as | |
| 0000 | 0055 | | Netherlands, Radio 9845na | | |
| 0000 | 0057 | | Canada, Radio Canada Intl | 5960na | 9590na |
| | | | 9755as 11895as | | |
| 0000 | 0100 | | Anguilla, Caribbean Beacon | 6090am | |
| 0000 | 0100 | | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0000 | 0100 | | Australia, ABC NT Katherine | 5025do | |
| 0000 | 0100 | | Australia, ABC NT Tennant Creek | 4910do | |
| 0000 | 0100 | | Australia, Radio 9660pa | 12080va | 13630pa |
| | | | 15240pa 15415as | 17750as | 17775va |
| | | | 17795va 21725as | | |
| 0000 | 0100 | | Bulgaria, Radio 7400na | 9400na | |
| 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 | 11870am | 13750na |
| 0000 | 0100 | 1st a/month | Finland, Scondinavian Weekend Radio | | 5990eu |
| | | | 11690eu | | |
| 0000 | 0100 | | Germany, Deutsche Welle | 7290as | 9880as |
| 0000 | 0100 | | Guyana, Voice of 3291do | 5950do | |
| 0000 | 0100 | | Japan, Radio 6145na | | |
| 0000 | 0100 | | Malaysia, RTM Radio 4 | 7295do | |
| 0000 | 0100 | | Namibia, Namibian BC Corp | 3270af | 3290af |
| | | | 6060af | | |
| 0000 | 0100 | | New Zealand, Radio NZ Intl | 17675pa | |
| 0000 | 0100 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0000 | 0100 | | Singapore, Mediacorp Radio | 6150do | |
| 0000 | 0100 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0000 | 0100 | | Spain, Radio Exterior Espana | 6055am | |
| 0000 | 0100 | | UK, BBC World Service | 5970as | 5975ca |
| | | | 6195as 9410as 9740as | 9825sa | 11955as |
| | | | 12095as 15280as | 15310as | 15360as |
| | | | 17790as | | |
| 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 | 7505no | |
| 0000 | 0100 | | USA, KWHR Naalehu HI | 17510as | |
| 0000 | 0100 | twhfa | USA, Voice of America | 5995am | 6130am |
| | | | 7405am 9455am | 9775am | 11695am |
| | | | 13790am | | |
| 0000 | 0100 | | USA, WBCQ Kennebunk ME | 7415na | 9330na |
| 0000 | 0100 | mtwhfa | USA, WBCQ Kennebunk ME | 5105na | |
| 0000 | 0100 | | USA, WBOH Newport NC | 5920am | |
| 0000 | 0100 | | USA, WEWN Birmingham AL | 5825va | |
| 0000 | 0100 | | USA, WHRA Greenbush ME | 7580va | |
| 0000 | 0100 | | USA, WHRI Noblesville IN | 5745va | 7315am |
| 0000 | 0100 | | USA, WINB Red Lion PA | 9320am | |
| 0000 | 0100 | | USA, WJIE Louisville KY | 13595am | |
| 0000 | 0100 | sm | USA, WRMI Miami FL | 9955am | |
| 0000 | 0100 | twhfa | USA, WRMI Miami FL | 7385no | |
| 0000 | 0100 | mwfas | USA, WSHB Cypress Creek SC | 7535am | |
| 0000 | 0100 | mwf | USA, WSHB Cypress Creek SC | 9430am | |
| 0000 | 0100 | | USA, WTJC Newport NC | 9370na | |
| 0000 | 0100 | sm | USA, WWBS Macon GA | 11900na | |
| 0000 | 0100 | | USA, WWCR Nashville TN | 3210na | 5070na |
| | | | 5935na 7465na | | |
| 0000 | 0100 | | USA, WWRB Manchester TN | 5050na | 5085na |
| | | | 6890na | | |
| 0000 | 0100 | | USA, WYFR Okeechobee FL | 6085na | 9505na |
| | | | 11720sa | | |
| 0000 | 0100 | vl | Vanuatu, Radio 3945al | 7260do | |
| 0000 | 0100 | | Zambia, Christian Voice | 4965do | |
| 0015 | 0030 | twhfa | Austria, Radio Austria Intl | 13730sa | |
| 0030 | 0100 | mtwhf | Germany, Bible Voice Broadcasting | | 7105as |
| 0030 | 0100 | | Iran, Voice of the Islamic Rep | 6120am | 9580am |
| 0030 | 0100 | | Lithuania, Radio Vilnius | 6120al | 7325na |
| 0030 | 0100 | | Sri Lanka, SLBC 6005as | 9770as | 15745as |
| 0030 | 0100 | | Thailand, Radio 13695na | | |
| 0030 | 0100 | | UK, BBC World Service | 9580as | |
| 0045 | 0100 | twhfo | Austria, Radio Austria Intl | 13730sa | |
| 0055 | 0100 | | Italy, RAI Intl 9675na | 11800na | |

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

| | | | | | |
|---|---|---|---|---|---|
| 0100 | 0115 | | Italy, RAI Intl 9675na | 11800na | |
| 0100 | 0127 | | Czech Rep, Radio Prague Intl | 6200na | 7345na |
| 0100 | 0127 | | Slovakia, Radio Slovakia Intl | 5930na | 7230co |
| | | | 9440sa | | |
| 0100 | 0127 | | Vietnam, Voice of 6175na | | |
| 0100 | 0130 | s | Germany, Universal Life | 9435as | |
| 0100 | 0130 | mtwhfa | Serbia & Montenegro, Intl Radio | 7115na | |
| 0100 | 0130 | twhfa | USA, Voice of America | 5995am | 6130am |
| | | | 7405am 9455am | 9775am | 13790am |
| 0100 | 0130 | | Uzbekistan, Radio Tashkent Intl | 5975as | 6165as |
| | | | 7160as | | |
| 0100 | 0155 | | Netherlands, Radio 6165na | | |
| 0100 | 0156 | | China, China Radio Intl | 6140va | 9580na |
| | | | 9790no | | |
| 0100 | 0156 | | North Korea, Voice of | 3560as | 6195as |
| | | | 7140am 9345as | 11735am | |
| 0100 | 0156 | | Romania, Radio Romania Intl | 6040na | 9510na |
| | | | 9530na 11740na | | |
| 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 15555pa | | |
| 0100 | 0200 | | Australia, Radio 9660pa | 12080va | 13630pa |
| | | | 15240pa 15415as | 17750as | 17775va |
| | | | 17795va 21725as | | |
| 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 Voncouver BC | 6160do | |
| 0100 | 0200 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750na |
| 0100 | 0200 | | Cuba, Radio Havana | 6000na | 9820na |
| 0100 | 0200 | 1st a/month | Finland, Scandinavian Weekend Radio | | 5990eu |
| | | | 11690eu | | |
| 0100 | 0200 | | Guyana, Voice of 3291do | 5950do | |
| 0100 | 0200 | | Iran, Voice of the Islamic Rep | 6120na | 9580na |
| 0100 | 0200 | | Japan, Radio 11860as | 11880va | 15325as |
| | | | 17560va 17685pa | 17810as | 17835as |
| | | | 17845as | | |
| 0100 | 0200 | | Malaysia, RTM Radio 4 | 7295do | |
| 0100 | 0200 | | Namibia, Namibian BC Corp | 3270af | 3290af |
| | | | 6060af | | |
| 0100 | 0200 | | New Zealand, Radio NZ Intl | 17675pa | |
| 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 | 9770as | 15745as |
| 0100 | 0200 | | UK, BBC World Service | 5975ca | 6195as |
| | | | 9410as 9525ca 9825sa | 11955as | 12095sa |
| | | | 15280as 15310as | 15360as | 17790as |
| 0100 | 0200 | | Ukraine, Radio Ukraine Intl | 5905na | |
| 0100 | 0200 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb 6350usb | 7507usb | 10320usb |
| | | | 12133usb 12579usb | 13362usb | 13855usb |
| 0100 | 0200 | | USA, KAIJ Dallas TX 13815va | | |
| 0100 | 0200 | | USA, KTBN Salt Lake City UT | 7505no | |
| 0100 | 0200 | | USA, KWHR Naalehu HI | 17510os | |
| 0100 | 0200 | | USA, Voice of America | 7200va | 7255va |
| | | | 9850va 11705va | 11820va | 15250va |
| | | | 15290va 17740va | 17820va | |
| 0100 | 0200 | | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| | | | 9330na | | |
| 0100 | 0200 | | USA, WBOH Newport NC | 5920am | |
| 0100 | 0200 | | USA, WEWN Birmingham AL | 5825vo | |
| 0100 | 0200 | | USA, WHRA Greenbush ME | 7580va | |
| 0100 | 0200 | | USA, WHRI Noblesville IN | 5745va | 7315am |
| 0100 | 0200 | | USA, WINB Red Lion PA | 9320am | |
| 0100 | 0200 | | USA, WJIE Louisville KY | 13595am | |
| 0100 | 0200 | sm | USA, WRMI Miami FL | 9955am | |
| 0100 | 0200 | twhfa | USA, WRMI Miami FL | 7385na | |
| 0100 | 0200 | | USA, WSHB Cypress Creek SC | 7535no | |
| 0100 | 0200 | m | USA, WSHB Cypress Creek SC | 9430am | |
| 0100 | 0200 | | USA, WTJC Newport NC | 9370na | |
| 0100 | 0200 | sm | USA, WWBS Macon GA | 11900na | |
| 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 |
| | | | 15060as | | |
| 0100 | 0200 | vl | Vanuatu, Radio 3945al | 7260do | |
| 0100 | 0200 | | Zambia, Christian Voice | 4965do | |
| 0105 | 0115 | sm | Austria, Radio Austria Intl | 7325am | 9870am |
| 0115 | 0120 | mtwhf | Kyrgyzstan, Radio Kyrgyzstan | 4010as | 4795as |
| 0115 | 0130 | | Austria, Radio Austria Intl | 7325am | 9870am |
| 0130 | 0200 | | Sweden, Radio 9435va | | |
| 0130 | 0200 | | UK, RTE Radio 6155ca | | |
| 0130 | 0200 | twhfa | USA, Voice of America | 5995am | 6130am |
| | | | 9455va 13740am | | |
| 0135 | 0145 | sm | Austria, Radio Austria Intl | 7325am | 9870am |
| 0140 | 0200 | | Vatican City, Vatican Radio | 7335as | 9865as |
| 0145 | 0200 | | Austria, Radio Austria Intl | 7325am | 9870am |

**SELECTED PROGRAMMING BEGINS ON PAGE 55**

# Shortwave Guide

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

| | | | | | |
|---|---|---|---|---|---|
| 0200 | 0227 | | Czech Rep, Radio Prague Intl | 6200na | 7345na |
| 0200 | 0228 | | Hungary, Radio Budapest | 9835na | |
| 0200 | 0230 | | Iran, Voice of the Islamic Rep | 6120na | 9580na |
| 0200 | 0230 | | Serbia & Montenegro, Intl Radio | 7130na | |
| 0200 | 0230 | | USA, KJES Vado NM | 7555no | |
| 0200 | 0256 | | North Korea, Voice of | 4405as | 9325as |
| | | | 11335as | | |
| 0200 | 0256 | | South Korea, Radio Korea Intl | 9560na | 11810sa |
| | | | 15575na | | |
| 0200 | 0259 | | Canado, Radio Canoda Intl | 6040am | 9755am |
| | | | 11725am 15150os | 17860am | |
| 0200 | 0300 | | Anguilla, Caribbean Beacon | 6090am | |
| 0200 | 0300 | twhfa | Argentino, RAE 11710am | | |
| 0200 | 0300 | | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0200 | 0300 | | Australia, ABC NT Kotherine | 5025do | |
| 0200 | 0300 | | Australio, ABC NT Tennant Creek | 4910do | |
| 0200 | 0300 | | Australia, HCJB 15555po | | |
| 0200 | 0300 | | Australia, Radio 9660pa | 12080va | 13630pa |
| | | | 15240po 15415as | 15515vo | 17750as |
| | | | 21725os | | |
| 0200 | 0300 | | Austria, AWR Europe | 7230as | |
| 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 Rico, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750na |
| 0200 | 0300 | | Cuba, Radio Havano | 6000no | 9820na |
| 0200 | 0300 | | Egypt, Rodio Cairo 11780na | | |
| 0200 | 0300 | 1st a/month | Finland, Scondinovian Weekend Radio | | 5980eu |
| | | | 11720eu | | |
| 0200 | 0300 | os | Germany, Bible Voice Broodcasting | | 17540as |
| 0200 | 0300 | | Guyana, Voice of 3291do | 5950do | |
| 0200 | 0300 | | Indonesio, Voice of 9525as | 11785os | |
| 0200 | 0300 | | Molaysia, RTM Radio 4 | 7295do | |
| 0200 | 0300 | | Myonmor, Radio 7185do | | |
| 0200 | 0300 | | Namibia, Nomibion BC Corp | 3270af | 3290af |
| | | | 6090af | | |
| 0200 | 0300 | | New Zealand, Radio NZ Intl | 17675po | |
| 0200 | 0300 | os | Philippines, Radio Pilipinos 12015me | 15120me | 15270me |
| 0200 | 0300 | | Russia, Voice of 5995me | 6155na | 7180no |
| | | | 9765no 15445na | 15595no | |
| 0200 | 0300 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0200 | 0300 | | Singapore, Mediacorp Radio | 6150do | |
| 0200 | 0300 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0200 | 0300 | | Sri Lanka, SL8C 6005os | 9770as | 15745as |
| 0200 | 0300 | | Taiwan, Radio Taiwan Intl | 5950na | 9680na |
| | | | 11875os 15320as | 15465as | |
| 0200 | 0300 | | UK, BBC World Service | 5975ca | 6195eu |
| | | | 9410me 9525ca | 9750af | 9825so |
| | | | 11955as 12095sa | 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 Solt Lake City UT | 7505na | |
| 0200 | 0300 | | USA, KWHR Noolehu HI | 17510as | |
| 0200 | 0300 | | USA, Voice of America | 7200vo | 7255va |
| | | | 9850va 11705va | 11705va | 11820va |
| | | | 15250va 15290va | 17740va | 17820va |
| 0200 | 0300 | mtwhfa | USA, WBCQ Kennebunk ME | 5105na | |
| 0200 | 0300 | | USA, WBOH Newport NC | 5920am | |
| 0200 | 0300 | | USA, WEWN Birmingham AL | 5825va | |
| 0200 | 0300 | | USA, WHRA Greenbush ME | 7580va | |
| 0200 | 0300 | | USA, WHRI Noblesville IN | 5745va | 7315am |
| 0200 | 0300 | | USA, WINB Red Lion PA | 9320am | |
| 0200 | 0300 | | USA, WJIE Louisville KY | 13595am | |
| 0200 | 0300 | twhfa | USA, WRMI Miami FL | 7385na | |
| 0200 | 0300 | sm | USA, WSHB Cypress Creek SC | 7535na | |
| 0200 | 0300 | mh | USA, WSHB Cypress Creek SC | 9430ca | |
| 0200 | 0300 | | USA, WTJC Newport NC | 9370na | |
| 0200 | 0300 | | USA, WWCR Nashville TN | 3210na | 5070no |
| | | | 5935na 7465no | | |
| 0200 | 0300 | | USA, WWRB Manchester TN | 5050na | 5085no |
| | | | 6890na | | |
| 0200 | 0300 | | USA, WYFR Okeechobee FL | 5985na | 6065na |
| | | | 9505no 9985sa | 11855ca | |
| 0200 | 0300 | vl | Vonuatu, Radio 3945al | 7260do | |
| 0200 | 0300 | | Zambia, Christian Voice | 4965do | |
| 0215 | 0220 | | Nepal, Radio 3230as | 5005as | 6100as |
| | | | 7164as | | |
| 0230 | 0257 | | Vietnom, Voice of 6175no | | |
| 0230 | 0300 | | Sweden, Radio 9495na | | |
| 0245 | 0300 | twhfas | Albanio, Radio Tirono Intl | 6115na | 7160na |
| 0245 | 0300 | | UK, BBC World Service | 9610af | |
| 0250 | 0300 | | Votican City, Vatican Radio | 7305am | 9605am |
| 0250 | 0300 | | Zombia, Radio 4910do | | |

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

| | | | | | |
|---|---|---|---|---|---|
| 0300 | 0310 | | Votican City, Vatican Radio | 7305am | 9605am |
| | | | 9660af 17665as | | |
| 0300 | 0315 | | Croatia, Voice af 7285na | | |
| 0300 | 0330 | | Australia, HCJB 15555pa | | |
| 0300 | 0330 | sm w fa | Belarus, Radio Belarus Intl | 5970eu | 7210eu |
| 0300 | 0330 | | Egypt, Radio Cairo 11780na | | |
| 0300 | 0330 | as | Philippines, Radio Pilipinas | 12015me | 15120me |
| | | | 15270me | | |
| 0300 | 0330 | | Thailand, Radio 15460na | | |
| 0300 | 0330 | a | UK, Wales Radio Intl 9735na | | |
| 0300 | 0330 | | USA, KJES Vado NM | 7555na | |
| 0300 | 0355 | | South Africa, Channel Africa | 3345af | 9770af |
| 0300 | 0356 | | China, China Radio Intl | 9690na | 9790na |
| 0300 | 0356 | | North Korea, Voice of | 3560as | 6195as |
| | | | 7140as 9345as | | |
| 0300 | 0356 | | Romania, Radio Romanio Intl | 6040na | 9515na |
| 0300 | 0358 | | New Zealand, Radio NZ Intl | 17675pa | |
| 0300 | 0400 | | Anguilla, Coribbeon Beacon | 6090am | |
| 0300 | 0400 | | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0300 | 0400 | | Australia, ABC NT Katherine | 5025do | |
| 0300 | 0400 | | Australio, ABC NT Tennant Creek | 4910do | |
| 0300 | 0400 | | Australia, Radio 9660pa | 12080va | 13630po |
| | | | 15240po 15415os | 15515vo | 17750as |
| | | | 21725as | | |
| 0300 | 0400 | vl | Botswana, Radio 4820do | 4830al | 7255do |
| 0300 | 0400 | | Bulgaria, Radio 7400na | 9400na | |
| 0300 | 0400 | | Canado, CBC Northern Service | 9625do | |
| 0300 | 0400 | | Canada, CFRX Toronto ON | 6070do | |
| 0300 | 0400 | | Canada, CFVP Colgory AB | 6030do | |
| 0300 | 0400 | | Canada, CKZN St John's NF | 6160do | |
| 0300 | 0400 | | Canado, CKZU Vancouver BC | 6160do | |
| 0300 | 0400 | | Costo Rico, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750na |
| | | | 17645as | | |
| 0300 | 0400 | | Cuba, Radio Havono | 6000na | 9820na |
| 0300 | 0400 | 1st a/manth | Finland, Scandinavian Weekend Radio | | 5980eu |
| | | | 11720eu | | |
| 0300 | 0400 | | Guyana, Voice of 3291do | 5950do | |
| 0300 | 0400 | | Japon, Radio 21610pa | | |
| 0300 | 0400 | | Molaysia, RTM Radio 4 | 7295do | |
| 0300 | 0400 | | Namibio, Namibian BC Corp | 3270af | 3290af |
| | | | 6090af | | |
| 0300 | 0400 | | Oman, Radio 15355af | | |
| 0300 | 0400 | | Russia, Voice of 6155no | 7180na | 7350na |
| | | | 15445na 15595na | | |
| 0300 | 0400 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0300 | 0400 | | Singapore, Mediacorp Radio | 6150do | |
| 0300 | 0400 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0300 | 0400 | | Sri Lonka, SLBC 6005os | 9770as | 15745as |
| 0300 | 0400 | | Toiwan, Radio Toiwan Intl | 5950na | 9680na |
| | | | 11875as 15125sa | 15320as | |
| 0300 | 0400 | | Uganda, Radio 4976do | 5026do | 7196do |
| 0300 | 0400 | | UK, BBC World Service | 3255af | 5975ca |
| | | | 6005af 6190af 6195eu | 7160af | 9410eu |
| | | | 9525am 9750af | 11760me | 11765af |
| | | | 12035af 15280as | 15310as | 15360as |
| | | | 15410af 15575me | 17760as | 17790as |
| | | | 21660os | | |
| 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 | | USA, Voice of America | 4960af | 6035af |
| | | | 6080af 7265af 7290af | 7340af | 7415af |
| | | | 9575af 9885af | | |
| 0300 | 0400 | | USA, WBCQ Kennebunk ME | 7415na | 9330no |
| 0300 | 0400 | mtwhfa | USA, WBCQ Kennebunk ME | 5105na | |
| 0300 | 0400 | | USA, WBOH Newport NC | 5920am | |
| 0300 | 0400 | | USA, WEWN Birmingham AL | 5825va | |
| 0300 | 0400 | | USA, WHRA Greenbush ME | 7580va | |
| 0300 | 0400 | | USA, WHRI Noblesville IN | 5745va | 7315am |
| 0300 | 0400 | | USA, WINB Red Lion PA | 9320am | |
| 0300 | 0400 | | USA, WJIE Louisville KY | 13595am | |
| 0300 | 0400 | | USA, WRMI Miami FL | 7385na | |
| 0300 | 0400 | m | USA, WSHB Cypress Creek SC | 5850eu | 7535eu |
| 0300 | 0400 | | USA, WTJC Newport NC | 9370na | |
| 0300 | 0400 | | USA, WWCR Noshville TN | 3210na | 5070na |
| | | | 5935na 7465na | | |
| 0300 | 0400 | | USA, WWRB Manchester TN | 5050na | 5085na |
| | | | 6890na | | |
| 0300 | 0400 | | USA, WYFR Okeechobee FL | 6065no | 9505na |
| | | | 11740sa | | |
| 0300 | 0400 | vl | Vanuatu, Radio 3945al | 7260do | |
| 0300 | 0400 | | Zambia, Radio 4910do | | |
| 0300 | 0400 | | Zombia, Radio Christian Voice | 6065do | |
| 0300 | 0400 | vl | Zimbabwe, ZBC Corp | 5975do | |
| 0310 | 0330 | | Vatican City, Votican Radio | 9660af | 17665as |
| 0320 | 0330 | | Vatican City, Vatican Radio | 9660af | |
| 0330 | 0357 | | Vietnam, Voice of 6175na | | |
| 0330 | 0358 | | Hungary, Radio Budopest | 9835na | |
| 0330 | 0400 | twhfas | Albania, Radio Tirona Intl | 6165eu | 7160eu |
| 0330 | 0400 | | Moloysio, Radio Maloysia Kota Kinabalu | | 5979do |
| 0330 | 0400 | | Sweden, Radio 9495na | | |
| 0330 | 0400 | | UAE, Rodio Dubai 12005na | 13675no | 15400na |
| | | | 17890na | | |
| 0330 | 0400 | | UK, BBC World Service | 7130eu | 7265eu |
| | | | 9670eu | | |
| 0345 | 0400 | | Tajikistan, Tajik Radio | 7245as | |

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

| | | | | | |
|---|---|---|---|---|---|
| 0400 | 0427 | | Czech Rep, Radio Prague Intl | 6200na | 7345na |
| 0400 | 0430 | | France, Radio France Intl | 9805af | 11995af |
| 0400 | 0430 | | South Africa, Channel Africa | 3345af | |
| 0400 | 0430 | | Sri Lanka, SLBC 6005as | 9770as | 15745as |
| 0400 | 0450 | | Turkey, Voice of 6020va | 7240eu | |
| 0400 | 0455 | | Netherlands, Radio 6165na | 9590na | |
| 0400 | 0456 | | China, China Radio Intl 9755na | 6190na | 9560na |
| 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 15240pa 21725as | 12080va 15415as | 13630po 15515va 17750as |
| 0400 | 0500 | vl | Botswana, Radio 4820do | 4830al | 7255do |
| 0400 | 0500 | | Canada, CBC Northern Service | 9625do | |
| 0400 | 0500 | | Canada, CFRX Toronto ON | 6070do | |
| 0400 | 0500 | | Canada, CKZN St John's NF | 6160do | |
| 0400 | 0500 | | Canada, CKZU Vancouver BC | 6160do | |
| 0400 | 0500 | | Costa Rica, University Network 7375am 9725sa 17645as | 5030am 11870am | 6150am 13750na |
| 0400 | 0500 | | Cuba, Radio Havana | 6000na | 9820na |
| 0400 | 0500 | 1st a/month | Finland, Scandinavian Weekend Radio 11720eu | | 5980eu |
| 0400 | 0500 | | Germany, Deutsche Welle 9710af | 6180af | 9545af |
| 0400 | 0500 | | Germany, Overcomer Ministries | 9770au | |
| 0400 | 0500 | | Guyana, Voice of 3291do | 5950do | |
| 0400 | 0500 | | Malaysia, Radio Malaysia Kota Kinabalu | | 5979co |
| 0400 | 0500 | | Malaysia, RTM Radio 4 | 7295do | |
| 0400 | 0500 | | Namibia, Namibian BC Corp 6090af | 3270af | 3290af |
| 0400 | 0500 | | New Zealand, Radio NZ Intl | 15340pa | |
| 0400 | 0500 | | Russia, Voice of 7125na 7350na | 7180na 12010na | 7240na 15445na 15595na |
| 0400 | 0500 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0400 | 0500 | | Singapore, Mediacorp Radio | 6150do | |
| 0400 | 0500 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0400 | 0500 | | Ugando, Radio 4976do | 5026do | 7196do |
| 0400 | 0500 | | UK, BBC World Service 6005af 6135ca 9410eu 15280as 15575me | 3255af 6190af 11760me 15310as 17760as | 5975am 6195eu 11765af 15360as 17790as | 7160af 12035af 15420af 21660as |
| 0400 | 0500 | DRM | UK, BBC World Service | 6010af | |
| 0400 | 0500 | | Ukraine, Radio Ukraine Intl | 5905na | |
| 0400 | 0500 | | USA, Armed Forces Radio 5765usb 12133usb | 4319usb 6350usb 12579usb | 5446usb 7507usb 13362usb | 10320usb 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 7170va 9575af 9885af | 4960af 7290af 15205va | 6030af 7415af | 9475af |
| 0400 | 0500 | mtwhfa | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| 0400 | 0500 | s | USA, WBCQ Kennebunk ME | 9330na | |
| 0400 | 0500 | | USA, WBOH Newport NC | 5920am | |
| 0400 | 0500 | | USA, WEWN Birmingham AL | 5825na | |
| 0400 | 0500 | | USA, WHRA Greenbush ME | 7580va | |
| 0400 | 0500 | | USA, WHRI Noblesville IN | 5745va | 7315am |
| 0400 | 0500 | | USA, WINB Red Lion PA | 9320am | |
| 0400 | 0500 | | USA, WJIE Louisville KY | 13595am | |
| 0400 | 0500 | mtwhf | USA, WMLK Bethel PA | 9465eu | |
| 0400 | 0500 | | USA, WRMI Miami FL | 7385na | |
| 0400 | 0500 | mtha | USA, WSHB Cypress Creek SC | 12020va | |
| 0400 | 0500 | | USA, WTJC Newport NC | 9370na | |
| 0400 | 0500 | | USA, WWCR Nashville TN 5935na 7465na | 3210na | 5070na |
| 0400 | 0500 | | USA, WWRB Manchester TN 6890na | 5050na | 5085na |
| 0400 | 0500 | | USA, WYFR Okeechobee FL 7355va 9505na | 6065na | 6855va |
| 0400 | 0500 | vl | Vanuatu, Radio 3945al | 7260do | |
| 0400 | 0500 | | Zambia, Radio 4910do | | |
| 0400 | 0500 | | Zambia, Radio Christian Voice | 6065do | |
| 0400 | 0500 | vl | Zimbabwe, ZBC Corp | 5975do | |
| 0415 | 0420 | mtwhf | Kyrgyzstan, Radio Kyrgyzstan | 4010as | 4795as |
| 0430 | 0457 | | Czech Rep, Radio Prague Intl | 9865va | 11600va |
| 0430 | 0500 | s | Austria, AWR Europe | 9875me | |
| 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 | | Swaziland, TWR 4775af | 6120af | |
| 0445 | 0500 | | Italy, RAI Intl 5965af | 6100af | 7230af |

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

| | | | | | |
|---|---|---|---|---|---|
| 0500 | 0515 | | Israel, Kol Israel 9435va | 11605va | 17600va |
| 0500 | 0529 | | Belgium, Radio Vlaanderen Intl | 9590na | |
| 0500 | 0530 | | France, Radio France Intl | 11850af | 13610af |
| 0500 | 0530 | DRM/ as | Netherlands, Radio 15255va | | |
| 0500 | 0530 | | South Africa, AWR Africa | 5960af | 6015af |
| 0500 | 0530 | | UK, BBC World Service | 15280as | 17885af |
| 0500 | 0530 | as | UK, BBC World Service 11845eu | 7295eu | 9670eu |
| 0500 | 0530 | | Vatican City, Vatican Radio 11625af | 7360af | 9660af |
| 0500 | 0556 | | China, China Radio Intl | 6190na | 9560na |
| 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 15160as 15240pa | 12080va | 13630pa 15515va | 17750as |
| 0500 | 0600 | mtwhf | Bhutan, Bhutan BC Service | 5030al | 6035do |
| 0500 | 0600 | vl | Botswana, Radio 4820do | 4830al | 7255do |
| 0500 | 0600 | | Canada, CBC Northern Service | 9625do | |
| 0500 | 0600 | | Canada, CFRX Toronto ON | 6070do | |
| 0500 | 0600 | | Canada, CKZN St John's NF | 6160do | |
| 0500 | 0600 | | Canada, CKZU Vancouver BC | 6160do | |
| 0500 | 0600 | | Costa Rica, University Network 7375am 9725so 17645as | 5030am 11870am | 6150am 13750na |
| 0500 | 0600 | | Cuba, Radio Havana 11760na | 9550am | 9820na |
| 0500 | 0600 | 1st a/month | Finland, Scandinavian Weekend Radio 11720eu | | 6170eu |
| 0500 | 0600 | 1st a/month | Finland, Scandinavian Weekend Radio 11690eu | | 6170va |
| 0500 | 0600 | | Germany, Deutsche Welle 12045af 15410af | 9565af | 11805af |
| 0500 | 0600 | vl | Greece, Voice of 9420eu | 12105eu | |
| 0500 | 0600 | | Guyana, Voice of 3291do | 5950do | |
| 0500 | 0600 | | Japan, Radio 11715eu 21755pa | 5975eu 11760as | 6110na 15195as | 7230eu 17810as |
| 0500 | 0600 | | Kuwait, Radio 15110as | | |
| 0500 | 0600 | | Malaysia, Radio Malaysia Kota Kinabalu | | 5979do |
| 0500 | 0600 | | Malaysia, RTM Radio 4 | 7295do | |
| 0500 | 0600 | | Namibia, Namibian BC Corp | 6060af | 6175al |
| 0500 | 0600 | | New Zealand, Radio NZ Intl | 15340pa | |
| 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 17800af | | |
| 0500 | 0600 | | Russia, Voice of 7125na 12010na | 7180na 15445na | 7240na 15595no |
| 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 | 9525af | 11710af |
| 0500 | 0600 | | Swaziland, TWR 6120af | 7205af | 9500af |
| 0500 | 0600 | | Uganda, Radio 4976do | 5026do | 7196do |
| 0500 | 0600 | | UK, BBC World Service 6190af 6195eu 11765af 15360as 17640af | 6005af 7160af 11940af 15420af 17760as | 6135ca 9410eu 11955as 15565eu 17790as | 11760me 15310os 15575me 21660as |
| 0500 | 0600 | | USA, Armed Forces Radio 5765usb 12133usb | 4319usb 6350usb 12579usb | 5446usb 7507usb 13362usb | 10320usb 13855usb |
| 0500 | 0600 | | USA, KAIJ Dallas TX 5755va | | |
| 0500 | 0600 | | USA, KTBN Salt Lake City UT | 7505na | |
| 0500 | 0600 | | USA, KWHR Naalehu HI | 17780as | |
| 0500 | 0600 | | USA, Voice of America 6105af 7170va 11835af | 6035af 7295af 13710af | 6080af 9700va 15205va | 11825va |
| 0500 | 0600 | | USA, WBCQ Kennebunk ME | 7415na | |
| 0500 | 0600 | twhfa | USA, WBCQ Kennebunk ME | 9330na | |
| 0500 | 0600 | m | USA, WBCQ Kennebunk ME | 5105na | |
| 0500 | 0600 | | USA, WBOH Newport NC | 5920am | |
| 0500 | 0600 | | USA, WEWN Birmingham AL | 5825na | 7570va |
| 0500 | 0600 | | USA, WHRA Greenbush ME | 7580af | |
| 0500 | 0600 | | USA, WHRI Noblesville IN | 5745va | 7315am |
| 0500 | 0600 | | USA, WINB Red Lion PA | 9320am | |
| 0500 | 0600 | | USA, WJIE Louisville KY | 13595am | |
| 0500 | 0600 | mtwhf | USA, WMLK Bethel PA | 9465eu | |
| 0500 | 0600 | | USA, WRMI Miami FL | 7385na | |
| 0500 | 0600 | m | USA, WSHB Cypress Creek SC | 7535eu | |
| 0500 | 0600 | | USA, WSHB Cypress Creek SC | 12020af | |
| 0500 | 0600 | | USA, WTJC Newport NC | 9370na | |
| 0500 | 0600 | | USA, WWCR Nashville TN 5935na 7560na | 3210na | 5070na |
| 0500 | 0600 | | USA, WWRB Manchester TN 6890na | 5050na | 5085na |
| 0500 | 0600 | | USA, WYFR Okeechobee FL | 6855eu | 7520eu |
| 0500 | 0600 | vl | Vanuatu, Radio 3945al | 7260do | |
| 0500 | 0600 | | Zambia, Radio Christian Voice | 6065do | |
| 0500 | 0600 | vl | Zimbabwe, ZBC Corp | 5975do | |
| 0515 | 0525 | | Rwanda, Radio 6005do | | |
| 0525 | 0600 | vl | Ghana, Ghana BC Corp | 3366da | 4915do |
| 0530 | 0545 | | UK, BBC World Service | 6010eu | 9865eu |
| 0530 | 0550 | | UAE, Radio Dubai 13675au 21700au | 15435au | 17830au |
| 0530 | 0600 | s | Austria, AWR Europe | 11905me | |
| 0530 | 0600 | | South Africa, AWR Africa | 15345af | |
| 0530 | 0600 | | Thailand, Radio 13780eu | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0530 | 0600 | mtwhf | UK, BBC World Service | 17885af | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0600 | 0615 | | South Africa, TWR | 11640af | | |
| 0600 | 0620 | | Vatican City, Vatican Radio | 4005eu | 5890eu | 7250eu |
| 0600 | 0630 | | France, Radio France Intl | 11725af | 15155af | 17800af |
| 0600 | 0630 | | South Africa, AWR Africa | 15345af | | |
| 0600 | 0630 | | Swaziland, TWR | 6120af | 7205af | 9500af |
| 0600 | 0700 | | Anguilla, Caribbean Beacon | 6090am | | |
| 0600 | 0700 | | Australia, ABC NT Alice Springs | 2310irr | 4835da | |
| 0600 | 0700 | | Australia, ABC NT Katherine | 5025do | | |
| 0600 | 0700 | | Australia, ABC NT Tennant Creek | 4910do | | |
| 0600 | 0700 | | Australia, Radio | 9660po | 11880pa | 12080va |
| | | | | 15160as | 15240pa | 15515va 17750as |
| 0600 | 0700 | vl | Botswana, Radio | 4820do | 4830al | 7255do |
| 0600 | 0700 | | Canada, CFRX Toronto ON | 6070do | | |
| 0600 | 0700 | | Canada, CFVP Calgary AB | 6030do | | |
| 0600 | 0700 | | Canada, CKZN St John's NF | 6160do | | |
| 0600 | 0700 | | Canada, CKZU Vancouver BC | 6160do | | |
| 0600 | 0700 | | Costa Rica, University Network | 5030am | 6150om | 7375am 9725sa 11870am 13750na 17645as |
| 0600 | 0700 | | Cuba, Radio Havana | 9550am | 9820na | 11760na |
| 0600 | 0700 | 1st a/month | Finland, Scandinavian Weekend Radio | | 6170eu | 11690eu |
| 0600 | 0700 | | Georgia, Radio Georgia | 11805eu | | |
| 0600 | 0700 | | Germany, Deutsche Welle | 6140eu | 7225af | 11785af 15410af |
| 0600 | 0700 | DRM | Germany, Deutsche Welle | 21675af | | |
| 0600 | 0700 | vl | Ghana, Ghana BC Corp | 3366do | 4915do | |
| 0600 | 0700 | | Guyana, Voice of | 3291do | 5950do | |
| 0600 | 0700 | | Japan, Radio | 7230eu | 11690am | 11740as 15195as 17870pa 21755pa |
| 0600 | 0700 | DRM | Kuwait, Radio | 15110as | | |
| 0600 | 0700 | | Kuwait, Radio | 15110as | | |
| 0600 | 0700 | | Liberia, ELWA | 4760do | | |
| 0600 | 0700 | | Malaysia, RTM Radio 4 | 7295do | | |
| 0600 | 0700 | | Malaysia, Voice of | 6175as | 9665os | 9750as 15295au |
| 0600 | 0700 | | Namibia, Namibian BC Corp | 6060af | 6175al | |
| 0600 | 0700 | | New Zealand, Radio NZ Intl | 15340pa | | |
| 0600 | 0700 | | Nigeria, Radio/Enugu | 6025do | | |
| 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 | 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 | 9525af | 15215af | |
| 0600 | 0700 | | Swaziland, TWR | 7205af | 9500af | |
| 0600 | 0700 | as | UK, BBC World Service | 17885af | | |
| 0600 | 0700 | | UK, BBC World Service | 6055af | 6190af | 6195eu 7160af 9410eu 11765af 11940af 11955as 12095eu 15310as 15360as 15400af 15565eu 15575me 17640of 17760as 17790as 21660as |
| 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 | 17780as | | |
| 0600 | 0700 | | USA, Voice of America | 5995vo | 6035af | 6080af 6105af 7170va 7295af 11825va 11835af 11930va 11995af 15205va |
| 0600 | 0700 | m | USA, WBCQ Kennebunk ME | 5105na | | |
| 0600 | 0700 | twhfa | USA, WBCQ Kennebunk ME | 9330na | | |
| 0600 | 0700 | | USA, WBOH Newport NC | 5920am | | |
| 0600 | 0700 | | USA, WEWN Birmingham AL | 5825na | 7570va | |
| 0600 | 0700 | | USA, WHRA Greenbush ME | 7580af | | |
| 0600 | 0700 | | USA, WHRI Noblesville IN | 5745va | 7315am | |
| 0600 | 0700 | | USA, WJIE Louisville KY | 13595am | | |
| 0600 | 0700 | | USA, WRMI Miami FL | 7385na | | |
| 0600 | 0700 | mwfa | USA, WSHB Cypress Creek SC | 7535af | | |
| 0600 | 0700 | | USA, WTJC Newport NC | 9370na | | |
| 0600 | 0700 | | USA, WWCR Nashville TN | 3210na | 5070na | 5935na 7560na |
| 0600 | 0700 | | USA, WWRB Manchester TN | 5050na | 5085na | 6890na |
| 0600 | 0700 | | USA, WYFR Okeechobee FL | 7355eu | 11530eu | 11580eu |
| 0600 | 0700 | vl | Vanuatu, Radio | 3945al | 4960do | 7260irr |
| 0600 | 0700 | | Yemen, Rep of Yemen Radio | 9780me | | |
| 0600 | 0700 | | Zambia, Radio Christian Voice | 9865do | | |
| 0600 | 0700 | vl | Zimbabwe, ZBC Corp | 5975do | | |
| 0605 | 0630 | s | Austria, Radio Austria Intl | 17870me | | |
| 0630 | 0645 | as | UK, BBC World Service | 9875eu | | |
| 0630 | 0700 | | Vatican City, Vatican Radio | 9660af | 11625of | 13765af |
| 0630 | 2000 | mtwha | Germany, AWR Europe | 9840eu | | |
| 0635 | 0700 | s | Austria, Radio Austria Intl | 17870me | | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0700 | 0715 | | Croatia, Voice of | 9470pa | | |
| 0700 | 0726 | | Romania, Radio Romania Intl | 11775na | 15105na | |
| 0700 | 0727 | | Slovakia, Radio Slovakia Intl | 13715au | 15460au | 17550au |
| 0700 | 0730 | a | Tibet, Xizang PBS | 9490as | 9580as | |
| 0700 | 0730 | as | UK, BBC World Service | 17885af | | |
| 0700 | 0745 | | USA, WYFR Okeechobee FL | 7355eu | 9985af | |
| 0700 | 0759 | | New Zealand, Radio NZ Intl | 15340pa | | |
| 0700 | 0800 | | Anguilla, Caribbean Beacon | 6090am | | |
| 0700 | 0800 | | Australia, ABC NT Alice Springs | 2310irr | 4835do | |
| 0700 | 0800 | | Australia, ABC NT Katherine | 5025do | | |
| 0700 | 0800 | | Australia, ABC NT Tennant Creek | 4910do | | |
| 0700 | 0800 | | Australia, Radio | 9660pa | 11880pa | 12080va 13630pa 15160as 15240va 17750os |
| 0700 | 0800 | vl | Botswana, Radio | 4820do | 4830al | 7255do |
| 0700 | 0800 | | Canada, CFRX Toronto ON | 6070do | | |
| 0700 | 0800 | | Canada, CFVP Calgary AB | 6030do | | |
| 0700 | 0800 | | Canada, CKZN St John's NF | 6160do | | |
| 0700 | 0800 | | Canada, CKZU Vancouver BC | 6160do | | |
| 0700 | 0800 | | Costa Rica, University Network | 5030am | 6150am | 7375am 9725sa 11870am 13750na 17645as |
| 0700 | 0800 | | Eqt Guinea, Radio Africa | 15184af | | |
| 0700 | 0800 | 1st a/month | Finland, Scandinavian Weekend Radio | | 6170eu | 11690eu |
| 0700 | 0800 | | France, Rodio France Intl | 15605af | | |
| 0700 | 0800 | DRM | Germany, Deutsche Welle | 21675af | | |
| 0700 | 0800 | | Germany, Deutsche Welle | 6140eu | | |
| 0700 | 0800 | vl | Ghana, Ghana BC Corp | 3366do | 4915do | |
| 0700 | 0800 | | Guyana, Voice of | 3291do | 5950do | |
| 0700 | 0800 | DRM | Kuwait, Radio | 15110as | | |
| 0700 | 0800 | | Kuwait, Radio | 15110as | | |
| 0700 | 0800 | | Liberia, ELWA | 4760do | | |
| 0700 | 0800 | | Malaysia, Radio Malaysia Kota Kinabalu | | 5979do | |
| 0700 | 0800 | | Malaysia, RTM Radio 4 | 7295do | | |
| 0700 | 0800 | | Malaysia, Voice of | 6175as | 9665as | 9750os 15295au |
| 0700 | 0800 | | Myanmar, Radio | 9730do | | |
| 0700 | 0800 | | Nigeria, Radio Enugu | 6025do | | |
| 0700 | 0800 | | Nigeria, Radio/Ibadan | 6050do | | |
| 0700 | 0800 | | Nigeria, Radio/Kaduna | 4770do | 6090do | |
| 0700 | 0800 | | Nigeria, Radio/Lagos | 3326do | 4990do | |
| 0700 | 0800 | | Nigeria, Voice of | 17800of | | |
| 0700 | 0800 | | Papua New Guinea, NBC | 4890do | 9675irr | |
| 0700 | 0800 | | Russia, Voice of | 21790pa | | |
| 0700 | 0800 | | Sierra Leone, Radio UNAMSIL | 6139af | | |
| 0700 | 0800 | | Singapore, Mediacorp Radio | 6150do | | |
| 0700 | 0800 | vl | Solomon Islands, SIBC | 5020do | 9545do | |
| 0700 | 0800 | | South Africa, Channel Africa | 9525af | | |
| 0700 | 0800 | | Swaziland, TWR | 7205af | 9500af | |
| 0700 | 0800 | | Taiwan, Radio Taiwan Intl | 5950na | | |
| 0700 | 0800 | | UK, BBC World Service | 6190af | 6195eu | 9410eu 11760me 11765af 11940af 11955as 12095eu 15310as 15360os 15400af 15485eu 15565eu 17640eu 17760as 17790as 21660as |
| 0700 | 0800 | | USA, Armed Forces Radio | 4319usb | 5446usb | 5765usb 6350usb 7507usb 10320usb 12133usb 12579usb 13362usb 13855usb |
| 0700 | 0800 | | USA, KTBN Salt Lake City UT | 7505na | | |
| 0700 | 0800 | | USA, KWHR Naalehu HI | 11565pa | 17780as | |
| 0700 | 0800 | m | USA, WBCQ Kennebunk ME | 5105na | | |
| 0700 | 0800 | | USA, WBCQ Kennebunk ME | 7415na | | |
| 0700 | 0800 | | USA, WBOH Newport NC | 5920am | | |
| 0700 | 0800 | | USA, WEWN Birmingham AL | 5825na | 7570va | |
| 0700 | 0800 | | USA, WHRA Greenbush ME | 7580af | | |
| 0700 | 0800 | | USA, WHRI Noblesville IN | 5745va | 7315am | |
| 0700 | 0800 | mtwhf | USA, WMLK Bethel PA | 9465eu | | |
| 0700 | 0800 | | USA, WRMI Miami FL | 7385na | | |
| 0700 | 0800 | th | USA, WSHB Cypress Creek SC | 7535af | | |
| 0700 | 0800 | mtwhas | USA, WSHB Cypress Creek SC | 9845pa | | |
| 0700 | 0800 | | USA, WTJC Newport NC | 9370na | | |
| 0700 | 0800 | | USA, WWCR Nashville TN | 3210na | 5070na | 5935na 7560na |
| 0700 | 0800 | vl | Vanuatu, Radio | 3945al | 4960do | 7260irr |
| 0700 | 0800 | | Zambia, Radio Christian Voice | 9865do | | |
| 0705 | 0720 | | UK, BBC World Service | 6005af | | |
| 0715 | 0730 | | UK, BBC World Service | 15575me | | |
| 0730 | 0745 | mtwhf | Vatican City, Vatican Radio | 4005eu | 5890eu | 6185eu 7250eu 9645va 11740eu 15595va |
| 0730 | 0800 | | Australia, HCJB | 11750pa | | |
| 0730 | 0800 | | Bulgaria, Radio | 11600eu | 13600eu | |
| 0730 | 0800 | as | Guam, TWR/KTWR | 15205as | | |
| 0730 | 0800 | | Switzerland, Swiss Radio Intl | 9885af | 13790af | 17665af |
| 0730 | 0800 | as | UK, BBC World Service | 15575me | 17885af | |
| 0740 | 0800 | mtwhf | Guam, TWR/KTWR | 15205as | | |
| 0745 | 0800 | as | Albania, TWR | 12070eu | | |
| 0745 | 0800 | | Guam, TWR/KTWR | 15330as | | |
| 0745 | 0800 | as | Monaco, TWR | 9870eu | | |
| 0755 | 0800 | mtwhf | Albania, TWR | 12070eu | | |
| 0755 | 0800 | mtwhf | Monaco, TWR | 9870eu | | |

# Shortwave Guide

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0800 | 0804 | | Pakistan, Radio | 17835eu | 21465eu | |
| 0800 | 0825 | | Malaysia, Voice of | 6175as | 9665as | 9750as |
| | | | 15295au | | | |
| 0800 | 0827 | | Czech Rep, Radio Prague Intl | | 7345eu | 9880eu |
| 0800 | 0829 | | Belgium, Radio Vlaanderen Intl | | 5965eu | |
| 0800 | 0830 | | Australia, ABC NT Katherine | | 5025do | |
| 0800 | 0830 | | Australia, ABC NT Tennant Creek | | 4910do | |
| 0800 | 0830 | | Malaysia, Radio Malaysia Kota Kinabalu | | | 5979do |
| 0800 | 0830 | | Myanmar, Radio | 9730do | | |
| 0800 | 0850 | a | Monaco, TWR | 9870eu | | |
| 0800 | 0900 | smtwhf | Albania, TWR | 12070eu | | |
| 0800 | 0900 | | Anguilla, Caribbean Beacon | | 6090am | |
| 0800 | 0900 | | Australia, ABC NT Alice Springs | | 2310irr | 4835do |
| 0800 | 0900 | | Australia, HCJB | 11750pa | | |
| 0800 | 0900 | | Australia, Radio | 5995na | 9580va | 9590as |
| | | | 9710pa | 12080va | 13630as | 15240va |
| | | | 15415as | | | |
| 0800 | 0900 | mtwhf | Bhutan, Bhutan BC Service | | 5030al | 6035do |
| 0800 | 0900 | vl | Botswana, Radio | 4820do | 4830al | 7255do |
| 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 | | 5030am | 6150am |
| | | | 7375am | 9725sa | 11870am | 13750na |
| | | | 17645as | | | |
| 0800 | 0900 | | Eqt Guinea, Radio Africa | | 15184af | |
| 0800 | 0900 | 1st a/month | Finland, Scandinavian Weekend Radio | | | 6170eu |
| | | | 11690eu | | | |
| 0800 | 0900 | | Germany, Bible Voice Broadcasting | | | 5975eu |
| 0800 | 0900 | | Germany, Deutsche Welle | | 6140eu | |
| 0800 | 0900 | DRM | Germany, Deutsche Welle | | 15440af | 21675af |
| 0800 | 0900 | vl | Ghana, Ghana BC Corp | | 3366do | 4915do |
| 0800 | 0900 | as | Guam, TWR/KTWR | 15205as | | |
| 0800 | 0900 | | Guam, TWR/KTWR | 15330as | | |
| 0800 | 0900 | mtwhf | Guam, TWR/KTWR | 15205as | | |
| 0800 | 0900 | | Guyana, Voice of | 3291do | 5950do | |
| 0800 | 0900 | | Indonesia, Voice of | 9525pa | 15150as | |
| 0800 | 0900 | | Liberia, ELWA | 4760do | | |
| 0800 | 0900 | m-f/ DRM | Luxembourg, RTL Radio Lutzebuerg | | | 6095eu |
| 0800 | 0900 | | Malaysia, RTM Radio 4 | | 7295do | |
| 0800 | 0900 | mtwhfs | Monaco, TWR | 9870eu | | |
| 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 | 17800af | | |
| 0800 | 0900 | | Papua New Guinea, NBC | | 4890do | 9675irr |
| 0800 | 0900 | | Russia, Voice of | 17495pa | 17525pa | 17665pa |
| | | | 21790pa | | | |
| 0800 | 0900 | | Sierra Leone, Radio UNAMSIL | | 6139af | |
| 0800 | 0900 | | Singapore, Mediacorp Radio | | 6150do | |
| 0800 | 0900 | vl | Solomon Islands, SIBC | | 5020do | 9545do |
| 0800 | 0900 | s | South Africa, Amateur Radio League | | | 9750af |
| | | | 17780af | | | |
| 0800 | 0900 | a | South Africa, Radio League | | 9750af | 17780af |
| 0800 | 0900 | | South Korea, Radio Korea Intl | | 9570as | 13670eu |
| 0800 | 0900 | | Swaziland, TWR | 7205af | 9500af | |
| 0800 | 0900 | | Taiwan, Radio Taiwan Intl | | 9610au | |
| 0800 | 0900 | | UK, BBC World Service | | 6190af | 9410eu |
| | | | 11760me | 11940af | 11955as | 12095eu |
| | | | 15310as | 15360as | 15400af | 15485eu |
| | | | 15565eu | 17640eu | 17760as | 17790as |
| | | | 17830af | 17885af | 21470af | 21660as |
| 0800 | 0900 | as | UK, BBC World Service | | 15575me | |
| 0800 | 0900 | | USA, Armed Forces Radio | | 4319usb | 5446usb |
| | | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb | 13855usb |
| 0800 | 0900 | | USA, KNLS Anchor Point AK | | 9795as | |
| 0800 | 0900 | | USA, KTBN Salt Lake City UT | | 7505na | |
| 0800 | 0900 | | USA, KWHR Naalehu HI | | 9930as | 11565pa |
| 0800 | 0900 | | USA, WBOH Newport NC | | 5920am | |
| 0800 | 0900 | | USA, WEWN Birmingham AL | | 5825na | |
| 0800 | 0900 | | USA, WHRI Noblesville IN | | 5745va | 7315am |
| 0800 | 0900 | | USA, WJIE Louisville KY | | 13595am | |
| 0800 | 0900 | mtwhf | USA, WMLK Bethel PA | | 9465eu | |
| 0800 | 0900 | | USA, WRMI Miami FL | | 7385na | |
| 0800 | 0900 | as | USA, WSHB Cypress Creek SC | | 7535eu | 9845pa |
| 0800 | 0900 | | USA, WTJC Newport NC | | 9370na | |
| 0800 | 0900 | | USA, WWCR Nashville TN | | 3210na | 5070na |
| | | | 5935na | 7560na | | |
| 0800 | 0900 | | USA, WYFR Okeechobee FL | | 9985eu | |
| 0800 | 0900 | vl | Vanuatu, Radio | 3945al | 4960do | 7260irr |
| 0800 | 0900 | | Zambia, Radio Christian Voice | | 9865do | |
| 0815 | 0900 | as | Guam, TWR/KTWR | 15330as | | |
| 0830 | 0900 | | Australia, ABC NT Katherine | | 2485do | |
| 0830 | 0900 | | Australia, ABC NT Tennant Creek | | 2325do | |
| 0830 | 0900 | | Austria, AWR Europe | | 9660af | 17670af |
| 0830 | 0900 | | Georgia, Radio Georgia | | 11910eu | |
| 0830 | 0900 | | Switzerland, Swiss Radio Intl | | 21770af | |
| 0840 | 0850 | | Turkmenistan, Turkmen Radio | | 4930do | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 0900 | 0915 | as | Germany, Bible Voice Broadcasting | | | 5975eu |
| 0900 | 0915 | vl | Ghana, Ghana BC Corp | | 3366do | 4915do |
| 0900 | 0920 | smtwhf | Albania, TWR | 12070eu | | |
| 0900 | 0920 | s | Monaco, TWR | 9870eu | | |
| 0900 | 0930 | | Austria, AWR Europe | | 17670af | |
| 0900 | 0930 | mtwhf | Guam, TWR/KTWR | 15330as | | |
| 0900 | 0930 | | Guam, TWR/KTWR | 15330as | | |
| 0900 | 0930 | as/vl | Italy, IRRS | 13840va | | |
| 0900 | 0956 | | China, China Radio Intl | | 15210po | 17690pa |
| 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 | 9590as | 11880as |
| | | | 15240va | 15415as | | |
| 0900 | 1000 | | Australia, Voice Intl | 11955as | | |
| 0900 | 1000 | vl | Botswana, Radio | 4820do | 4830al | 7255do |
| 0900 | 1000 | | Canada, CFRX Toronto ON | | 6070do | |
| 0900 | 1000 | | Canada, CFVP Calgary AB | | 6030do | |
| 0900 | 1000 | | Canada, CKZN St John's NF | | 6160do | |
| 0900 | 1000 | | Canada, CKZU Vancouver BC | | 6160do | |
| 0900 | 1000 | | Costa Rica, University Network | | 5030am | 6150am |
| | | | 7375am | 9725sa | 11870am | 13750na |
| | | | 17645as | | | |
| 0900 | 1000 | | Eqt Guinea, Radio Africa | | 15184af | |
| 0900 | 1000 | 1st a/month | Finland, Scandinavian Weekend Radio | | | 6170eu |
| | | | 11690eu | | | |
| 0900 | 1000 | DRM mtwhf | Germany, Deutsche Welle | | 17700af | |
| 0900 | 1000 | | Germany, Deutsche Welle | | 6140eu | 15440af |
| 0900 | 1000 | DRM | Germany, Deutsche Welle | | 21675af | |
| 0900 | 1000 | | Guyana, Voice of | 3291do | 5950do | |
| 0900 | 1000 | m-f/ DRM | Luxembourg, RTL Radio Lutzebuerg | | | 6095eu |
| 0900 | 1000 | | Malaysia, RTM Radio 4 | | 7295do | |
| 0900 | 1000 | | New Zealand, Radio NZ Intl | | 9885pa | |
| 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 | 17800af | | |
| 0900 | 1000 | | Palua, KHBN | 15725as | | |
| 0900 | 1000 | | Papua New Guinea, NBC | | 4890do | 9675irr |
| 0900 | 1000 | | Russia, Voice of | 17495pa | 17525pa | 17665pa |
| 0900 | 1000 | | Singapore, Mediacorp Radio | | 6150do | |
| 0900 | 1000 | vl | Solomon Islands, SIBC | | 5020do | 9545do |
| 0900 | 1000 | s | UAE, Radio UNMEE | 21460af | | |
| 0900 | 1000 | | UK, BBC World Service | | 6190af | 6195as |
| | | | 9605as | 9740as | 11760me | 11940af | 12095eu |
| | | | 15190sa | 15310as | 15360as | 15400af |
| | | | 15485eu | 15565eu | 15575me | 17640eu |
| | | | 17760as | 17790as | 17830af | 17885af |
| | | | 21470af | 21660as | | |
| 0900 | 1000 | | USA, Armed Forces Radio | | 4319usb | 5446usb |
| | | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb | 13855usb |
| 0900 | 1000 | | USA, KTBN Salt Lake City UT | | 7505na | |
| 0900 | 1000 | | USA, KWHR Naalehu HI | | 9930as | 11565pa |
| 0900 | 1000 | | USA, WBOH Newport NC | | 5920am | |
| 0900 | 1000 | | USA, WEWN Birmingham AL | | 5825na | |
| 0900 | 1000 | | USA, WHRA Greenbush ME | | 7580af | |
| 0900 | 1000 | | USA, WHRI Noblesville IN | | 5745va | 7315am |
| 0900 | 1000 | | USA, WJIE Louisville KY | | 13595am | |
| 0900 | 1000 | | USA, WRMI Miami FL | | 7385na | |
| 0900 | 1000 | | USA, WTJC Newport NC | | 9370na | |
| 0900 | 1000 | | USA, WWCR Nashville TN | | 3210na | 5070na |
| | | | 5935na | 7560na | | |
| 0900 | 1000 | vl | Vanuatu, Radio | 3945al | 4960do | 7260irr |
| 0900 | 1000 | | Zambia, Radio Christian Voice | | 9865do | |
| 0910 | 0930 | s | Armenia, Voice of | 4810eu | 15270as | |
| 0930 | 1000 | | Georgia, Radio Georgia | | 11910me | |
| 0930 | 1000 | | Greece, Voice of | 9420eu | 12105eu | 15630eu |
| 0930 | 1000 | | Lithuania Radio Vilnius | | 9710eu | |
| 0945 | 1000 | | Serbio & Montenegro, Intl Radio | | 9850eu | |

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

| | | | | | | |
|---|---|---|---|---|---|---|
| 1000 | 1027 | | Vietnam, Voice of | 9840as | 12020as | |
| 1000 | 1029 | | Czech Rep, Radio Prague Intl | | 21745va | |
| 1000 | 1030 | | Germany, Deutsche Welle | | 6205as | 15190as |
| | | | 17820as | | | |
| 1000 | 1030 | DRM | Germany, Deutsche Welle | | 6140eu | 15440eu |
| 1000 | 1030 | | Guam, AWR/KSDA | 11705as | 11900as | |
| 1000 | 1030 | | Mongolia, Voice of | 12015as | | |
| 1000 | 1030 | | UK, BBC World Service | | 9605as | 15360as |
| 1000 | 1030 | as | UK, BBC World Service | | 15190sa | 15400af |
| | | | 17830af | | | |
| 1000 | 1030 | | UK, RTE Radio | 15280au | | |
| 1000 | 1045 | | USA, KWHR Naalehu HI | | 9930as | 11565pa |
| 1000 | 1055 | | Netherlands, Radio | 7315as | 9785au | 12065as |
| | | | 12070pa | 12080pa | 13820as | 15595pa |
| 1000 | 1055 | DRM | Netherlands, Radio | 9850pa | | |
| 1000 | 1056 | | China, China Radio Intl | | 15210pa | 17690pa |
| 1000 | 1056 | | North Korea, Voice of | | 3560as | 9335am |

| | | | | | |
|---|---|---|---|---|---|
| | | | 9850as 11709am 11735as | | |
| 1000 | 1059 | | New Zealand, Radio NZ Intl | 9885po | |
| 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 9580va 15240va | 9590as 15415as | 11880as |
| 1000 | 1100 | | Australia, Voice Intl 11955as | 13685as | |
| 1000 | 1100 | as | Bhutan, Bhutan BC Service | 5030al | 6035do |
| 1000 | 1100 | | Canada, CFRX Toronto ON | 6070do | |
| 1000 | 1100 | | Canada, CFVP Calgary AB | 6030do | |
| 1000 | 1100 | | Canada, CKZN St John's NF | 6160do | |
| 1000 | 1100 | | Canada, CKZU Vancouver BC | 6160do | |
| 1000 | 1100 | | Costa Rica, University Network 7375am 9725sa 17645as | 5030am 11870am | 6150am 13750na |
| 1000 | 1100 | | Eqt Guinea, Radio Africa | 15184af | |
| 1000 | 1100 | 1st a/month | Finland, Scandinavian Weekend Radio 11720eu | | 6170eu |
| 1000 | 1100 | mtwhf | Germany, Deutsche Welle | 17700vo | |
| 1000 | 1100 | | Guyana, Voice of 3291do | 5949do | |
| 1000 | 1100 | | India, All India Radio 15020os 15235os 17800as 17895au | 7270as 15260as | 13710as 17510au |
| 1000 | 1100 | as/vl | Italy, IRRS 13840va | | |
| 1000 | 1100 | | Japan, Radio 6120no 17585eu 21755pa | 9695as | 11730as |
| 1000 | 1100 | m-f/ DRM | Luxembourg, RTL Radio Lutzebuerg | | 6095eu |
| 1000 | 1100 | | Malaysia, RTM Radio 4 | 7295do | |
| 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, Radio Veritas | 7240af | |
| 1000 | 1100 | | UK, BBC World Service 9740as 11760me 15310as 15485eu 17640eu 17760as | 6190af 12095eu 15565eu 17790as | 6195va 15190sa 15575me 17830af |
| 1000 | 1100 | | USA, Armed Forces Radio 5765usb 12133usb | 4319usb 6350usb 12579usb | 5446usb 7507usb 13362usb 10320usb 13855usb |
| 1000 | 1100 | | USA, KTBN Salt Lake City UT | 7505na | |
| 1000 | 1100 | | USA, WBOH Newport NC | 5920am | |
| 1000 | 1100 | | USA, WEWN Birmingham AL | 5825na | |
| 1000 | 1100 | | USA, WHRI Noblesville IN | 9495am | 9840na |
| 1000 | 1100 | | USA, WJIE Louisville KY | 13595am | |
| 1000 | 1100 | | USA, WRMI Miami FL | 9955am | |
| 1000 | 1100 | a | USA, WSHB Cypress Creek SC | 9455am | |
| 1000 | 1100 | | USA, WTJC Newport NC | 9370na | |
| 1000 | 1100 | | USA, WWCR Nashville TN 7560na 9475no | 5070na | 5935na |
| 1000 | 1100 | | USA, WYFR Okeechobee FL | 5950no | |
| 1000 | 1100 | mtwhfa.vl | Vanuatu, Radio 3945al | 4960do | 7260irr |
| 1000 | 1100 | | Zambia, Radio Christian Voice | 9865do | |
| 1030 | 1045 | mtwhf | Ethiopia, Radio 5990do | 7110do | 9704do |
| 1030 | 1100 | | Germany, Deutsche Welle | 15440vo | |
| 1030 | 1100 | DRM | Germany, Deutsche Welle | 6140eu | 15440eu |
| 1030 | 1100 | | Guam, AWR/KSDA 11900as | | |
| 1030 | 1100 | | Iran, Voice of the Islamic Rep 21470as | 15550as | 15480as |
| 1030 | 1100 | | UAE, Radio Dubai 13675eu 21605eu | 15435eu | 17865eu |
| 1030 | 1100 | t | UAE, Radio UNMEE 21550af | | |
| 1030 | 1100 | | UK, BBC World Service 15285as 21660as | 9605as | 11945as |
| 1030 | 1100 | as | UK, BBC World Service | 15400af | 17830af |
| 1030 | 1100 | mt hfa | Vatican City, Vatican Radio | 5890eu | |
| 1045 | 1100 | | USA, KWHR Naalehu HI | 9930as | |
| 1045 | 1100 | as | USA, KWHR Naalehu HI | 11565pa | |

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

| | | | | | |
|---|---|---|---|---|---|
| 1100 | 1104 | | Pakistan, Radio 17835eu | 21465eu | |
| 1100 | 1115 | mtwhfa.vl | Vanuatu, Radio 3945al | 4960do | 7260irr |
| 1100 | 1127 | | Vietnam, Voice of 7285as | | |
| 1100 | 1130 | | Australia, HCJB 11750pa | | |
| 1100 | 1130 | as | Bhutan, Bhutan BC Service | 5030al | 6035do |
| 1100 | 1130 | | Iran, Voice of the Islamic Rep 21470as | 15550as | 15480os |
| 1100 | 1130 | | Tajikistan, Tajik Radio | 7245as | |
| 1100 | 1130 | | Tibet, Xizang PBS 4905as 7385as 9490as | 4920os | 6200as |
| 1100 | 1130 | t | UAE, Radio UNMEE 21550af | | |
| 1100 | 1130 | | UK, BBC World Service | 15400af | |
| 1100 | 1130 | mtwhf | UK, BBC World Service | 6195ca | 15190ca |
| 1100 | 1155 | DRM | Netherlands, Radio 21780eu | | |
| 1100 | 1155 | | Netherlands, Radio 9850va | | |
| 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 9475as 9580va | 6020pa 9590as | 6035va 11880as 15240va |
| 1100 | 1200 | | Australia, Voice Intl 13685as | | |
| 1100 | 1200 | | Canada, CFRX Toronto ON | 6070do | |
| 1100 | 1200 | | Canada, CFVP Calgary AB | 6030da | |
| 1100 | 1200 | | Canada, CKZN St John's NF | 6160do | |
| 1100 | 1200 | | Canada, CKZU Vancouver BC | 6160do | |
| 1100 | 1200 | | Costa Rica, University Network 7375am 9725sa 17645as | 5030am 11870am | 6150am 13750na |
| 1100 | 1200 | | Ecuador, HCJB 21455va | | |
| 1100 | 1200 | 1st a/month | Finland, Scandinavian Weekend Radio 11720eu | | 6170eu |
| 1100 | 1200 | | Germany, Deutsche Welle | 17670as | 21650as |
| 1100 | 1200 | DRM | Germany, Deutsche Welle | 6140eu | 15440eu |
| 1100 | 1200 | DRM mtwhf | Germany, Deutsche Welle | 17710af | |
| 1100 | 1200 | s | Germany, Overcomer Ministries | 6110eu | |
| 1100 | 1200 | as/vl | Italy, IRRS 13840va | | |
| 1100 | 1200 | | Japan, Radio 6120na | 9695as | 11730as |
| 1100 | 1200 | m-f/ DRM | Luxembourg, RTL Radio Lutzebuerg | | 6095eu |
| 1100 | 1200 | | Malaysia, RTM Radio 4 | 7295do | |
| 1100 | 1200 | | New Zealand, Radio NZ Intl | 15530pa | |
| 1100 | 1200 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 1100 | 1200 | | Singapore, Radio Singapore Intl | 6150as | 9600as |
| 1100 | 1200 | | South Africa, Channel Africa | 9525af | |
| 1100 | 1200 | | South Africa, Radio Veritas | 7240af | |
| 1100 | 1200 | | Taiwan, Radio Taiwan Intl | 7445as | |
| 1100 | 1200 | | UK, BBC World Service 9740as 11760me 15310as 15485eu 17640eu 17885af | 6190af 11940af 15565eu 17760as | 6195va 12095eu 15190am 15575me 17790as 17830af 21470of |
| 1100 | 1200 | | USA, Armed Forces Radio 5765usb 12133usb | 4319usb 6350usb 12579usb | 5446usb 7507usb 13362usb 10320usb 13855usb |
| 1100 | 1200 | | USA, KTBN Salt Lake City UT | 7505na | |
| 1100 | 1200 | as | USA, KWHR Naalehu HI | 11565po | |
| 1100 | 1200 | | USA, KWHR Naalehu HI | 9930as | |
| 1100 | 1200 | | USA, WBOH Newport NC | 5920am | |
| 1100 | 1200 | | USA, WEWN Birmingham AL | 5825na | |
| 1100 | 1200 | | USA, WHRI Noblesville IN | 9495am | 9840na |
| 1100 | 1200 | | USA, WINB Red Lion PA | 9320am | |
| 1100 | 1200 | | USA, WJIE Louisville KY | 13595am | |
| 1100 | 1200 | | USA, WRMI Miami FL | 9955am | |
| 1100 | 1200 | fas | USA, WSHB Cypress Creek SC | 6095am | |
| 1100 | 1200 | | USA, WTJC Newport NC | 9370na | |
| 1100 | 1200 | | USA, WWCR Nashville TN 7560na 15825na | 5070na | 5935na |
| 1100 | 1200 | | USA, WYFR Okeechobee FL 9555sa 11725sa 11830na | 5950na | 7355na |
| 1100 | 1200 | | Zambia, Radio Christian Voice | 9865do | |
| 1110 | 1120 | | Israel, Kol Isroel 15640va | 17545va | |
| 1115 | 1145 | | Nepal, Radio 3230as 7164as | 5005as | 6100as |
| 1130 | 1145 | | Germany, Bible Voice Broadcasting | | 13590as |
| 1130 | 1145 | | UK, BBC World Service | 7135as | 11920as |
| 1130 | 1157 | | Czech Rep, Radio Prague Intl | 11640eu | 21745va |
| 1130 | 1159 | | Belgium, Radio Vlaanderen Intl | 9945as | |
| 1130 | 1200 | | Iran, Voice of the Islamic Rep | 6035na | 9835na |
| 1130 | 1200 | | South Korea, Radio Korea Intl | 9650na | |
| 1130 | 1200 | a | UK, Wales Radio Intl 17625au | | |
| 1130 | 1200 | f | Vatican City, Vatican Radio | 15595va | 17515va |
| 1145 | 1155 | | Rwanda, Radio 6055do | | |
| 1145 | 1200 | | Germany, Bible Voice Broadcasting | | 13590as |

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

| | | | | | |
|---|---|---|---|---|---|
| 1200 | 1215 | vl | Cambodia, National Radio Of | 11940as | |
| 1200 | 1230 | | France, Radio France Intl | 17815af | 25820af |
| 1200 | 1230 | | Iran, Voice of the Islamic Rep | 6035na | 9835na |
| 1200 | 1230 | | South Korea, Radio Korea Intl | 9650na | |
| 1200 | 1230 | | UAE, AWR Africa 15135as | | |
| 1200 | 1230 | as | UK, BBC World Service | 6195ca | 15190am |
| 1200 | 1230 | | Uzbekistan, Radio Tashkent Intl 6025as 9715as | 5060as | 5975as |
| 1200 | 1255 | | Netherlands, Radio 5965na | | |
| 1200 | 1255 | DRM | Netherlands, Radio 21780eu | | |
| 1200 | 1256 | | China, China Radio Intl 11760po | 9730as 11980os | 9760pa 15415pa |
| 1200 | 1259 | | Canada, Radio Canada Intl | 9795as | 11730as |
| 1200 | 1259 | | New Zealand, Radio NZ Intl | 15530pa | |
| 1200 | 1300 | | Anguilla, Caribbean Beacon | 11775am | |
| 1200 | 1300 | | Australia, ABC NT Alice Springs | 2310do | 4835irr |
| 1200 | 1300 | | Australia, ABC NT Katherine | 2485do | |
| 1200 | 1300 | | Australia, ABC NT Tennant Creek | 2325do | |
| 1200 | 1300 | | Australia, Radio 5995pa 9475as 9580va | 6020pa 9590as | 6035va 11880as 15240va |
| 1200 | 1300 | | Australia, Voice Intl 13685as | | |
| 1200 | 1300 | | Canada, CBC Northern Service | 9625do | |
| 1200 | 1300 | | Canada, CFRX Toronto ON | 6070do | |
| 1200 | 1300 | | Canada, CFVP Calgary AB | 6030do | |
| 1200 | 1300 | | Canada, CKZN St John's NF | 6160do | |
| 1200 | 1300 | | Canada, CKZU Vancouver BC | 6160do | |
| 1200 | 1300 | | Costa Rica, University Network 7375am 9725sa 17645as | 5030am 11870am | 6150am 13750na |
| 1200 | 1300 | | Ecuador, HCJB 21455va | | |
| 1200 | 1300 | 1st a/month | Finland, Scandinavian Weekend Radio 11720eu | | 6170eu |
| 1200 | 1300 | DRM | Germany, Deutsche Welle | 9655eu | 15440eu |
| 1200 | 1300 | | Germany, Overcomer Ministries | 6110eu | |

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|---|---|---|---|---|---|---|---|
| 1200 | 1300 | as/vl | Italy, IRRS | 13840va | | | |
| 1200 | 1300 | m-f/ DRM | Luxembourg, RTL Radio Lutzebuerg | | | 6095eu | |
| 1200 | 1300 | | Malaysia, RTM Radio 4 | 7295do | | | |
| 1200 | 1300 | | Papua New Guinea, NBC | 4890do | | 9675irr | |
| 1200 | 1300 | | Singapore, Radio Singapore Intl | 6150as | | 9600as | |
| 1200 | 1300 | | South Africa, Channel Africa | 9525af | | | |
| 1200 | 1300 | | South Africa, Radio Veritas | 7240af | | | |
| 1200 | 1300 | | Taiwan, Radio Taiwan Intl | 7130as | | | |
| 1200 | 1300 | | UK, BBC World Service | 6190af | | 6195as | |
| | | | 9740as 11760me | 11940af | | 12095eu | 15310as |
| | | | 15485eu | 15565eu | | 15575me | 17640eu |
| | | | 17760as | 17790as | | 17830af | 17885af |
| | | | 21470af | | | | |
| 1200 | 1300 | | Ukraine, Radio Ukraine Intl | 15520eu | | | |
| 1200 | 1300 | | USA, Armed Forces Radio | 4319usb | | 5446usb | |
| | | | 5765usb | 6350usb | | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | | 13362usb | 13855usb |
| 1200 | 1300 | | USA, KTBN Salt Lake City UT | 7505na | | | |
| 1200 | 1300 | | USA, KWHR Naalehu HI | 9930as | | | |
| 1200 | 1300 | as | USA, KWHR Naalehu HI | 11565pa | | | |
| 1200 | 1300 | | USA, Voice of America | 6110va | | 9645va | |
| | | | 9760va | 11705va | | 11715va | 15250va |
| | | | 15425va | | | | |
| 1200 | 1300 | | USA, WBOH Newport NC | 5920am | | | |
| 1200 | 1300 | | USA, WEWN Birmingham AL | 5825na | | | |
| 1200 | 1300 | | USA, WHRI Noblesville IN | 9495am | | 9840no | |
| 1200 | 1300 | | USA, WINB Red Lion PA | 9320am | | | |
| 1200 | 1300 | | USA, WJIE Louisville KY | 13595am | | | |
| 1200 | 1300 | | USA, WRMI Miami FL | 15725na | | | |
| 1200 | 1300 | a | USA, WSHB Cypress Creek SC | 9455am | | | |
| 1200 | 1300 | | USA, WTJC Newport NC | 9370na | | | |
| 1200 | 1300 | | USA, WWCR Nashville TN | 5070na | | 5935na | |
| | | | 7560na | 15825na | | | |
| 1200 | 1300 | | USA, WYFR Okeechobee FL | 5950na | | 7355na | |
| | | | 11830na | 11970na | | 13695na | |
| 1200 | 1300 | | Zambia, Radio Christian Voice | 9865do | | | |
| 1215 | 1245 | m | Germany, Bible Voice Broadcasting | | | 13590as | |
| 1215 | 1300 | | Egypt, Radio Cairo | 15445al | | 17670as | |
| 1230 | 1245 | | UK, BBC World Service | 15425af | | 17780af | |
| | | | 21640af | | | | |
| 1230 | 1257 | | Vietnam, Voice of | 9840as | | 12020as | |
| 1230 | 1300 | | Australia, HCJB | 15390pa | | | |
| 1230 | 1300 | | Bangladesh, Bangla Betar | 7185as | | 9550as | |
| 1230 | 1300 | | Bulgario, Radio | 11700eu | | 15700eu | |
| 1230 | 1300 | | Sri Lanka, SLBC | 6005as | | 9770as | 15745as |
| 1230 | 1300 | | Thailand, Radio | 9810as | | | |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1300 | 1330 | | Ecuador, HCJB | 21455va | | | |
| 1300 | 1330 | | Egypt, Radio Cairo | 15445al | | 17670as | |
| 1300 | 1355 | | Poland, Radio Polonia | | | 9525eu | 11820eu |
| 1300 | 1356 | | China, China Radio Intl | | | 9570na | 9755po |
| | | | 11760pa | 11900as | | 11980as | 15180as |
| 1300 | 1356 | | North Korea, Voice of | | | 4405as | 7505eu |
| | | | 9335na | 11335eu | | 11710am | |
| 1300 | 1356 | | Romania, Radio Romania Intl | | | 15105eu | 17745eu |
| 1300 | 1400 | | Anguilla, Caribbean Beacon | | | 11775am | |
| 1300 | 1400 | | Australia, HCJB | 15390pa | | | |
| 1300 | 1400 | | Australia, Radio | 5995pa | | 6020pa | 6035va |
| | | | 9580va | 9590as | | | |
| 1300 | 1400 | | Australia, Voice Intl | 13685as | | | |
| 1300 | 1400 | | Canada, CBC Northern Service | | | 9625do | |
| 1300 | 1400 | | Canada, CFRX Toronto ON | | | 6070do | |
| 1300 | 1400 | | Canada, CFVP Calgary AB | | | 6030do | |
| 1300 | 1400 | | Canada, CKZN St John's NF | | | 6160do | |
| 1300 | 1400 | | Canada, CKZU Vancouver BC | | | 6160do | |
| 1300 | 1400 | mtwhf | Canada, Radio Canada Intl | | | 9515am | 13655am |
| | | | 17820am | | | | |
| 1300 | 1400 | | Costa Rica, University Network | | | 5030am | 6150am |
| | | | 7375am | 9725sa | | 11870am | 13750na |
| | | | 17645as | | | | |
| 1300 | 1400 | 1st a/month | Finland, Scandinavian Weekend Radio | | | | 6170eu |
| | | | 11720eu | | | | |
| 1300 | 1400 | | Germany, Deutsche Welle | | | 6140eu | 9655va |
| | | | 15440va | | | | |
| 1300 | 1400 | | Germany, Overcomer Ministries | | | 6110eu | 13810me |
| 1300 | 1400 | as/vl | Italy, IRRS | 13840va | | | |
| 1300 | 1400 | | Jordan, Radio | 11690eu | | | |
| 1300 | 1400 | m-f/ DRM | Luxembourg, RTL Radio Lutzebuerg | | | | 6095eu |
| 1300 | 1400 | | Malaysia, RTM Radio 4 | 7295do | | | |
| 1300 | 1400 | | New Zealand, Radio NZ Intl | 9870po | | | |
| 1300 | 1400 | | Papua New Guinea, NBC | 4890do | | 9675 rr | |
| 1300 | 1400 | | Singapore, Radio Singapore Intl | 6150as | | 9600as | |
| 1300 | 1400 | | South Africa, Radio Veritas | 7240af | | | |
| 1300 | 1400 | | South Korea, Radio Korea Intl | 9570as | | 13670as | |
| 1300 | 1400 | | Sri Lanka, SLBC | 6005as | | 9770as | 15745as |
| 1300 | 1400 | | UK, BBC World Service | 6190af | | 6195va | |
| | | | 9740as 11760me | 11940af | | 12095eu | 15190am |
| | | | 15310as | 15420af | | 15485eu | 15565eu |
| | | | 15575me | 17640eu | | 17760as | 17790as |
| | | | 17830af | 17885af | | 21470af | |
| 1300 | 1400 | | USA, Armed Forces Radio | 4319usb | | 5446usb | |
| | | | 5765usb | 6350usb | | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | | 13362usb | 13855usb |
| 1300 | 1400 | | USA, KNLS Anchor Point AK | 9780as | | | |
| 1300 | 1400 | | USA, KTBN Salt Lake City UT | 7505na | | | |
| 1300 | 1400 | | USA, KWHR Naalehu HI | 9930as | | | |
| 1300 | 1400 | | USA, Voice of America | 6110va | | 9760va | |
| | | | 11705va | 15425va | | | |
| 1300 | 1400 | mtwhf | USA, WBCQ Kennebunk ME | 17495na | | | |
| 1300 | 1400 | | USA, WBOH Newport NC | 5920am | | | |
| 1300 | 1400 | | USA, WEWN Birmingham AL | 9955na | | | |
| 1300 | 1400 | | USA, WHRA Greenbush ME | 17560af | | | |
| 1300 | 1400 | | USA, WHRI Noblesville IN | 9840na | | 15105am | |
| 1300 | 1400 | | USA, WINB Red Lion PA | 9930am | | | |
| 1300 | 1400 | | USA, WJIE Louisville KY | 13595am | | | |
| 1300 | 1400 | | USA, WRMI Miami FL | 15725na | | | |
| 1300 | 1400 | as | USA, WSHB Cypress Creek SC | 9430na | | | |
| 1300 | 1400 | f | USA, WSHB Cypress Creek SC | 9455ca | | | |
| 1300 | 1400 | | USA, WTJC Newport NC | 9370na | | | |
| 1300 | 1400 | | USA, WWCR Nashville TN | 5935na | | 7560na | |
| | | | 12160na | 15825na | | | |
| 1300 | 1400 | | USA, WYFR Okeechobee FL | 7355na | | 11560as | |
| | | | 11740na | 11830na | | 11970na | 13695na |
| 1300 | 1400 | | Zambia, Radio Christian Voice | 9865do | | | |
| 1305 | 1315 | mtwhfa | Turkmenistan, Turkmen Radio | 5015do | | | |
| 1305 | 1330 | as | Austria, Radio Austria Intl | 6155eu | | 13730eu | |
| 1315 | 1320 | mtwhf | Austria, Radio Austria Intl | 17855as | | | |
| 1330 | 1345 | | UK, BBC World Service | 15105af | | 21640af | |
| 1330 | 1350 | | UAE, Radio Dubai | 13630eu | | 13675eu | 15395eu |
| | | | 17865eu | 21605eu | | | |
| 1330 | 1357 | | Vietnam, Voice of | 7280eu | | 9730eu | |
| 1330 | 1400 | m th a | Guam, AWR/KSDA | 15660as | | | |
| 1330 | 1400 | | Guam, AWR/KSDA | 11755as | | | |
| 1330 | 1400 | | India, All Indio Radio | | | 9690as | 11620as |
| | | | 13710as | | | | |
| 1330 | 1400 | | Laos, National Radio | 7145as | | | |
| 1330 | 1400 | | Serbia & Montenegro, Intl Radio | 11835au | | | |
| 1330 | 1400 | | Sweden, Radio | 9430va | | 17505va | 18960va |
| 1330 | 1400 | DRM | Sweden, Radio | 9815eu | | | |
| 1330 | 1400 | | Turkey, Voice of | 15155va | | 15195eu | |
| 1330 | 1400 | | UAE, AWR Africa | 9860as | | 15235as | |
| 1330 | 1400 | | Uzbekistan, Radio Tashkent Intl | 6025as | 9715as | 5060as | 5975as |
| 1335 | 1345 | as | Austria, Radio Austria Intl | 6155eu | | 13730eu | |
| 1345 | 1400 | | Austria, Radio Austria Intl | 6155eu | | 13730eu | |
| 1345 | 1400 | mtwhf | Austria, Radio Austria Intl | 17855as | | | |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1400 | 1415 | fa | Germany, Bible Voice Broadcasting | | | | 7485as |
| 1400 | 1415 | | Serbia & Montenegro, Intl Radio | 9445as | | | |
| 1400 | 1415 | mtw | UK, BBC World Service | | | 11860af | 15420af |
| | | | 21490af | | | | |
| 1400 | 1420 | | Turkey, Voice of | 15155as | | 15195eu | |
| 1400 | 1429 | | Czech Rep, Radio Prague Intl | 21745va | | | |
| 1400 | 1430 | | Netherlands, Radio | 12070as | | 12080as | 15595as |
| 1400 | 1430 | | Thailand, Radio | 9560as | | | |
| 1400 | 1456 | | China, China Radio Intl | | | 9755na | 11675as |
| | | | 11765af | | 13685af | 15125na | 17720na |
| 1400 | 1500 | | Anguilla, Caribbean Beacon | | | 11775am | |
| 1400 | 1500 | | Australia, HCJB | 15390pa | | | |
| 1400 | 1500 | | Australia, Radio | 5995va | | 6080po | 7240as |
| | | | 9475as 9590va | 11750as | | | |
| 1400 | 1500 | | Australia, Voice Intl | 13635as | | | |
| 1400 | 1500 | | Canada, CBC Northern Service | | | 9625do | |
| 1400 | 1500 | | Canada, CFRX Toronto ON | | | 6070do | |
| 1400 | 1500 | | Canada, CFVP Calgary AB | | | 6030do | |
| 1400 | 1500 | | Canada, CKZN St John's NF | | | 6160do | |
| 1400 | 1500 | | Canada, CKZU Vancouver BC | | | 6160do | |
| 1400 | 1500 | | Canada, Radio Canada Intl | | | 9515am | 13655am |
| | | | 17820am | | | | |
| 1400 | 1500 | DRM | Canada, Radio Canada Intl | | | 9815eu | |
| 1400 | 1500 | | Costa Rica, University Network | | | 5030am | 6150am |
| | | | 7375am | 9725sa | | 11870am | 13750na |
| | | | 17645as | | | | |
| 1400 | 1500 | 1st a/month | Finland, Scandinavian Weekend Radio | | | | 6170eu |
| | | | 11720eu | | | | |
| 1400 | 1500 | | France, Radio France Intl | | | 7175as | 11610as |
| | | | 17515as | 17620as | | | |
| 1400 | 1500 | | Germany, Deutsche Welle | | | 6140eu | |
| 1400 | 1500 | | Germany, Overcomer Ministries | | | 6110eu | 13810eu |
| | | | 21590sa | | | | |
| 1400 | 1500 | | India, All India Radio | | | 9690as | 11620as |
| | | | 13710as | | | | |
| 1400 | 1500 | | Japan, Radio | 7200as | | 9845as | 11840va |
| | | | 17755va | | | | |
| 1400 | 1500 | | Jordan, Radio | 11690eu | | | |
| 1400 | 1500 | m-f/ DRM | Luxembourg, RTL Radio Lutzebuerg | | | | 6095eu |
| 1400 | 1500 | | New Zealand, Radio NZ Intl | 9870pa | | | |
| 1400 | 1500 | | Oman, Radio | 15140eu | | | |
| 1400 | 1500 | | Singapore, Mediacorp Radio | 6150do | | | |
| 1400 | 1500 | as | South Africa, Channel Africa | 9525af | | | |
| 1400 | 1500 | | Sri Lanka, SLBC | 6005as | | 9770as | 15745as |
| 1400 | 1500 | | Taiwan, Radio Taiwan Intl | 15265as | | | |
| 1400 | 1500 | | UK, BBC World Service | 6190af | | 6195as | |
| | | | 7160as 9740as | 11940af | | 12095eu | 15190am |
| | | | 15310as | 15485eu | | 15565eu | 15575me |
| | | | 17640eu | 17790as | | 17830af | 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 | |
| 1400 | 1500 | | USA, KWHR Naalehu HI | 9930as | |
| 1400 | 1500 | | USA, Voice of America | 6110va | 7125va |
| | | | 9645va 9760va | 11705va | 15205va |
| | | | 15425va | | |
| 1400 | 1500 | mtwhf | USA, WBCQ Kennebunk ME | 17495na | |
| 1400 | 1500 | | USA, WBOH Newport NC | 5920am | |
| 1400 | 1500 | | USA, WEWN Birmingham AL | 9955na | |
| 1400 | 1500 | | USA, WHRA Greenbush ME | 17560af | |
| 1400 | 1500 | | USA, WHRI Noblesville IN | 9840na | 15105am |
| 1400 | 1500 | | USA, WINB Red Lion PA | 9930am | |
| 1400 | 1500 | | USA, WJIE Louisville KY | 13595am | |
| 1400 | 1500 | | USA, WRMI Miami FL | 15725na | |
| 1400 | 1500 | | USA, WTJC Newport NC | 9370na | |
| 1400 | 1500 | | USA, WWCR Nashville TN | 9475na | 12160na |
| | | | 13845na 15825na | | |
| 1400 | 1500 | mtwhf | USA, WWRB Manchester TN | 9320na | 12172na |
| 1400 | 1500 | | USA, WYFR Okeechobee FL | 11560as | 11740na |
| | | | 11830na 17760am | | |
| 1400 | 1500 | | Zambio, Radio Christian Voice | 9865do | |
| 1415 | 1420 | | Nepal, Radio 3230as | 5005as | 6100as |
| | | | 7164as | | |
| 1415 | 1430 | ha | Germany, Bible Voice Broadcasting | | 7485as |
| 1430 | 1445 | s ha | Germany, Bible Voice Broadcasting | | 7485as |
| 1430 | 1500 | s | Germany, Pan American BC | 13605me | |
| 1430 | 1500 | | Myanmar, Radio 5040do | 5985do | |
| 1430 | 1500 | DRM | Netherlands, Radio 9815eu | | |
| 1430 | 1500 | | Netherlands, Radio 12070as | 12080as | 15595as |
| 1430 | 1500 | | Sweden, Radio 17505va | 18960va | |
| 1445 | 1500 | as | Germony, Bible Voice Broadcasting | | 7485as |
| 1445 | 1500 | | Guam, TWR/KTWR 15330as | | |
| 1445 | 1500 | mtwhfa | UK, BBC World Service | 6140as | 7205as |
| | | | 15425as | | |

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

| | | | | | |
|---|---|---|---|---|---|
| 1500 | 1530 | | Mongolia, Voice of 9720as | | |
| 1500 | 1530 | | UK, BBC World Service | 11860af | 15420af |
| | | | 21490af | | |
| 1500 | 1545 | | Guam, TWR/KTWR 15330as | | |
| 1500 | 1555 | | Netherlands, Radio 12070as | 12080as | 15595as |
| 1500 | 1556 | | China, China Radio Intl | 7160as | 9785as |
| | | | 11675as 11765as | 13685af | 15125af |
| | | | 17720na | | |
| 1500 | 1556 | | North Korea, Voice of | 4405as | 7505eu |
| | | | 9335am 11335eu | 11710am | |
| 1500 | 1559 | | Canada, Radio Canada Intl | 9515am | 9635as |
| | | | 11935as 13655am | 17820am | |
| 1500 | 1600 | | Anguilla, Caribbean Beacon | 11775am | |
| 1500 | 1600 | | Australia, HCJB 15390pa | | |
| 1500 | 1600 | | Australia, Radio 5995va | 6080pa | 7240as |
| | | | 9475as9590as 11750as | | |
| 1500 | 1600 | | Australia, Voice Intl 13635as | | |
| 1500 | 1600 | | Canada, CBC Northern Service | 9625do | |
| 1500 | 1600 | | Canada, CFRX Toronto ON | 6070do | |
| 1500 | 1600 | | Canada, CFVP Calgary AB | 6030do | |
| 1500 | 1600 | | Canada, CKZN St John's NF | 6160do | |
| 1500 | 1600 | | Canada, CKZU Vancouver BC | 6160do | |
| 1500 | 1600 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750na |
| | | | 17645as | | |
| 1500 | 1600 | 1st a/month | Finland, Scandinavian Weekend Radio | | 5990eu |
| | | | 11720eu | | |
| 1500 | 1600 | | Germany, Deutsche Welle | 6140eu | |
| 1500 | 1600 | | Germany, Overcomer Ministries | 6110eu | 13810eu |
| | | | 21590sa | | |
| 1500 | 1600 | s | Germany, Pan American BC | 12015me | |
| 1500 | 1600 | | Japan, Radio 7200as | 9505am | 9750as |
| | | | 9845as | | |
| 1500 | 1600 | | Jordan, Radio 11690na | | |
| 1500 | 1600 | m-f/ DRM | Luxembourg, RTL Radio Lutzebuerg | | 6095eu |
| 1500 | 1600 | | Myanmar, Radio 5040do | 5985do | |
| 1500 | 1600 | | New Zealand, Radio NZ Intl | 9870pa | |
| 1500 | 1600 | | Russia, Voice of 6205as | 7260as | 7315as |
| | | | 7350as11500as | | |
| 1500 | 1600 | | Seychelles, FEBA 7340as | | |
| 1500 | 1600 | | Singapore, Mediacorp Radio | 6150do | |
| 1500 | 1600 | | South Africa, Channel Africa | 9525af | 17770af |
| 1500 | 1600 | | Sri Lanka, SLBC 6005as | 9770as | 15745as |
| 1500 | 1600 | | UK, BBC World Service | 5975as | 6190af |
| | | | 6195as7160as 9410eu | 9740as | 11940af |
| | | | 12095eu 15190am | 15310as | 15400af |
| | | | 15485eu 15565eu | 17790as | 17830af |
| | | | 21470af 21660af | | |
| 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 | |
| 1500 | 1600 | | USA, Voice of America | 6110va | 7125va |
| | | | 9575va 9645va | 9760va | 9765va |
| | | | 9825va 15205va | 15395va | 15460va |
| 1500 | 1600 | mtwhf | USA, WBCQ Kennebunk ME | 17495na | |
| 1500 | 1600 | | USA, WBOH Newport NC | 5920am | |
| 1500 | 1600 | | USA, WEWN Birmingham AL | 9955na | |
| 1500 | 1600 | | USA, WHRA Greenbush ME | 17650af | |
| 1500 | 1600 | | USA, WHRI Noblesville IN | 9840na | 15105am |
| 1500 | 1600 | | USA, WINB Red Lion PA | 9930am | |
| 1500 | 1600 | | USA, WJIE Louisville KY | 13595am | |
| 1500 | 1600 | | USA, WRMI Miami FL | 15725na | |
| 1500 | 1600 | | USA, WTJC Newport NC | 9370na | |
| 1500 | 1600 | | USA, WWCR Nashville TN | 9475na | 12160na |
| | | | 13845na 15825na | | |
| 1500 | 1600 | mtwhf | USA, WWRB Manchester TN | 9320na | 12172na |
| 1500 | 1600 | | USA, WYFR Okeechobee FL | 6280as | 11830na |
| | | | 15520as 17760na | | |
| 1500 | 1600 | | Zambia, Radio Christian Voice | 4965da | |
| 1515 | 1530 | as | Germany, Bible Voice Broadcasting | | 9860me |
| 1515 | 1530 | | Vatican City, Vatican Radio | 9865as | 13765as |
| | | | 15235as | | |
| 1530 | 1600 | | Germany, Bible Voice Broadcasting | | 9860me |
| 1530 | 1600 | m wtfo | Germany, Bible Voice Broadcasting | | 9705as |
| 1530 | 1600 | | Iran, Voice of the Islamic Rep | 7190as | 9610as |
| 1530 | 1600 | | UAE, AWR Africa 15225as | | |
| 1530 | 1600 | | UK, BBC World Service | 11685as | 15540as |
| 1530 | 1600 | a | Vatican City, Vatican Radio | 9865of | 13765af |
| | | | 15235af | | |

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

| | | | | | |
|---|---|---|---|---|---|
| 1600 | 1615 | | Pakistan, Radio 9320me | 11570me | 11640af |
| | | | 15725af 17820af | | |
| 1600 | 1627 | | Vietnam, Voice of 7280as | 9730as | |
| 1600 | 1628 | s | Hungary, Radio Budapest | 6025eu | 9585eu |
| 1600 | 1630 | | Guam, AWR/KSDA 15495as | | |
| 1600 | 1630 | | Iran, Voice of the Islamic Rep | 7190as | 9610as |
| 1600 | 1630 | | Sri Lanka, SLBC 6005as | 9770as | 15745as |
| 1600 | 1635 | | UAE, Radio Dubai 13630eu | 13675eu | 15395eu |
| | | | 17865eu 21605eu | | |
| 1600 | 1656 | | China, China Radio Intl | 7190af | 9570af |
| | | | 13685af 15125af | | |
| 1600 | 1656 | | North Korea, Voice of | 3560as | 9975af |
| | | | 11735af | | |
| 1600 | 1659 | as | Canada, Radio Canada Intl | 9515am | 13655am |
| | | | 17820am | | |
| 1600 | 1700 | | Anguilla, Coribbeon Beacon | 11775am | |
| 1600 | 1700 | | Australia, HCJB 15390pa | | |
| 1600 | 1700 | | Australia, Radio 5995va | 6080pa | 7240as |
| | | | 9475as | | |
| 1600 | 1700 | | Australia, Voice Intl 13635as | | |
| 1600 | 1700 | | Canado, 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 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750no |
| | | | 17645as | | |
| 1600 | 1700 | | Ethiopia, Radio 5990af | 7110af | 7165af |
| | | | 9560af 9704af 11800af | | |
| 1600 | 1700 | 1st a/month | Finland, Scandinavian Weekend Radio | | 5990eu |
| | | | 11720eu | | |
| 1600 | 1700 | | France, Radio France Intl | 9730af | 11615af |
| | | | 15160af 15605af | 17605af | 17850af |
| 1600 | 1700 | | Germany, Bible Voice Broadcasting | | 9860me |
| 1600 | 1700 | DRM | Germony, Deutsche Welle | 6140eu | |
| 1600 | 1700 | | Germany, Deutsche Welle | 6170as | 7225as |
| | | | 11695as | | |
| 1600 | 1700 | a | Germany, Overcomer Ministries | 6110eu | |
| 1600 | 1700 | | Jordan, Radio 11690na | | |
| 1600 | 1700 | | New Zealand, Radio NZ Intl | 9870pa | |
| 1600 | 1700 | | Russia, Voice of 4940va | 4965va | 4975va |
| | | | 6005me 7260as | 9830me | |
| 1600 | 1700 | | South Korea, Radio Korea Intl | 5975am | 7255va |
| | | | 9870va | | |
| 1600 | 1700 | | Taiwan, Radio Taiwan Intl | 11550as | |
| 1600 | 1700 | | UK, BBC World Service | 3915as | 5975as |
| | | | 6190af 6195as 7160as | 9410eu | 9510as |
| | | | 11940af 12095eu | 15190am | 15310as |
| | | | 15400af 15485eu | 15565eu | 17790as |
| | | | 17830af 21470af | 21660af | |
| 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 | 6035af | 6110va |
| | | | 7125va 9575va | 9645va | 9760va |
| | | | 13600va 13710af | 15205va | 15225af |
| | | | 15395va 15240af | 15445va | 17640va |
| | | | 17715af 17895af | | |
| 1600 | 1700 | mtwhf | USA, WBCQ Kennebunk ME | 17495na | |
| 1600 | 1700 | | USA, WBOH Newport NC | 5920am | |
| 1600 | 1700 | | USA, WEWN Birmingham AL | 13615na | 17840af |
| 1600 | 1700 | | USA, WHRA Greenbush ME | 17650af | |
| 1600 | 1700 | | USA, WHRI Noblesville IN | 13760va | 15105am |
| 1600 | 1700 | | USA, WINB Red Lion PA | 9930am | |
| 1600 | 1700 | | USA, WJIE Louisville KY | 13595am | |
| 1600 | 1700 | mtwhf | USA, WMLK Bethel PA | 9465eu | |
| 1600 | 1700 | | USA, WRMI Miami FL | 15725na | |
| 1600 | 1700 | a | USA, WSHB Cypress Creek SC | 17665af | |
| 1600 | 1700 | | USA, WTJC Newport NC | 9370na | |
| 1600 | 1700 | | USA, WWCR Nashville TN | 9475na | 12160na |
| | | | 13845na 15825na | | |
| 1600 | 1700 | mtwhf | USA, WWRB Manchester TN | 9320na | 12172na |

| | | | | | |
|---|---|---|---|---|---|
| 1600 | 1700 | | USA, WYFR Okeechobee FL | 11830na | 11865na |
| | | | 15520na 17760na | 17790af | 18980eu |
| | | | 21455eu | | |
| 1600 | 1700 | | Zambia, Radio Christian Voice | 4965do | |
| 1605 | 1610 | as | Austria, Radio Austria Intl | 17865na | |
| 1610 | 1625 | | Austria, Radio Austria Intl | 17865na | |
| 1625 | 1630 | as | Austria, Radio Austria Intl | 17865na | |
| 1630 | 1700 | | Egypt, Radio Cairo 9855af | | |
| 1630 | 1700 | | Georgia, Radio Georgia | 6180me | |
| 1630 | 1700 | | Guam, AWR/KSDA 11980as | 15495as | |
| 1630 | 1700 | s | Ireland, Reflections Europe | 3910eu | 6295eu |
| | | | 12255eu | | |
| 1630 | 1700 | | UK, BBC World Service | 15420af | |
| 1630 | 1700 | as | UK, BBC World Service | 11860af | 21490af |
| 1635 | 1640 | as | Austria, Radio Austria Intl | 17865na | |
| 1640 | 1650 | mtwhfa | Turkmenistan, Turkmen Radio | 4930do | |
| 1640 | 1655 | | Austria, Radio Austria Intl | 17865na | |
| 1645 | 1700 | | Tojikistan, Tajik Radio | 7245as | |
| 1655 | 1700 | as | Austria, Radio Austria Intl | 17865na | |

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

| | | | | | |
|---|---|---|---|---|---|
| 1700 | 1715 | vl | Somalia, Radio Galkayo | 6985va | 9615va |
| 1700 | 1727 | | Czech Rep, Radio Prague Intl | 5930eu | 17485af |
| 1700 | 1727 | | Vietnam, Voice of 9725eu | | |
| 1700 | 1730 | | Azerbaijan, Voice of 6110eu | 9155eu | |
| 1700 | 1730 | | France, Radio France Intl | 11615af | 15605af |
| 1700 | 1730 | | Guam, AWR/KSDA 11560me | | |
| 1700 | 1730 | | Jordan, Radio 11690na | | |
| 1700 | 1730 | mtwhf | Moldova, Radio Pridnestrovye | 5960eu | |
| 1700 | 1745 | | UK, BBC World Service | 6005eu | |
| 1700 | 1750 | | New Zealand, Radio NZ Intl | 9870pa | |
| 1700 | 1756 | | China, China Radio Intl | 7190af | 9570af |
| | | | 13685af 15125af | | |
| 1700 | 1800 | | Anguilla, Caribbean Beacon | 11775am | |
| 1700 | 1800 | | Australia, Radio 5995va | 6080pa | 7240as |
| | | | 9475as9710va 11880va | | |
| 1700 | 1800 | | Australia, Voice Intl 13635as | | |
| 1700 | 1800 | | Canada, CBC Northern Service | 9625do | |
| 1700 | 1800 | | Canada, CFRX Toronto ON | 6070do | |
| 1700 | 1800 | | Canada, CFVP Calgary AB | 6030do | |
| 1700 | 1800 | | Canada, CKZN St John's NF | 6160do | |
| 1700 | 1800 | | Canada, CKZU Vancouver BC | 6160do | |
| 1700 | 1800 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750na |
| | | | 17645as | | |
| 1700 | 1800 | | Egypt, Radio Cairo 9855af | | |
| 1700 | 1800 | | Eqt Guinea, Radio Africa | 7189af | 15184al |
| 1700 | 1800 | 1st a/month | Finland, Scandinavian Weekend Radio | | 5990eu |
| | | | 11720eu | | |
| 1700 | 1800 | a w fa | Germany, Bible Voice Broadcasting | | 9860me |
| 1700 | 1800 | as | Germany, Bible Voice Broadcasting | | 11650me |
| 1700 | 1800 | DRM | Germany, Deutsche Welle | 6140eu | |
| 1700 | 1800 | | Germany, Radio Africa Intl | 11735af | 13820af |
| 1700 | 1800 | a | Greece, Voice of 9420na | 15630eu | 17705na |
| 1700 | 1800 | s | Ireland, Reflections Europe | 3910eu | 6295eu |
| | | | 12255eu | | |
| 1700 | 1800 | | Japan, Radio 9535am | 11970eu | 15355af |
| 1700 | 1800 | | Russia, Voice of 5910as | 5945as | 9830af |
| 1700 | 1800 | | Swaziland, TWR 3200af | 9500af | |
| 1700 | 1800 | | Taiwan, Radio Taiwan Intl | 11550as | |
| 1700 | 1800 | | UK, BBC World Service | 3255af | 3915as |
| | | | 5975as6190af 6195eu | 7160as | 9410eu |
| | | | 9510as9630af 12095eu | 15310as | 15400af |
| | | | 15420af 15565eu | 17830af | 21470af |
| 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, Voice of America | 6040va | 6110va |
| | | | 7125va 9645va | 9760va | 13710af |
| | | | 15205va 15240af | 15395va | 15445af |
| | | | 17895af | | |
| 1700 | 1800 | mtwhf | USA, Voice of America | 5990va | 6045va |
| | | | 9525va 9795va | 11955va | 12005va |
| | | | 13600af 15255va | | |
| 1700 | 1800 | mtwhf | USA, WBCQ Kennebunk ME | 9330na | 17495na |
| 1700 | 1800 | | USA, WBOH Newport NC | 5920am | |
| 1700 | 1800 | | USA, WEWN Birmingham AL | 13615na | 17840af |
| 1700 | 1800 | | USA, WHRA Greenbush ME | 17650af | |
| 1700 | 1800 | | USA, WHRI Noblesville IN | 13760va | 15105am |
| 1700 | 1800 | | USA, WINB Red Lion PA | 9930am | |
| 1700 | 1800 | | USA, WJIE Louisville KY | 13595am | |
| 1700 | 1800 | mtwhf | USA, WMLK Bethel PA | 9465eu | |
| 1700 | 1800 | | USA, WRMI Miami FL | 15725na | |
| 1700 | 1800 | ta | USA, WSHB Cypress Creek SC | 17505af | |
| 1700 | 1800 | | USA, WTJC Newport NC | 9370na | |
| 1700 | 1800 | | USA, WWCR Nashville TN | 9475na | 12160na |
| | | | 13845na 15825na | | |
| 1700 | 1800 | smtwhf | USA, WWRB Manchester TN | 9320na | 12172na |
| 1700 | 1800 | | USA, WYFR Okeechobee FL | 18980eu | 21455eu |
| | | | 21680af | | |
| 1700 | 1800 | | Zambia, Radio Christian Voice | 4965do | |
| 1715 | 1730 | | Vatican City, Vatican Radio | 4005eu | 5890eu |
| | | | 7250eu 9645eu | 15595va | |
| 1730 | 1726 | | Romania, Radio Romania Intl | 9570eu | 11940eu |
| 1730 | 1740 | vl | Libya, Voice of Africa | 15220irr | 15615irr |
| | | | 15660irr 17880irr | | |
| 1730 | 1745 | mtwhf | UK, United Nations Radio | 7170af | 15495me |
| | | | 21535af | | |
| 1730 | 1800 | s | Austria, AWR Europe | 15385me | |
| 1730 | 1800 | | Guam, AWR/KSDA 9385me | | |
| 1730 | 1800 | | Liberia, ELWA 4760do | | |
| 1730 | 1800 | | Philippines, Radio Pilipinas | 11730me | 11890me |
| | | | 15190me | | |
| 1730 | 1800 | | Slovakia, Radia Slovakia Intl | 5915eu | 6055eu |
| | | | 7345eu | | |
| 1730 | 1800 | | Switzerland, Swiss Radio Intl | 9755af | 11810af |
| | | | 15555 skd1203 | | |
| 1730 | 1800 | | UK, BBC World Service | 3390af | 5875eu |
| | | | 7105eu 7230af | 9530eu | 9685af |
| 1730 | 1800 | | Vatican City, Vatican Radio | 13765af | 15570af |
| | | | 17515af | | |
| 1735 | 1745 | vl/th | Paraguay, Radio Nacional | 9739so | |
| 1745 | 1755 | mtwhfa | Turkmenistan, Turkmen Radio | 4930as | |
| 1745 | 1800 | | Bangladesh, Bangla Betar | 7185eu | 15550eu |
| 1745 | 1800 | | India, All India Radio | 7410eu | 9445af |
| | | | 9950eu 11620eu | 11935af | 13605af |
| | | | 15075af 15155af | 17670af | |
| 1751 | 1800 | | New Zealand, Radio NZ Intl | 11980pa | |

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

| | | | | | |
|---|---|---|---|---|---|
| 1800 | 1810 | | Zanzibar, Voice of Tanzania | 11734do | |
| 1800 | 1815 | | Banglodesh, Bangla Betar | 7185eu | 15520eu |
| 1800 | 1815 | a | Germany, Bible Voice Broadcasting | | 13845me |
| 1800 | 1815 | | Israel, Kol Israel 11605va | 17545va | |
| 1800 | 1827 | | Czech Rep, Radio Prague Intl | 5930eu | 9415va |
| 1800 | 1827 | | Vietnam, Voice of 7280eu | 9725eu | 9730al |
| 1800 | 1830 | | Egypt, Radio Cairo 9855af | | |
| 1800 | 1830 | s | Germany, Universal Life | 11840af | |
| 1800 | 1830 | | South Africa, AWR Africa | 5960af | 7265af |
| | | | 11985af | | |
| 1800 | 1830 | | UK, BBC World Service | 5975as | 9510as |
| 1800 | 1830 | | UK, RTE Radio 9850me | | |
| 1800 | 1830 | | UK, RTE Radio 9850na | | |
| 1800 | 1855 | | Poland, Radio Polonia | 5995eu | 7150eu |
| 1800 | 1900 | | Anguilla, Caribbean Beacon | 11775am | |
| 1800 | 1900 | mtwhf | Argentina, RAE 9690eu | 15345eu | |
| 1800 | 1900 | | Australia, HCJB 11765pa | | |
| 1800 | 1900 | | Australia, Radio 6080pa | 7240va | 9475as |
| | | | 9580va 9710pa | 11880va | |
| 1800 | 1900 | | Australia, Voice Intl 11685as | | |
| 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 | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750na |
| | | | 17645as | | |
| 1800 | 1900 | | Eqt Guinea, Radio Africa | 7189af | 15184al |
| 1800 | 1900 | 1st a/month | Finland, Scandinavian Weekend Radio | | 6170eu |
| | | | 11720eu | | |
| 1800 | 1900 | | Germany, Radio Africa Intl | 11735af | 13820af |
| 1800 | 1900 | | India, All India Radio | 7410eu | 9445af |
| | | | 9950eu 11620eu | 11935af | 13605af |
| | | | 15075af 15155af | 17670af | |
| 1800 | 1900 | s | Ireland, Reflections Europe | 3910eu | 6295eu |
| | | | 12255eu | | |
| 1800 | 1900 | | Kuwait, Radio 11990va | | |
| 1800 | 1900 | | Latvia, Laser Radio 9290eu | | |
| 1800 | 1900 | | Liberia, ELWA 4760do | | |
| 1800 | 1900 | | Netherlands, Radio 6020af | 9895af | 11655af |
| 1800 | 1900 | | New Zealand, Radio NZ Intl | 11980pa | |
| 1800 | 1900 | | Nigeria, Voice of 15120af | 17800al | |
| 1800 | 1900 | | Philippines, Radio Pilipinas | 11730me | 11890me |
| | | | 15190me | | |
| 1800 | 1900 | | Russia, Voice of 5910as | 5945as | 7290eu |
| | | | 9830af 11510af | | |
| 1800 | 1900 | as | Russia, Voice of 5950eu | 6175eu | |
| 1800 | 1900 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 1800 | 1900 | | South Africa, Channel Africa | 15265af | |
| 1800 | 1900 | as | South Africa, Radio Lusofonia | 3345af | |
| 1800 | 1900 | vl | Sudan, Radio Omdurman | 7200do | 9505do |
| 1800 | 1900 | | Swaziland, TWR 3200af | 9500af | |
| 1800 | 1900 | | Taiwan, Radio Taiwan Intl | 3955eu | |
| 1800 | 1900 | | UK, BBC World Service | 3255af | 6055af |
| | | | 6190af 6195eu | 9410eu | 9630af 12095eu |
| | | | 15310me 15400af | 15420af | 17830af |
| | | | 21470af | | |
| 1800 | 1900 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb 6350usb | 7507usb | 10320usb |
| | | | 12133usb 12579usb | 13362usb | 13855usb |
| 1800 | 1900 | | USA, KTBN Salt Lake City UT | 15590na | |
| 1800 | 1900 | | USA, Voice of America | 6035af | 6040va |
| | | | 9760va 9885va | 11975af | 13710af |
| | | | 15240af 15580af | 17895af | |
| 1800 | 1900 | mtwhfa | USA, WBCQ Kennebunk ME | 9330na | 17495na |
| 1800 | 1900 | | USA, WBOH Newport NC | 5920am | |
| 1800 | 1900 | | USA, WEWN Birmingham AL | 13615na | 17840af |
| 1800 | 1900 | | USA, WHRA Greenbush ME | 17650af | |
| 1800 | 1900 | | USA, WHRI Noblesville IN | 9495am | 13760va |
| 1800 | 1900 | | USA, WINB Red Lion PA | 9930am | |
| 1800 | 1900 | | USA, WJIE Louisville KY | 13595am | |
| 1800 | 1900 | mtwhf | USA, WMLK Bethel PA | 9465eu | |
| 1800 | 1900 | | USA, WRMI Miami FL | 15725na | |
| 1800 | 1900 | a | USA, WSHB Cypress Creek SC | 15665eu | 17505af |

| | | | | | |
|---|---|---|---|---|---|
| 1800 | 1900 | | USA, WTJC Newport NC | 9370na | |
| 1800 | 1900 | | USA, WWCR Nashville TN 13845na 15825no | 9475na | 12160na |
| 1800 | 1900 | smtwhf | USA, WWRB Manchester TN | 9320na | 12172na |
| 1800 | 1900 | | USA, WYFR Okeechobee FL | 18980eu | |
| 1800 | 1900 | | Yemen, Rep of Yemen Radio | 9780me | |
| 1800 | 1900 | | Zambia, Radio Christian Voice | 4965do | |
| 1815 | 1900 | | Bangladesh, Bangla Betar 15550eu | 7185eu | 9550eu |
| 1820 | 1830 | vl | Libya, Voice of Africa 11860irr 17880irr | 11635irr | 11715irr |
| 1830 | 1845 | | Germany, IBRA Radio | 9520af | |
| 1830 | 1845 | m w | UK, BBC World Service 9685eu | 6050eu | 7105eu |
| 1830 | 1859 | | Belgium, Radio Vlaanderen Intl | 5910va | 7330eu |
| 1830 | 1900 | s | Austria, AWR Europe | 11865me | |
| 1830 | 1900 | | Bulgaria, Radio 5800eu | 7500eu | |
| 1830 | 1900 | | Georgia, Radio Georgia | 11910eu | |
| 1830 | 1900 | | South Africa, AWR Africa | 11985af | |
| 1830 | 1900 | mtwhfa | Sweden, Radio 6065va | | |
| 1830 | 1900 | | UK, RTE Radio 13640na | 21640na | |
| 1845 | 1900 | | Congo, RTV Congolaise | 4765af | 5985af |

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

| | | | | | |
|---|---|---|---|---|---|
| 1900 | 1915 | | Congo, RTV Congoloise | 4765af | 5985af |
| 1900 | 1915 | | Germany, Bible Voice Broadcasting | | 7295af |
| 1900 | 1915 | smtwhf | Germany, Bible Voice Broadcasting | | 6015eu |
| 1900 | 1915 | a fa | Germany, Bible Voice Broadcasting | | 9470me |
| 1900 | 1927 | | Vietnam, Voice of 7280eu | 9730eu | |
| 1900 | 1930 | s | Germany, Universol Life | 7105me | |
| 1900 | 1930 | s | Greece, Voice of 7475eu 17705na | 9420eu | 15630eu |
| 1900 | 1930 | | Philippines, Radio Pilipinas 15190me | 11730me | 11890me |
| 1900 | 1945 | | Indio, All India Radio 9950eu 11620eu 15075af 15155af | 7410eu 11935af 17670af | 9445af 13605af |
| 1900 | 1950 | | New Zealand, Radio NZ Intl | 11980po | |
| 1900 | 1956 | | China, China Radio Intl | 9440af | 9585af |
| 1900 | 1956 | | North Koreo, Voice of 11335eu 11710eu | 4405as | 7505eu |
| 1900 | 2000 | | Anguillo, Caribbeon Beocon | 11775om | |
| 1900 | 2000 | | Australio, HCJB 11765pa | | |
| 1900 | 2000 | | Australio, Radio 6080po 9580vo 9710pa | 7240vo 11880va | 9500as |
| 1900 | 2000 | | Australia, Voice Intl 11685os | | |
| 1900 | 2000 | vl | Botswana, Radio 4820do | 4830al | |
| 1900 | 2000 | | Canada, CBC Northern Service | 9625do | |
| 1900 | 2000 | | Conada, CFRX Toronto ON | 6070do | |
| 1900 | 2000 | | Conodo, CFVP Colgory AB | 6030do | |
| 1900 | 2000 | | Conodo, CKZN St John's NF | 6160do | |
| 1900 | 2000 | | Canada, CKZU Vancouver BC | 6160do | |
| 1900 | 2000 | | Costa Rica, University Network 7375om 9725sa 17645as | 5030am 11870om | 6150am 13750na |
| 1900 | 2000 | | Eqt Guineo, Radio Africo | 7189af | 15184al |
| 1900 | 2000 | 1st a/month | Finlond, Scondinavian Weekend Radio 11690eu | | 5990eu |
| 1900 | 2000 | | Germony, Deutsche Welle 13590af 13780af | 6180af | 11865af |
| 1900 | 2000 | vl | Ghono, Ghono BC Corp | 3366do | 4915do |
| 1900 | 2000 | | Kuwait, Radio 11990va | | |
| 1900 | 2000 | | Latvia, Laser Radio 9290eu | | |
| 1900 | 2000 | | Liberia, ELWA 4760do | | |
| 1900 | 2000 | | Malaysia, RTM Radio 4 | 7295do | |
| 1900 | 2000 | | Namibia, Namibion BC Corp 6060af | 3270af | 3290af |
| 1900 | 2000 | | Netherlands, Radio 7120af 17810af | 9895af | 11655af |
| 1900 | 2000 | as | Netherlands, Radio 15315na | 17725na | 17875na |
| 1900 | 2000 | | Nigeria, Radio/Enugu | 6025do | |
| 1900 | 2000 | | Nigeria, Radio/Ibadan | 6050do | |
| 1900 | 2000 | | Nigeria, Radio/Koduna | 4770do | 6090do |
| 1900 | 2000 | | Nigeria, Radio/Logos | 3326do | 4990do |
| 1900 | 2000 | | Nigeria, Voice of 15120af | 17800al | |
| 1900 | 2000 | | Russia, Voice of 6175eu 7360eu | 6235eu 7290eu | 7335af 11510af |
| 1900 | 2000 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 1900 | 2000 | | Sierra Leone, SLBS 3316do | | |
| 1900 | 2000 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 1900 | 2000 | m | South Africa, Amateur Radio League | | 3215af |
| 1900 | 2000 | | South Africa, Channel Africa | 3345af | |
| 1900 | 2000 | m | South Africa, Radio League | 3215af | |
| 1900 | 2000 | | South Korea, Radio Koreo Intl | 5975om | 7275eu |
| 1900 | 2000 | o | Sri Lanko, SLBC 6010eu | | |
| 1900 | 2000 | | Swaziland, TWR 3200af | | |
| 1900 | 2000 | | Thailand, Radio 9535eu | | |
| 1900 | 2000 | | Uganda, Radio 4976do | 5026do | 7196do |
| 1900 | 2000 | | UK, BBC World Service 6190af 6195eu 15310me | 3255af 9410eu 15400af | 6005af 9630af 12095af 17830af |
| 1900 | 2000 | | USA, Armed Forces Radio 5765usb 12133usb | 4319usb 6350usb 12579usb | 5446usb 7507usb 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 7415af 9525va 11870va 13710af 17895af | 9690va 11975af 15180va | 9760va 12015vo 15240af 9785va 13640va 15580af |
| 1900 | 2000 | s | USA, WBCQ Kennebunk ME | 7415na | |
| 1900 | 2000 | mtwhfo | USA, WBCQ Kennebunk ME | 9330na | 17495na |
| 1900 | 2000 | | USA, WBOH Newport NC | 5920am | |
| 1900 | 2000 | | USA, WEWN Birmingham AL | 13615na | 17840af |
| 1900 | 2000 | | USA, WHRA Greenbush ME | 17650af | |
| 1900 | 2000 | | USA, WHRI Noblesville IN | 9495am | 13760va |
| 1900 | 2000 | | USA, WINB Red Lion PA | 9930am | |
| 1900 | 2000 | | USA, WJIE Louisville KY | 13595am | |
| 1900 | 2000 | mtwh: | USA, WMLK Bethel PA | 9465eu | |
| 1900 | 2000 | | USA, WRMI Miami FL | 15725na | |
| 1900 | 2000 | a | USA, WSHB Cypress Creek SC | 15665eu | |
| 1900 | 2000 | | USA, WSHB Cypress Creek SC | 17505af | |
| 1900 | 2000 | | USA, WTJC Newport NC | 9370na | |
| 1900 | 2000 | | USA, WWCR Nashville TN 13845no 15825no | 9475na | 12160na |
| 1900 | 2000 | smtwhf | USA, WWRB Monchester TN | 9320na | 12172na |
| 1900 | 2000 | | USA, WYFR Okeechobee FL 15565eu 18980eu | 3230af | 15115af |
| 1900 | 2000 | vl | Vonuatu, Radio 3945al | 7260do | |
| 1900 | 2000 | | Zombia, Radio Christian Voice | 4965do | |
| 1900 | 2000 | vl | Zimbobwe, ZBC Corp | 5975do | |
| 1915 | 1925 | | Rwando, Radio 6005do | | |
| 1915 | 1930 | s t | Germony, Bible Voice Broadcasting | | 6015eu |
| 1915 | 1930 | s fo | Germany, Bible Voice Broadcasting 9470me | | 7295af |
| 1915 | 1930 | | UK, BBC World Service | 15105af | 17885af |
| 1923 | 1930 | vl | Libya, Voice of Africa | 15105af | 15315af |
| 1930 | 1945 | mtwhf | Germany, Bible Voice Broadcasting | | 6015eu |
| 1930 | 1945 | a | Germony, Bible Voice Broadcasting | | 7295af |
| 1930 | 2000 | | Georgia, Radio Georgia | 11760eu | |
| 1930 | 2000 | mtwhc | Germany, AWR Europe | 11845eu | |
| 1930 | 2000 | s fa | Germony, Bible Voice Broadcasting | | 9470me |
| 1930 | 2000 | | Greece, Voice of 12105eu | | |
| 1930 | 2000 | s | Greece, Voice of 7475eu 17705na | 9420eu | 15630eu |
| 1930 | 2000 | | Iron, Voice of the Islamic Rep | 6110eu | 7320eu |
| 1930 | 2000 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 1930 | 2000 | | Serbio & Montenegro, Intl Radio | 6100eu | |
| 1930 | 2000 | | Slovakio, Radio Slovakio Intl 7345eu | 5915eu | 6055eu |
| 1930 | 2000 | | Switzerland, Swiss Radio Intl 13660va 17660va | 9820va | 11920va |
| 1930 | 2000 | | Turkey, Voice of 5980eu | | |
| 1935 | 1955 | | Italy, RAI Intl 5965eu | 9755eu | |
| 1945 | 2000 | mtwhfa | Albanio, Radio Tirano Intl | 7210eu | 9510eu |
| 1945 | 2000 | o | Germony, Bible Voice Broadcasting 7295af | | 6015eu |
| 1951 | 2000 | | New Zealand, Radio NZ Intl | 15265po | |

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

| | | | | | |
|---|---|---|---|---|---|
| 2000 | 2015 | as | Germony, Bible Voice Broadcasting | | 9470me |
| 2000 | 2020 | | Turkey, Voice of 5980eu | | |
| 2000 | 2028 | | Hungory, Radio Budopest | 3975eu | 6025eu |
| 2000 | 2030 | s | Germony, Bible Voice Broodcosting | | 6015eu |
| 2000 | 2030 | | Iron, Voice of the Islomic Rep | 6110eu | 7320eu |
| 2000 | 2030 | | Israel, Kol Israel 9435va 15640af | 11605va | 13720va |
| 2000 | 2030 | | Mongolio, Voice of 9720as | | |
| 2000 | 2030 | | Switzerland, Swiss Radio Intl 13660af 17660af | 9820af | 11920af |
| 2000 | 2030 | | Vaticon City, Votican Radio 11625af | 7365af | 9660af |
| 2000 | 2045 | | Swaziland, TWR 3200af | | |
| 2000 | 2045 | mtwhfa | USA, WBCQ Kennebunk ME | 9330na | 17495na |
| 2000 | 2045 | s | USA, WBCQ Kennebunk ME | 7415na | |
| 2000 | 2055 | | Netherlands, Radio 7120af 17810af | 9895af | 11655af |
| 2000 | 2055 | as | Netherlands, Radio 15315no | 17725no | 17875na |
| 2000 | 2056 | | China, China Radio Intl 9840eu | 5965eu 11640af | 9440af 13630af |
| 2000 | 2059 | mtwhf | Spain, Radio Exterior Espana | 9595af | 9680eu |
| 2000 | 2100 | | Anguillo, Coribbean Beocon | 11775am | |
| 2000 | 2100 | | Australia, ABC NT Alice Springs | 2310do | 4835irr |
| 2000 | 2100 | | Australia, ABC NT Katherine | 2485do | |
| 2000 | 2100 | | Australia, ABC NT Tennant Creek | 2325do | |
| 2000 | 2100 | | Australio, Radio 9500as 11880vo 12080va | 9580va | 11650va |
| 2000 | 2100 | os | Australia, Radio 6080po | | |
| 2000 | 2100 | | Australia, Voice Intl 11685as | | |
| 2000 | 2100 | vl | Botswana, Radio 4820do | 4830al | |
| 2000 | 2100 | | Conada, CBC Northern Service | 9625do | |
| 2000 | 2100 | | Conada, CFRX Toronto ON | 6070do | |
| 2000 | 2100 | | Canada, CFVP Calgary AB | 6030do | |
| 2000 | 2100 | | Conodo, CKZN St John's NF | 6160do | |
| 2000 | 2100 | | Canada, CKZU Voncouver BC | 6160do | |
| 2000 | 2100 | | Costo Rico, University Network 7375am 17645os | 5030am 9725so | 6150am 11870om 13750na |
| 2000 | 2100 | | Eqt Guineo, Rodio Africa | 7189af | 15184al |
| 2000 | 2100 | 1st a/month | Finland, Scondinavian Weekend Rodio 11690eu | | 5990eu |
| 2000 | 2100 | | Germony, Deutsche Welle 15205af | 13590af 15410af | 13780af |

# Shortwave Guide

| | | | | | |
|---|---|---|---|---|---|
| 2000 | 2100 | vl | Ghana, Ghana BC Corp | 3366do | 4915da |
| 2000 | 2100 | | Indonesia, Voice of 15150eu | | |
| 2000 | 2100 | s | Ireland, Reflections Europe 12255eu | 3910eu | 6295eu |
| 2000 | 2100 | vl | Italy, IRRS 5775va | | |
| 2000 | 2100 | | Kuwait, Radio 11990va | | |
| 2000 | 2100 | | Latvia, Laser Radio 9290eu | | |
| 2000 | 2100 | | Liberia, ELWA 4760do | | |
| 2000 | 2100 | | Malaysia, RTM Radio 4 | 7295do | |
| 2000 | 2100 | | Namibia, Namibian BC Corp 6060af | 3270af | 3290af |
| 2000 | 2100 | | New Zealand, Radio NZ Intl | 15265pa | |
| 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 | 4990da |
| 2000 | 2100 | | Nigeria, Voice of 17800af | | |
| 2000 | 2100 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 2000 | 2100 | | Russia, Voice of 6145eu 7360eu | 6235eu | 7290eu |
| 2000 | 2100 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 2000 | 2100 | | Sierra Leone, SLBS 3316do | | |
| 2000 | 2100 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 2000 | 2100 | | South Africa, AWR Africa | 15295af | |
| 2000 | 2100 | | South Africa, Channel Africa | 3345af | |
| 2000 | 2100 | | Syria, Radio Damascus | 12085eu | 13610eu |
| 2000 | 2100 | | Uganda, Radio 4976do | 5026do | 7196do |
| 2000 | 2100 | | UK, BBC World Service 6190af 6195eu 9410eu 15400af 17830af | 3255af | 6005af 9630af 12095af |
| 2000 | 2100 | | USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb | 4319usb | 5446usb 7507usb 10320usb 13362usb 13855usb |
| 2000 | 2100 | | USA, KAIJ Dallas TX 13815va | | |
| 2000 | 2100 | | USA, KTBN Salt Lake City UT | 15590na | |
| 2000 | 2100 | | USA, Voice of America 6095va 7415af 9690va 9760va 13710af 15240af 17895af | 4950af | 6035af 11855af 11975af |
| 2000 | 2100 | | USA, WBOH Newport NC | 5920am | |
| 2000 | 2100 | | USA, WEWN Birmingham AL | 13615na | 17595af |
| 2000 | 2100 | | USA, WHRA Greenbush ME | 17650as | |
| 2000 | 2100 | | USA, WHRI Noblesville IN | 5745va | 9495am |
| 2000 | 2100 | | USA, WINB Red Lion PA | 9930am | |
| 2000 | 2100 | | USA, WJIE Louisville KY | 13595am | |
| 2000 | 2100 | mtwhf | USA, WMLK Bethel PA | 9465eu | |
| 2000 | 2100 | | USA, WRMI Miami FL | 15725na | |
| 2000 | 2100 | mwfs | USA, WSHB Cypress Creek SC | 15665af | |
| 2000 | 2100 | | USA, WTJC Newport NC | 9370na | |
| 2000 | 2100 | | USA, WWCR Nashville TN 13845na 15825na | 9475na | 12160na |
| 2000 | 2100 | smtwhf | USA, WWRB Manchester TN | 9320na | 12172na |
| 2000 | 2100 | | USA, WYFR Okeechobee FL 7580eu 15195sa | 3230af | 5810eu 15565sa 17575sa |
| 2000 | 2100 | vl | Vanuatu, Radio 3945al | 7260do | |
| 2000 | 2100 | | Zambia, Radio Christian Voice | 4965do | |
| 2000 | 2100 | vl | Zimbabwe, ZBC Corp | 5975do | |
| 2025 | 2045 | | Italy, RAI Intl 5985af | 9515af | 11880af |
| 2030 | 2045 | | Thailand, Radio 9535eu | | |
| 2030 | 2056 | | Romania, Radio Romania Intl | 6110eu | 7105eu |
| 2030 | 2057 | | Vietnam, Voice of 7280eu | 9730eu | |
| 2030 | 2059 | | Belgium, Radio Vlaanderen Intl | 7330eu | |
| 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 | | Sweden, Radio 6065va | 9400va | |
| 2030 | 2100 | as | USA, Voice of America | 4950af | |
| 2030 | 2100 | | Uzbekistan, Radio Tashkent Intl 11905eu | 5025eu | 7185eu |
| 2040 | 2100 | mtwhfa | Armenia, Voice of 4810eu | 9960eu | |
| 2045 | 2100 | | India, All India Radio 9575au 9910au 11715au | 7410eu | 9445eu 9950eu 11620va |
| 2045 | 2100 | | USA, WBCQ Kennebunk ME | 7415na | |
| 2045 | 2100 | mtwhfa | USA, WBCQ Kennebunk ME 17495na | 5105na | 9330na |
| 2050 | 2100 | | Vatican City, Vatican Radio 7250eu | 4005eu | 5890eu |
| 2050 | 2100 | DRM | Vatican City, Vatican Radio | 9800eu | |

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

| | | | | | |
|---|---|---|---|---|---|
| 2100 | 2110 | | Vatican City, Vatican Radio 7250eu | 4005eu | 5890eu |
| 2100 | 2110 | DRM | Vatican City, Vatican Radio | 9800eu | |
| 2100 | 2115 | | Egypt, Radio Cairo 15375af | | |
| 2100 | 2115 | mtwhf | UK, BBC World Service | 5975ca | |
| 2100 | 2127 | | Czech Rep, Radio Prague Intl | 5930eu | 9430va |
| 2100 | 2130 | | Australia, ABC NT Katherine | 2485do | |
| 2100 | 2130 | | Australia, ABC NT Tennant Creek | 2325do | |
| 2100 | 2130 | | China, China Radio Intl 11640af 13630af | 5965eu | 9840eu |
| 2100 | 2130 | | Cuba, Radio Havana | 9505na | 11760eu |
| 2100 | 2130 | vl | Italy, IRRS 5775va | | |
| 2100 | 2130 | DRM | Netherlands, Radio 11730eu | | |
| 2100 | 2130 | mtwhf | Nigeria, Radio Jakada Intl | 7380af | |
| 2100 | 2130 | mtwhfa | USA, WBCQ Kennebunk ME 17495na | 5105na | 9330na |
| 2100 | 2156 | | North Korea, Voice of 11335eu | 4405as | 7505eu |
| 2100 | 2159 | | Canada, Radio Canada Intl 7425va 9770va | 5850va | 7235va 9805va 13650va |
| 2100 | 2200 | | Anguilla, Caribbean Beacon | 11775am | |
| 2100 | 2200 | | Australia, ABC NT Alice Springs | 2310do | 4835irr |
| 2100 | 2200 | | Australia, Radio 9500as 11880va 12080va | 9660pa | 11650va 13630va 21740va |
| 2100 | 2200 | | Australia, Voice Intl 9795as | | |
| 2100 | 2200 | | Austria, AWR Europe | 9660af | |
| 2100 | 2200 | vl | Botswana, Radio 4820do | 4830al | |
| 2100 | 2200 | | Canada, CBC Northern Service | 9625do | |
| 2100 | 2200 | | Canada, CFRX Toronto ON | 6070do | |
| 2100 | 2200 | | Canada, CFVP Calgary AB | 6030do | |
| 2100 | 2200 | | Canada, CKZN St John's NF | 6160do | |
| 2100 | 2200 | | Canada, CKZU Vancouver BC | 6160do | |
| 2100 | 2200 | | Costa Rica, University Network 7375am 9725sa 17645as | 5030am | 6150am 11870am 13750na |
| 2100 | 2200 | | Eqt Guinea, Radio Africa | 7189af | 15184al |
| 2100 | 2200 | 1st f/month | Finland, Scandinavian Weekend Radio 11720eu | | 5990eu |
| 2100 | 2200 | | Germany, Deutsche Welle 15410af | 9615af | 13780af |
| 2100 | 2200 | vl | Ghana, Ghana BC Corp | 3366do | 4915do |
| 2100 | 2200 | | Guyana, Voice of 5949do | | |
| 2100 | 2200 | | India, All India Radio 9575au 9910au 11715au | 7410eu | 9445eu 9950eu 11620va |
| 2100 | 2200 | s | Ireland, Reflections Europe 12255eu | 3910eu | 6295eu |
| 2100 | 2200 | | Japan, Radio 6090eu 11920va 17825na | 6180eu | 11855af 21670as |
| 2100 | 2200 | | Latvia, Laser Radio 9290eu | | |
| 2100 | 2200 | | Liberia, ELWA 4760do | | |
| 2100 | 2200 | | Malaysia, RTM Radio 4 | 7295do | |
| 2100 | 2200 | | Namibia, Namibian BC Corp 6060af | 3270af | 3290af |
| 2100 | 2200 | | New Zealand, Radio NZ Intl | 15265pa | |
| 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 17800af | | |
| 2100 | 2200 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 2100 | 2200 | | Russia, Voice of 6235eu | 7290eu | 7360eu |
| 2100 | 2200 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 2100 | 2200 | | Sierra Leone, SLBS 3316do | | |
| 2100 | 2200 | | South Africa, Channel Africa | 3345af | |
| 2100 | 2200 | | Syria, Radio Damascus | 12085eu | 13610eu |
| 2100 | 2200 | | UK, BBC World Service 5965as 5975ca 6195va 9410eu 15400af | 3255af 6005af 9605af | 3915as 6110as 6190af 12095sa |
| 2100 | 2200 | | USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb | 4319usb | 5446usb 7507usb 10320usb 13362usb 13855usb |
| 2100 | 2200 | | USA, KAIJ Dallas TX 13815va | | |
| 2100 | 2200 | | USA, KTBN Salt Lake City UT | 15590no | |
| 2100 | 2200 | | USA, Voice of America 6095va 7415af 9760va 11870va 15185va 15240af 17820va 17895af | 6035af 9595va 11975af 15580af | 6040va 9670va 13710af 17735va |
| 2100 | 2200 | | USA, WBCQ Kennebunk ME | 7415na | 17495na |
| 2100 | 2200 | | USA, WBOH Newport NC | 5920am | |
| 2100 | 2200 | | USA, WEWN Birmingham AL | 13615na | 17595af |
| 2100 | 2200 | | USA, WHRA Greenbush ME | 17650af | |
| 2100 | 2200 | | USA, WHRI Noblesville IN | 5745va | 9495am |
| 2100 | 2200 | | USA, WINB Red Lion PA | 9930am | |
| 2100 | 2200 | | USA, WJIE Louisville KY | 13595am | |
| 2100 | 2200 | | USA, WRMI Miami FL | 15725na | |
| 2100 | 2200 | asm | USA, WSHB Cypress Creek SC | 11650eu | |
| 2100 | 2200 | f | USA, WSHB Cypress Creek SC | 15665af | |
| 2100 | 2200 | | USA, WTJC Newport NC | 9370na | |
| 2100 | 2200 | | USA, WWCR Nashville TN 12160na 13845na | 7465na | 9475na |
| 2100 | 2200 | smtwhf | USA, WWRB Manchester TN | 9320na | 12172na |
| 2100 | 2200 | | USA, WYFR Okeechobee FL 11740na 15565af | 5810eu | 7580eu 17575sa |
| 2100 | 2200 | vl | Vanuatu, Radio 3945al | 7260do | |
| 2100 | 2200 | | Zambia, Radio Christian Voice | 4965do | |
| 2100 | 2200 | vl | Zimbabwe, ZBC Corp | 5975do | |
| 2115 | 2130 | mtwhf | UK, BBC World Service 15390ca | 5975ca | 11675ca |
| 2115 | 2200 | | Egypt, Radio Cairo 9989eu | 15375af | |
| 2123 | 2130 | vl | Libya, Voice of Africa | 15105af | 15315af |
| 2130 | 2155 | DRM | Netherlands, Radio 9800na | 11730na | |
| 2130 | 2156 | | China, China Radio Intl | 5965eu | 9840eu |
| 2130 | 2200 | | Australia, ABC NT Katherine | 5025do | |
| 2130 | 2200 | | Australia, ABC NT Tennant Creek | 4910do | |
| 2130 | 2200 | t h | Belarus, Radio Belarus Intl | 7105eu | 7210eu |
| 2130 | 2200 | | Guam, AWR/KSDA 11980as | | |
| 2130 | 2200 | mt h a | Guam, AWR/KSDA 12010as | | |
| 2130 | 2200 | f/vl | Italy, IRRS 5775va | | |
| 2130 | 2200 | | Turkey, Voice of 9525as | | |
| 2130 | 2200 | f | UK, Wales Radio Intl 7110eu | | |
| 2130 | 2200 | mtwhfa | USA, WBCQ Kennebunk ME 17495na | 5105na | 9330na |
| 2130 | 2200 | | Uzbekistan, Radio Tashkent Intl 11905eu | 5025eu | 7185eu |

# Shortwave Guide

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

| | | | | | |
|---|---|---|---|---|---|
| 2200 | 2220 | | Turkey, Voice of 9525as | | |
| 2200 | 2228 | | Hungary, Radio Budapest | 6025eu | 11965af |
| 2200 | 2229 | | Belgium, Radio Vlaanderen Intl | 11730na | |
| 2200 | 2230 | | Canada, Radio Canada Intl | 5850va | 6045vo |
| | | | 9770va 12005va | | |
| 2200 | 2230 | | India, All India Radio | 7410eu | 9445eu |
| | | | 9575au 9910au | 9950eu | 11620va |
| | | | 11715au | | |
| 2200 | 2230 | s | Ireland, Reflections Europe | 3910eu | 6295eu |
| | | | 12255eu | | |
| 2200 | 2230 | twhfas/vl | Italy, IRRS 5775va | | |
| 2200 | 2230 | | Liberia, ELWA 4760do | | |
| 2200 | 2230 | | Serbia & Montenegro, Intl Radio | 6100eu | |
| 2200 | 2230 | | South Korea, Radio Korea Intl | 3955eu | |
| 2200 | 2230 | mtwhf | USA, Voice of America | 6035af | 7415af |
| | | | 11655af 11975af | 13710af | |
| 2200 | 2237 | | New Zealand, Radio NZ Intl | 15265pa | |
| 2200 | 2245 | | Egypt, Radio Cairo 9989eu | | |
| 2200 | 2256 | | China, China Radio Intl | 7170eu | |
| 2200 | 2256 | | Romania, Radio Romania Intl | 5975eu | 7250eu |
| | | | 9550na 11830no | | |
| 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 9660va | 11880va | 12080va |
| | | | 13620va 13630va | 15230as | 21740va |
| 2200 | 2300 | | Australia, Voice Intl 9795as | | |
| 2200 | 2300 | vl | Botswana, Radio 4820do | 4830al | |
| 2200 | 2300 | | Bulgaria, Radio 5800eu | 7500eu | |
| 2200 | 2300 | | Canada, CBC Northern Service | 9625do | |
| 2200 | 2300 | | Canada, CFRX Toronto ON | 6070do | |
| 2200 | 2300 | | Canada, CFVP Calgary AB | 6030do | |
| 2200 | 2300 | | Canada, CKZN St John's NF | 6160do | |
| 2200 | 2300 | | Canada, CKZU Vancouver BC | 6160do | |
| 2200 | 2300 | DRM | Canada, Radio Canada Intl | 9800eu | |
| 2200 | 2300 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750na |
| | | | 17645as | | |
| 2200 | 2300 | | Eqt Guinea, Radio Africa | 7189af | 15184al |
| 2200 | 2300 | 1st f/month | Finland, Scandinavian Weekend Radio | | 5980eu |
| | | | 11720eu | | |
| 2200 | 2300 | | Germany, Deutsche Welle | 6180as | 6225as |
| 2200 | 2300 | vl | Ghana, Ghana BC Corp | 3366do | 4915do |
| 2200 | 2300 | | Guyana, Voice of 3291do | 5949do | |
| 2200 | 2300 | | Malaysia, RTM Radio 4 | 7295do | |
| 2200 | 2300 | | Namibia, Namibian BC Corp | 3270af | 3290af |
| | | | 6060af | | |
| 2200 | 2300 | | Netherlands, Radio 15530eu | | |
| 2200 | 2300 | | Nigeria, Radio/Enugu | 6025do | |
| 2200 | 2300 | | Nigeria, Radio/Ibadon | 6050do | |
| 2200 | 2300 | | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 2200 | 2300 | | Nigeria, Radio/Lagos | 3326do | 4990do |
| 2200 | 2300 | | Nigeria, Voice of 15120af | 17800ol | |
| 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 | as | Spain, Radio Exterior Espana | 9595af | 9680eu |
| 2200 | 2300 | | Taiwan, Radio Taiwan Intl | 9355eu | |
| 2200 | 2300 | | UK, BBC World Service | 5965as | 5975co |
| | | | 6195va 7105as | 9605af | 9740as |
| | | | 11955as 12095so | 15400af | |
| 2200 | 2300 | | Ukraine, Radio Ukraine Intl | 5840eu | |
| 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 | 9705va |
| | | | 9890va 11760va | 15185vo | 15290va |
| | | | 15305va 17735va | 17820va | |
| 2200 | 2300 | mtwhfo | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| | | | 9330na 17495no | | |
| 2200 | 2300 | | USA, WBOH Newport NC | 5920am | |
| 2200 | 2300 | | USA, WEWN Birmingham AL | 9975na | 17595af |
| 2200 | 2300 | | USA, WHRA Greenbush ME | 17650af | |
| 2200 | 2300 | | USA, WHRI Noblesville IN | 5745va | 9495am |
| 2200 | 2300 | | USA, WINB Red Lion PA | 9930am | |
| 2200 | 2300 | | USA, WJIE Louisville KY | 13595am | |
| 2200 | 2300 | | USA, WRMI Miami FL | 15725na | |
| 2200 | 2300 | s | USA, WSHB Cypress Creek SC | 7510eu | |
| 2200 | 2300 | ws | USA, WSHB Cypress Creek SC | 15285sa | |
| 2200 | 2300 | | USA, WTJC Newport NC | 9370na | |
| 2200 | 2300 | | USA, WWCR Nashville TN | 5070na | 7465na |
| | | | 9475na 13845na | | |
| 2200 | 2300 | smtwhf | USA, WWRB Manchester TN | 9320na | 12172na |
| 2200 | 2300 | | USA, WYFR Okeechobee FL | 7580eu | 11740na |
| | | | 21525af | | |
| 2200 | 2300 | vl | Vanuatu, Radio 3945al | 7260do | |
| 2200 | 2300 | | Zambia, Radio Christian Voice | 4965do | |
| 2205 | 2230 | | Itoly, RAI Intl 11895as | | |
| 2230 | 2257 | | Czech Rep, Radio Prague Intl | 7345na | 9435af |
| 2230 | 2300 | mtwhfa | Albania, Radio Tirana Intl | 7130eu | 9530eu |
| 2230 | 2300 | f/accasionol | Itoly, IRRS 5775va | | |
| 2230 | 2300 | | Sweden, Radio 6065va | | |
| 2238 | 2300 | | New Zealand, Radio NZ Intl | 17675pa | |
| 2245 | 2300 | | India, All India Radio | 9705as | 9950os |
| | | | 11620as 13605as | | |

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

| | | | | | |
|---|---|---|---|---|---|
| 2300 | 0000 | | Anguilla, Caribbeon 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 | | Australia, Radio 9660po | 11695as | 12080vo |
| | | | 13620os 13630as | 15230as | 17750as |
| | | | 17795va 21740va | | |
| 2300 | 0000 | | Australia, Voice Intl 13620as | | |
| 2300 | 0000 | vl | Botswana, Radio 4820do | 4830al | |
| 2300 | 0000 | | Canada, CBC Northern Service | 9625do | |
| 2300 | 0000 | | Canada, CFRX Toronto ON | 6070do | |
| 2300 | 0000 | | Canada, CFVP Colgary AB | 6030do | |
| 2300 | 0000 | | Canada, CKZN St John's NF | 6160do | |
| 2300 | 0000 | | Canada, CKZU Vancouver BC | 6160do | |
| 2300 | 0000 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | 11870am | 13750na |
| | | | 17645as | | |
| 2300 | 0000 | | Cuba, Radio Havana | 9550am | |
| 2300 | 0000 | | Egypt, Radio Cairo 11725na | | |
| 2300 | 0000 | 1st f/month | Finland, Scandinavian Weekend Radio | | 5980eu |
| | | | 11690eu | | |
| 2300 | 0000 | | Germany, Deutsche Welle | 7250as | 9815as |
| | | | 12035as | | |
| 2300 | 0000 | DRM | Germany, Deutsche Welle | 9800as | |
| 2300 | 0000 | vl | Ghana, Ghana BC Corp | 3366do | 4915do |
| 2300 | 0000 | | Guyana, Voice of 3291do | 5949do | |
| 2300 | 0000 | | India, All India Radio | 9705as | 9950as |
| | | | 11620as 13605as | | |
| 2300 | 0000 | | Malaysia, RTM Radio 4 | 7295do | |
| 2300 | 0000 | | Namibia, Nomibian BC Corp | 3270af | 3290af |
| | | | 6060af | | |
| 2300 | 0000 | | New Zealand, Radio NZ Intl | 17675pa | |
| 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 | | UK, BBC World Service | 3915as | 5965as |
| | | | 6035as6195va 9740as | 11945os | 11955as |
| | | | 12095sa 15280as | | |
| 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, WBCQ Kennebunk ME | 5105na | 7415na |
| | | | 9330na | | |
| 2300 | 0000 | | USA, WBOH Newport NC | 5920am | |
| 2300 | 0000 | | USA, WEWN Birmingham AL | 9975na | 17595af |
| 2300 | 0000 | | USA, WHRA Greenbush ME | 7580va | |
| 2300 | 0000 | | USA, WHRI Noblesville IN | 5745va | 9495am |
| 2300 | 0000 | | USA, WINB Red Lion PA | 9320am | |
| 2300 | 0000 | | USA, WJIE Louisville KY | 13595am | |
| 2300 | 0000 | | USA, WRMI Miami FL | 15725na | |
| 2300 | 0000 | mtwhf | USA, WRMI Miami FL | 15725no | |
| 2300 | 0000 | ws | USA, WSHB Cypress Creek SC | 7510va | |
| 2300 | 0000 | s | USA, WSHB Cypress Creek SC | 15285am | |
| 2300 | 0000 | | USA, WTJC Newport NC | 9370na | |
| 2300 | 0000 | as | USA, WWBS Macon GA | 11910na | |
| 2300 | 0000 | | USA, WWCR Nashville TN | 3210na | 5070na |
| | | | 7465na 13845na | | |
| 2300 | 0000 | | USA, WWRB Manchester TN | 5050na | 5085no |
| | | | 6890na | | |
| 2300 | 0000 | | USA, WYFR Okeechobee FL | 5985sa | 11740na |
| | | | 11855sa 15170sa | 15400so | |
| 2300 | 0000 | | USA, WYFR Okeechobee FL | 5985ca | 11855ca |
| | | | 15170af | | |
| 2300 | 0000 | vl | Vanuatu, Radio 3945ol | 7260do | |
| 2300 | 0000 | | Zambia, Radio Christian Voice | 4965do | |
| 2300 | 2329 | | Canada, Radio Canada Intl | 5960am | 9590am |
| | | | 11865am | | |
| 2300 | 2330 | | USA, Voice of America | 6180va | 7205vo |
| | | | 9780va 11735va | 15110va | |
| 2300 | 2330 | w | USA, WBCQ Kennebunk ME | 17495no | |
| 2300 | 2350 | | Turkey, Voice of 6015va | 9655va | |
| 2300 | 2356 | | China, China Radio Intl | 5990ca | 6040na |
| | | | 13680na | | |
| 2300 | 2356 | | Ramania, Radio Ramania Intl | 11840au | 11940au |
| | | | 15145au 15370au | | |
| 2304 | 0000 | | USA, WYFR Okeechobee FL | 15400so | |
| 2315 | 2330 | | Croatia, Voice of 7285sa | | |
| 2330 | 0000 | | Canada, Radio Canada Intl | 5960na | 9590na |
| 2330 | 0000 | | Lithuania, Radio Vilnius | 9875na | |
| 2330 | 0000 | | Switzerland, Swiss Radio Intl | 9885so | 11660so |
| 2330 | 0000 | | USA, Voice of America | 6180va | 7130vo |
| | | | 7205va 9620va | 9780va | 11735va |
| | | | 11805va 13640va | 15110va | 15205va |
| 2330 | 2357 | | Czech Rep, Radio Prague Intl | 5915na | 7345no |
| 2330 | 2357 | | Vietnam, Voice of 9840as | 12020as | |

**Headnotes:**

1. **The Deutsche Welle transmissions that have provide credible reception in at least parts of North America are originate at the Kigali, Rwanda relay site and target West Africa. During the winter months only the 0600 and 2100 broadcasts have been consistently reliable, so we list the programs available at these times. Consult the frequency section of the SWG for where to tune.**
2. **Listings for the US-based independent shortwave broadcasters are limited to general interest programming that departs from their primary formats of religious and political fare. Please be aware that the schedules of these stations can be quite fluid, so we caution you that they are highly subject to change.**
3. **BBCWS stream abbreviations: (am)=Americas; (eas)=East Asia. These are the streams recommended by Bush House for North American listeners and both are included in the program schedules when identified by the BBC as potentially receivable on shortwave in North America.**

## 0000 UTC 7pmET/4pmPT

BBC WORLD SERVICE (am)
0000 D News; 0006 S Pick of the World (BBC's best), M Age of Empire (America in the modern world), T-A Outlook (magazine); 0032 M Quiz or panel game; 0045 S Write On (letters), T-A Off the Shelf (book readings).

RADIO AUSTRALIA
0000 D News; 0005 S Keys to Music (enjoying the classics), A Business Report; 0010 M AWAYE! (Aboriginal culture), T The Science Show, W The National Interest (Australian politics), H Background Briefing (documentary), F Hindsight (Australian history); 0030 A Ockham's Razor (science opinion); 0045 A Lingua Franca (about language).

RADIO CANADA INTERNATIONAL
0000 D CBC News; 0005 S Quirks & Quarks (science), M Global Village (world music), T-A As It Happens (interviews with newsmakers)[began at 2330]; 0030 H Dispatches (world events in Canadian perspective).

RADIO EXTERIOR ESPANA
0000 S Visitors Book (travelers to Spain), M Window on Spain (culture), T-A News (international, Spain, Latin America); 0015 S/M Spanish history or culture series; 0025 S/M Rebroadcast of 0035 weekday programs, T-A Spanish pop music; 0030 T-A Press Review; 0035 S/T Radio Waves, W Chronicles (Spain & the US), H Entremeses (food & travel), F Africa Today, A Radio Club (letters); 0045 T-A A Language Without Bounds (Spanish lesson).

RADIO JAPAN - NHK WORLD
0000 D News; 0010 S Hello from Tokyo (listener contact), M Weekend Japanology, T-A Songs for Everyone; 0015 T-A 44 Minutes (magazine); 0054 M Japan: Take 5.

RADIO NETHERLANDS
0000 S/M News; T-A Newsline; 0005 S Wide Angle (in-depth), M Europe Unzipped; 0025 S The Week Ahead (on RN), M Insight (commentary); 0030 S Amsterdam Forum (conversations), M Vox Humana (culture, T Research File (science), W EuroQuest (Europe in context), H Documentary, F Dutch Horizons, A A Good Life (development).

RADIO NEW ZEALAND INTERNATIONAL
0000 S/A RNZ News, M-F Pacific Regional News; 0006 S At the Movies, M-F Wayne's Music (favorites), A Digital Life; 0030 S Bookmarks, A Saturday Comedy Zone.

VOICE OF AMERICA (News Now)
0000 T-A News and Reports; 0023 T-A Sports; 0030 T-A News Headlines; 0033 T-A Coast to Coast (American life).

WBCQ, Maine
7415 kHz.: 0000 S The Real Amateur Radio Show, M Le Show (humor/entertainment), H Off the Hook (public telecommunications issues), F Uncle Ed's Musical Memories (cont'd from 2130), A The Last Discs Radio Show; 0030 S Fred Flintstone Music Show.
9330 kHz.: 0000 S Split Secs (free form).

## 0100 UTC 8pmET/5pmPT

BBC WORLD SERVICE (am)
0100 D News; 0106 S Top of the Pops (British music charts), M Everywoman, T Age of Empire (America in the modern world), W Masterpiece (artistic ideas), H Passport Please (national identity-1/22, 29; 2/5)/ Documentaries (2/12, 19, 26), F Assignment, A Sports International; 0132 M Westway Omnibus, T Music Feature, W White Label (new music), H Charlie Gillett (world music), F Music Biz, A John Peel (eclectic).

CHINA RADIO INTERNATIONAL
0100 D News & Reports; 0110 S Report on Developing Countries; 0115 A Cutting Edge (sci/tech); 0120 S CRI Roundup; 0130 S In the Spotlight (cultural magazine), M People in the Know (China's leoding personalities), T Biz China, W China Horizons (China outside Beijing), H Voices from Other Lands, F Life in China, A Listeners' Garden.

RADIO AUSTRALIA
0100 D News; 0105 S Correspondents' Report, A Asia Pacific (regional current affairs); 0110 M-F Asia Pacific; 0130 S In Conversation (about science), M Health Report, T Law Report, W Religion Report, H Media Report, F The Sports Factor, A The Lounge (interviews).
[Special service: 0105 S/A Grandstand (live sports action) on 9660, 12080, 17580, 21725 kHz. only.]

RADIO HABANA CUBA
0100 D International News; 0110 M Weekly Review, T-S National News; 0115 T-S Viewpoint; 0130 M Reports & Music, T-S News Bulletin; 0135 T-A Time Out (sports); 0140 S/W DXers Unlimited, M Mailbag Show, T/H/F Caribbean Outlook, A Weekly Review; 0150 M Breakthrough (science report).

RADIO NETHERLANDS
0100 S/M News; T-A Newsline; 0105 S Wide Angle (in-depth), M Europe Unzipped; 0125 S The Week Ahead (on RN), M Insight (commentary); 0130 S Amsterdam Forum (conversations), M Vox Humana (culture), T Research File (science), W EuroQuest (Europe in context), H Documentary, F Dutch Horizons, A A Good Life (development).

RADIO NEW ZEALAND INTERNATIONAL
0100 D RNZ News; 0105 S Feature, M-F In Touch with New Zealand (music, interviews, variety), A Eureka! (science)*; 0130 A Health Matters [or] Environment Matters.
[*may be preempted by live sport]

RADIO PRAGUE
0100 D News; 0105 S Magazine, M Mailbox, T-A Current Affairs; 0110 S Letter from Prague, M ABC of Czech (the language), W Czech Science, H Witness (eyewitness to history), A The Arts; 0115 S/W One on One (interview), M Encare [or] Magic Carpet (both monthly) [ar] Czech Books (biweekly), T Talking Point (Czech issues), H Czechs in History [or] Czechs Today (both monthly) [or] Spotlight (travelogue), F Economic Report, A Stepping Out (Prague nightlife).

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

RADIO UKRAINE INTERNATIONAL
0100 D News; 0110 S Ukroinian Diary (weekly review), M Music from Ukraine, T-A Ukraine Today (magazine); 0115 S The Whale World on the Radio Dial (DX program); 0130 S Hello From Kiev (listener letters/music), M Roots (culture & education); 0145 T-A Closeup (current issues).

VOICE OF AMERICA (News Now)
0100 T-A News and Reports; 0115 Focus (one news story in depth); 0123 T-A Sports; 0130 T-A News Headlines; 0133 T-F Business Report, A Our World (science magazine); 0145 T-F Dateline (daily short documentary); 0155 T-F Opinion Roundup.

VOICE OF VIETNAM
0100 D News; 0105 D Current Affairs; 0110 S Weekly Review, M Sunday Show, T/W/F/A Press Review, H Talk of the Week; 0115 T Vietnam: Land & People, W Culture & Society, H Letterbox, F Vietnam Economy, A Rural Vietnam; 0120 S Music, A Literature and Arts.

WBCQ, Maine
7415 kHz.: 0100 S Different Kind of Oldies Show, M Radio New York International, W/A Allan Weiner Worldwide.

RTE, Ireland
0130 S Saturday View, M This Week with Gerald Barry, T-A 5-7 Live (top news of the day).

VOICE OF AMERICA (Special English)
0130 T-A News; 0140 T Agriculture Today, W/H Science Report, F Environment Report, A In the News; 0145 T Science in the News, W Explorations, H Making of a Nation, F American Mosaic; A American Stories.

## 0200 UTC 9pmET/6pmPT

BBC WORLD SERVICE (am)
0200 D News; 0206 S Play of the Week, M The Ticket (global arts survey), T Health Matters, W Go Digital, H Discovery (science), F One Planet (ecology), A Science in Action; 0232 T Quiz or panel game, W Music Review, H/A Westway, F The Word (writing & writers) [exc. 27th, World Book Club (discussion)]; 0245 H Heart & Soul (beliefs & values), A What's the Problem (advice).

RADIO AUSTRALIA
0200 D News; 0205 S Margaret Throsby (interviews and music), A Background Briefing (documentary); 0210 M-F The World Today (ABC Radio flagship news program); 0255 T-F Stock Market Report, A Reporter's Notebook.
[Special service: 0205 S/A Grandstand (live sports action) on 9660, 12080, 17580, 21725 kHz. only.]

RADIO AUSTRIA INTERNATIONAL
0205 S/M Insight Central Europe; 0215 T-A Report from Austria; 0225 S/M Listener Letters; 0235 S/M Insight Central Europe; 0245 T-A Report from Austria; 0255 S/M Listener Letters.

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RADIO BUDAPEST
0200 D News; 0205 S Insight Central Europe; M Europe Unlimited (trade) or Heading for Hungary (travel) or Spotlight (culture) or And the Gatepost (letters), T-A Hungary Today (current events magazine); 0220 A DX Corner.

RADIO CANADA INTERNATIONAL
0200 D News; 0205 S Business Sense, M Maple Leaf Mailbag (w/CIDX report bimonthly); 0210 T-A Canada Today (current events magazine); 0235 S/A Sci-Tech File, M/H Spotlight (arts & culture), T Media Zone (journalists discuss), W Maple Leaf Mailbag (w/CIDX report bimonthly), F Business Sense.

RADIO HABANA CUBA
0200 D International News; 0210 M From Habana (Cuban musicians), T-S National News; 0215 T-S Reports and music; 0230 M The Jazz Place or Top Tens, T-S News Bulletin; 0235 S World of Stamps, T-A Reports and music; 0250 S Cuban music.

RADIO KOREA INTERNATIONAL
0200 D News; 0210 S Worldwide Friendship (letters, DX news), M Korean Pop Interactive (requests), T-A News Commentary; 0215 T-A Seoul Calling (magazine); 0230 T Korea Today & Tomorrow (peninsular relations), W Korean Kaleidoscope (society), H Wonderful Korea (travelogue), F Seoul Report.

RADIO NEW ZEALAND INTERNATIONAL
0200 D RNZ News; 0205 S Feature*, A Home Grown (NZ music)*; 0208 M-F In Touch w/NZ (cont'd); 0230 A Musical Chairs (artist spotlight)*.
[*may be preempted by live sport]

RADIO PRAGUE
0200 D News; 0205 S Magazine, M Mailbox, T-A Current Affairs; 0210 S Letter from Prague, M ABC of Czech (the language), W Czech Science, H Witness (eyewitness to history), A The Arts; 0215 S/W One on One (interview), M Encore [or] Magic Carpet (both monthly) [or] Czech Books (biweekly), T Talking Point (Czech issues), H Czechs in History [or] Czechs Today (both monthly) [or] Spotlight (travelogue), F Economic Report, A Stepping Out (Prague nightlife).

RADIO ROMANIA INTERNATIONAL
0200 D Radio Newsreel; 0210 S The Week, M Focus, T-A Commentary; 0215 S World of Culture, M Sunday Studio, T Pro Memoria (history), W Business Club, H Society Today, F Cards on the Table (debate) or The Romanian Next to You (interview), A Challenge for the Future or Terra 2001; 0220 S RRI Encyclopedia, T Political Flash, W European Horizons; 0225 S Roots (culture/traditions), M Romanian by Radio, T/H/A Business Update, W Tourist News, F Listeners' Letterbox; 0230 S Radio Pictures, M Romanian Itineraries, T Pulse of Transition, W W Mother Nature (ecology), H Visit Romania, A Practical Guide; 0235 S Romanian Itineraries, M Listeners' Letterbox, T Performing Arts, W Youth Club, H Partners in a Changing World, A Cultural Survey; 0240 S, Bucharest Along the Centuries, T Pages of Romanian Literature, W/F Skylark (folk music), H Stage and Screen, A Spectator (voice of the people); 0245 S DX Mailbag, T Romanian Hits, H Romanian Musicians, A Romanian Folk Music At Its Best; 0250 M Romanian Folk Music At Its Best, T Sports Roundup, W Athlete of the Week, H Sports Club, F Football Flash, A Sports Weekend.

RADIO TAIWAN INTERNATIONAL
0200 D News; 0215 S News Talk, M Jade Bells & Bamboo Pipes (traditional music), T Culture Express, W Taiwan Today, H Discover Taiwan, F Taipei Magazine, A Groove Zone; 0230 S Hakka World (Hakka culture), T Trends, W Instant Noodles (the wacky), H Confuscius & Inspiration Beyond, F People; 0240 S Mailbag Time; 0245 M-F Let's Learn Chinese (M/W/F elementary, T/H intermediate), A Kaleidoscope (life in Taiwan).
[This schedule also airs at 0700 for western North America.]

VOICE OF RUSSIA
0200 D News; 0211 S/M Moscow Mailbag, T-A Commonwealth Update; 0230 D News in Brief; 0232 S Moscow Yesterday & Today, M Timelines, T Folk Box, W Jazz Show, H Musical Portraits, F Moscow Calling, A Christian Message from Moscow; 0246 F Music At Your Request; 0254 H Russia: People & Events.

WBCQ, Maine
7415 kHz.: 0200 S Marion's Attic (vintage recordings), M Radio New York International (cont'd), A Tasha Takes Control.

WHRA, Maine
7580 kHz.: 0230 S DXing with Cumbre.

RADIO SWEDEN
0230 S Network Europe (Europe magazine-1st week)/ Sweden Today (2nd)/Spectrum (arts magazine-3rd)/Studio 49 (topical discussion-4th), M In Touch with Stockholm (listener contact-1st)/ Sounds Nordic (rock music-exc. 1st), T-A Sixty Degrees North (regional report); 0245 T Sports Scan, W Close Up (profiles of Swedes-1st), F Nordic Lights (1st)/Green Scan (ecology-2nd)/ Heart Beat (health-3rd)/The S-Files (things Swedish-4th), A Review of the Newsweek.

VOICE OF VIETNAM
0230 D News; 0235 D Current Affairs; 0240 Su Weekly Review, M Sunday Show, T/W/F/A Press Review, H Talk of the Week; 0245 T Vietnam: Land & People, W Culture & Society, H Letterbox, F Vietnam Economy, A Rural Vietnam; 0250 S Music, A Literature and Arts.

## 0300 UTC 10pmET/7pmPT

BBC WORLD SERVICE (am)
0300 S/A News, M-F The World Today; 0332 S The Interview (trends), M World Business Review, T-A World Business Report; 0345 M Instant Guide (background), T/W/F/A Analysis, H From Our Own Correspondent.

CHINA RADIO INTERNATIONAL
0300 D News & Reports; 0310 S Report on Developing Countries; 0315 A Cutting Edge (sci/tech); 0320 S CRI Roundup; 0330 S In the Spotlight (cultural magazine), M People in the Know (China's leading personalities), T Biz China, W China Horizons (China outside Beijing), H Voices from Other Lands, F Life in China, A Listeners' Garden.

RADIO AUSTRALIA
0300 D News; 0305 S Verbatim (oral histories), A Rural Reporter; 0310 M-F Regional Sports Report; 0320 M-F Life Matters (social issues); 0330 S Jazz Notes, A Australian Country Style; 0354 Heywire (young rural Australian opinion).
[Special service: 0305 S/A Grandstand (live sports action) on 9660, 12080, 17580, 21725 kHz. only.]

RADIO BULGARIA
0300 D News; 0310 S Views Behind the News, M Folk Studio (Bulgarian folk music), T-A Events and Developments; 0320 T Sports; 0325 W-S Timeout for Music; 0330 T Bulgarian Plaza (cultural magazine) or Walks and Talks (interesting places); 0335 T Answering Your Letters, W-M Keyword Bulgaria (Bulgaria and things Bulgarian); 0345 S Radio Bulgaria Calling (for radio hobbyists), W Magazine Economy, H Arts and Artists, F History Club, A The Way We Live.

RADIO HABANA CUBA
0300 D International News; 0310 M Weekly Review, T-S National News; 0315 T-S Viewpoint; 0330 M Reports & Music, T-S News Bulletin; 0335 T-A Time Out (sports); 0340 S/W DXers Unlimited, M Mailbag Show, T/H/F Caribbean Outlook, A Weekly Review; 0350 M Breakthrough (science report).

RADIO NEW ZEALAND INTERNATIONAL
0300 S/A* RNZ News, M-F Pacific Regional News; 0305 S Sunday Drama* (radio plays), A Home Grown (cont'd from 0205); 0308 M-F Dateline Pacific; 0330 M New Music Releases, T Mailbox (letters & DX news) or RNZI Talk (station info), W Tradewinds (Pacific commerce), H The World in Sport, F Pacific Correspondent.
[*may be preempted by live sport]

RADIO TAIWAN INTERNATIONAL
0300 D News; 0315 S Hakka World (Hakka culture), M Taiwan Economic Journal, T Jade Bells & Bamboo Pipes (traditional music), W New Music Lounge, H Instant Noodles (the wacky), F Formosa Outlook, A News Talk; 0325 A Kaleidoscope (life in Taiwan); 0330 S Asia Pacific (from Radio Australia), M Stage, Screen & Studio, H Life Unusual, F Bookworm; 0340 A Mailbag Time; 0345 M-F Let's Learn Chinese (M/W/F elementary, T/H intermediate).

VOICE OF AMERICA, Africa Service
0300 S/A News & Reports, M-F Daybreak Africa (morning newsmagazine); 0323 S/A Sports; 0330 D News Headlines; 0333 S Encounter (topical debate), M-F Business Report, A Our World (ecology, science & technology); 0345 M-F Dateline (documentary); 0355 M-F Opinion Roundup.

VOICE OF RUSSIA
0300 D News; 0311 M Sunday Panorama, T-S News & Views; 0330 D News in Brief; 0332 S Songs from Russia, M/F Russian by Radio, T Kaleidoscope (Russian events), W Musical Portraits, H Moscow Yesterday & Today, A Audio Book Club (Russian lit.); 0346 S You Write to Moscow; 0354 S/W Russia: People & Events.

WBCQ, Maine
7415 kHz.: 0300 S Alan Sane ("pirate" radio), M Radio New York International (cont'd).

WHRI, Indiana
5745 kHz.: 0330 M DXing with Cumbre.

WRMI, Florida
7385 kHz: 0300 S Wavescan; 0330 S Viva Miami, M Wavescan.

WWCR, Tennessee
5070 kHz.: 0300 S DX Partyline; 0330 S World of Radio.

KWHR, Hawaii
17510 kHz.: 0300 M DXing with Cumbre.

RADIO BUDAPEST
0330 D News; 0335 S Insight Central Europe; M Europe Unlimited (trade) or Heading for Hungary (travel) or Spotlight (culture) or And the Gatepost (letters), T-A Hungary Today (current events magazine); 0350 A DX Corner.

RADIO SWEDEN
0330 S Network Europe (Europe magazine-1st week)/ Sweden Today (2nd)/Spectrum (arts magazine-3rd)/Studio 49 (topical discussion-4th), M In Touch with Stockholm (listener contact-1st)/ Sounds Nordic (rock music-exc. 1st), T-A Sixty Degrees North (regional report); 0345 T Sports Scan, W Close Up (profiles of Swedes-1st), F Nordic Lights (1st)/Green Scan (ecology-2nd)/

Heart Beat (health-3rd)/The S-Files (things Swedish-4th), A Review of the Newsweek.

VOICE OF VIETNAM
0330 D News; 0335 D Current Affairs; 0340 Su Weekly Review, M Sunday Show, T/W/F/A Press Review, H Talk of the Week; 0345 T Vietnam: Land & People, W Culture & Society, H Letterbox, F Vietnam Economy, A Rural Vietnam; 0350 S Music, A Literature & Arts.

## 0400 UTC 11pmET/8pmPT

BBC WORLD SERVICE (am)
0400 S World Briefing, M-A News; 0406 M Talking Point (phone-in)[taped S 1406], T-F Outlook (magazine), A Pick of the World (BBC's best); 0432 S Global Business; 0445 M-F Off the Shelf (book readings), A Write On (letters).

CHINA RADIO INTERNATIONAL
0400 D News & Reports; 0410 S Report on Developing Countries; 0415 A Cutting Edge (sci/tech); 0420 S CRI Roundup; 0430 S In the Spotlight (cultural magazine), M People in the Know (China's leading personalities), T Biz China, W China Horizons (China outside Beijing), H Voices from Other Lands, F Life in China, A Listeners' Garden.

RADIO AUSTRALIA
0400 D News; 0405 S All in the Mind (the brain), A The Music Show (classical); 0410 M-F Margaret Throsby (interviews and music); 0430 S The Lounge (interviews); 0455 M-F Perspective (commentary).
[Special service: 0405 S/A Grandstand (live sports action) on 9660, 12080, 17580, 21725 kHz. only.]

RADIO HABANA CUBA
0400 D International News; 0410 M From Habana (Cuban musicians), T-S National News; 0415 T-S Reports and music; 0430 M The Jazz Place or Top Tens, T-S News Bulletin; 0435 S World of Stamps, T-A Reports and music; 0450 S Cuban music.

RADIO NETHERLANDS
0400 S/M News; T-A Newsline; 0405 S Wide Angle (in-depth), M Europe Unzipped; 0425 S The Week Ahead (on RN), M Insight (commentary); 0430 S Amsterdam Forum (conversations), M Vox Humana (culture, T Research File (science), W EuroQuest (Europe in context), H Documentary, F Dutch Horizons, A A Good Life (development).

RADIO NEW ZEALAND INTERNATIONAL
0400 S/A RNZ News, M-F Checkpoint (major domestic evening news magazine); 0410 S Religion feature or series, A Tagata O Te Moana (Pacific magazine); 0440 S Jazz Spotlight.

RADIO PRAGUE
0400 D News; 0405 S Magazine, M Mailbox, T-A Current Affairs; 0410 S Letter from Prague, M ABC of Czech (the language), W Czech Science, H Witness (eyewitness to history), A The Arts; 0415 S/W One on One (interview), M Encore [or] Magic Carpet (both monthly) [or] Czech Books (biweekly), T Talking Point (Czech issues), H Czechs in History [or] Czechs Today (both monthly) [or] Spotlight (travelogue), F Economic Report, A Stepping Out (Prague nightlife).

RADIO ROMANIA INTERNATIONAL
0400 D Radio Newsreel; 0410 S The Week, M Focus, T-A Commentary; 0415 S World of Culture, M Sunday Studio, T Pro Memoria (history), W Business Club, H Society Today, F Cards on the Table (debate) or The Romanian Next to You (interview), A Challenge for the Future or Terra 2001; 0420 S RRI Encyclopedia, T Political Flash, W European Horizons; 0425 S Roots (culture/traditions), M Romanian by Radio, T/H/A Business Update, W Tourist News, F Listeners' Letterbox; 0430 S Radio Pictures, M Romanian Itineraries, T Pulse of Transition, W Mother Nature (ecology), H Visit Romania, A Practical Guide; 0435 S Romanian Itineraries, M Listeners' Letterbox, T Performing Arts, W Youth Club, H Partners in a Changing World, A Cultural Survey; 0440 S, Bucharest Along the Centuries, T Pages of Romanian Literature, W/F Skylark (folk music), H Stage and Screen, A Spectator (voice of the people); 0445 S DX Mailbag, T Romanian Hits, H Romanian Musicians, A Romanian Folk Music At Its Best; 0450 M Romanian Folk Music At Its Best, T Sports Roundup, W Athlete of the Week, H Sports Club, F Football Flash, A Sports Weekend.

RADIO UKRAINE INTERNATIONAL
0400 D News; 0410 S Ukrainian Diary (weekly review), M Music from Ukraine, T-A Ukraine Today (magazine); 0415 S The Whole World on the Radio Dial (DX program); 0430 S Hello From Kiev (listener letters/music), M Roots (culture & education), 0445 T-A Closeup (current issues).

VOICE OF AMERICA, Africa Service
0400 D News & Reports; 0415 M-F Focus (a topic in-depth); 0423 D Sports; 0430 S/A News Headlines, M-F Daybreak Africa (morning newsmagazine); 0433 S/A Main Street (life in America).

VOICE OF RUSSIA
0400 D News; 0411 S Music & Musicians, M This is Russia, T Musical Portraits, W/A Moscow Mailbag, H Science Plus, F Newmarket; 0430 D News in Brief; 0432 M Moscow Calling, T/H/A The River of Time, W Guest Speaker, F Russian history/culture; 0447 W Ladies of Character.

VOICE OF TURKEY
0400 D News; 0410 D Press Review; 0415 S Outlook, M Tunes Spanning Centuries, T Last Week, W Live From Turkey, H Review of the Foreign Media, F Big Powers & the Armenian Problem, A Archaeological Settlements in Turkey; 0420 S The Stream of Love or DX Corner, T Hues & Colors of Anatolia, H Letterbox; 0425 M/A Music, F In the Wake of a Contest; 0430 S/T Music; 0435 S Turkish Arts, M Turks in the Mirror of Centuries, T From Past to Present, H Turkey's Off the Beaten Track Sites, F The Culture Parade, A The Travel Itinerary of Anatolia.

KWHR, Hawaii
17780 kHz.: 0430 S DXing with Cumbre.

WBCQ, Maine
7415 kHz.: 0400 S You Are What You Think (satire), M Radio New York International (cont'd).

WHRA, Maine
7580 kHz.: 0430 A DXing with Cumbre.

WHRI, Indiana
7315 kHz.: 0430 M DXing with Cumbre.

WRMI, Florida
7385 kHz.: 0400 S IBC Radio Network, M Old Time Radio.

WWCR Tennessee
5070 kHz.: 0400 S Spectrum (communications discussion).

## 0500 UTC 12mET/9pmPT

BBC WORLD SERVICE (am)
0500 D World Briefing; 0520 D Sports Roundup; 0532 S Reporting Religion, M-F The World Today, A People & Politics.

CHANNEL AFRICA, South Africa
0500 S Network Africa (week in review), M-F Dateline Africa (news magazine), A Channel Africa Sport.

CHINA RADIO INTERNATIONAL
0500 D News & Reports; 0510 S Report on Developing Countries; 0515 A Cutting Edge (sci/tech); 0520 S CRI Roundup; 0530 S In the Spotlight (cultural magazine), M People in the Know (China's leading personalities), T Biz China, W China Horizons (China outside Beijing), H Voices from Other Lands, F Life in China, A Listeners' Garden.

RADIO AUSTRALIA
0500 D News; 0505 S The Europeans, A The Music Show (cont'd); 0510 M-F Pacific Beat (Pacific islands magazine with regional sports report @ 0530); 0530 S The Ark (religious history); 0549 S The Pulse (Aussie music now).
[Special service: 0505 S/A Grandstand (live sports action) on 9660, 12080, 17580, 21725 kHz. only.]

RADIO HABANA CUBA
0500 D International News; 0510 M Weekly Review, T-S National News; 0515 T-S Viewpoint; 0530 M Reports & Music, T-S News Bulletin; 0535 T-A Time Out (sports); 0540 S/W DXers Unlimited, M Mailbag Show, T/H/F Caribbean Outlook, A Weekly Review; 0550 M Breakthrough (science report).

RADIO JAPAN - NHK WORLD
0500 D News; 0510 S Pop Joins the World, A Hello from Tokyo (listener contact); 0515 M-F 44 Minutes (magazine).

RADIO NEW ZEALAND INTERNATIONAL
0500 D RNZ News; 0507 S Mana Korero (Maori magazine), M-F Worldwatch & Pacific Report, A The Mix ('live' music acts); 0530 M Letter from America (Alistair Cooke); 0545 M-F Storytime.

RVi, Belgium
0500 S Music from Flanders, M Radio World, T-A News; 0504 T-A Flanders Today (incl. press review, reports & CD of the Week); 0508 M Tourism in Flanders; 0514 M Brussels 1043 (letters).

VOICE OF AMERICA, Africa Service
0500 S News, M-A News & Reports; 0523 M-A Sports Report; 0530 D News Headlines; 0533 S Issues in the News, M-F Business Report, A Press Conference USA; 0545 M-F Dateline (documentary); 0555 M-F Opinion Roundup.

VOICE OF NIGERIA
0500 S/A News Summary, M-F VON Scope (news magazine); 0505 S This Week on VON, A VON Link-up (music requests); 0530 D Moving On (variety magazine).

VOICE OF RUSSIA
0500 D News; 0511 S/M Musical Portraits, T/F Moscow Mailbag, W/A Science Plus, H Newmarket (business); 0530 D News in Brief; 0532 S Kaleidoscope, M Audio Book Club, T Music Around Us, W Moscow Yesterday & Today, H Folk Box, F Audio Book Club (Russian lit.), A Timelines; 0547 T Music At Your Request.

WBCQ, Maine
7415 kHz.: 0500 S Tom & Darryl (electronic media), M-A Amos 'n Andy; 0515 T-F Planet World News Tonight; 0545 M World of Radio.

WRMI, Florida
7385 kHz.: 0500 S Twilight Zone (science fiction), M Old Time Radio (cont'd.)

WWCR, Tennessee
5070 kHz.: 0500 S Cyber Line (digital communications).

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## 0600 UTC 1amET/10pmPT

CHANNEL AFRICA, South Africa
0600 S Network Africa (week in review), M-F Dateline Africa (news magazine), A Channel Africa Sport.

DEUTSCHE WELLE
0600 D News; 0605 S Inside Europe, M Mailbag, T-A Newslink Africa; 0630 T Insight (international affairs), W World in Progress (development), H Money Talks, F Living Planet, A Spectrum (sci-tech); 0445 T Business German.

RADIO AUSTRALIA
0600 D News; 0605 S The Arts on RA, A Verbatim (oral histories); 0610 M-F Regional Sports Report; 0620 M Ockham's Razor (science opinion), T In Conversation (about science), W Lingua Franca (about language), H The Ark (religious history), F The Makers (artists); 0630 S Hit Mix (pop/rock), A In Conversation; 0635 M Hit Mix, T Music Deli (diverse world/folk),W Jazz Notes, H Australian Country Style, F The Lounge (interviews).
[Special service: 0605 S/A Grandstand (live sports action) on 9660, 12080, 17580, 21725 kHz. only.]

RADIO HABANA CUBA
0600 D International News; 0610 M From Habana (Cuban musicians), T-S National News; 0615 T-S Reports and music; 0630 M The Jazz Place or Top Tens, T-S News Bulletin; 0635 S World of Stamps, T-A Reports and music; 0650 S Cuban music.

RADIO JAPAN - NHK WORLD
0600 D News; 0610 S Weekend Square (Japanese life), M-F Songs for Everyone, A Pop Joins the World; 0615 M-F Asian Top News (headlines from region's radio); 0625 M Japan Music Treasure Box, T Basic Japanese for You, W Japan Musicscape, H Brush Up Your Japanese, F Music Beat; 0654 S Japan: Take Five.

RADIO NEW ZEALAND INTERNATIONAL
0600 S/A RNZ News, M-F Checkpoint (repeat of 0400); 0604 S One in Five (disability issues), A Saturday Night with Peter Fry (variety); 0635 S This Week in Parliament.

RADIO ROMANIA INTERNATIONAL
0600 D Radio Newsreel; 0610 S The Week, M Focus, T-A Commentary; 0615 S World of Culture, M Sunday Studio, T Pro Memoria (history), W Business Club, H Society Today, F Cards on the Table (debate) or The Romanian Next to You (interview), A Challenge for the Future or Terra 2001; 0620 S RRI Encyclopedia, T Political Flash, W European Horizons; 0625 S Roots (culture/traditions), M Romanian by Radio, T/H/A Business Update, W Tourist News, F Listeners' Letterbox; 0630 S Radio Pictures, M Romanian Itineraries, T Pulse of Transition, W W Mother Nature (ecology), H Visit Romania, A Practical Guide; 0635 S Romanian Itineraries, M Listeners' Letterbox, T Performing Arts, W Youth Club, H Partners in a Changing World, A Cultural Survey; 0640 S, Bucharest Along the Centuries, T Pages of Romanian Literature, W/F Skylark (folk music), H Stage and Screen, A Spectator (voice of the people); 0645 S DX Mailbag, T Romanian Hits, H Romanian Musicians, A Romanian Folk Music At Its Best; 0650 M Romanian Folk Music At Its Best, T Sports Roundup, W Athlete of the Week, H Sports Club, F Football Flash, A Sports Weekend.

VOICE OF AMERICA, Africa Service
0600 S/A News & Reports, M-F Daybreak Africa (morning newsmagazine); 0623 S/A Sports; 0630 S/A News Headlines; 0633 S/A Main Street (life in America).

VOICE OF NIGERIA
0600 D Nigeria/Africa/World News (magazine); 0630 S In the News, A News Maker; 0645 A Window on Abuja.

KWHR, Hawaii
17780 kHz.: 0600 A DXing with Cumbre.

WBCQ, Maine
7415 kHz.: 0600 S Juliet's Wild Kingdom.

WRMI, Florida
7385 kHz.: 0600 S Lou Gentile (the paranormal), M IBC Radio Network.

## 1000 UTC 5amET/2amPT

BBC WORLD SERVICE (am)
1000 S/A News, M-F World Update; 1006 S From Our Own Correspondent, A Assignment; 1032 S Reporting Religion, A The Interview (trends).

BBC WORLD SERVICE (eas)
1000 S/A News, M-F World Update; 1006 S From Our Own Correspondent, A Assignment; 1032 S Play of the Week (radio theatre), M-F World Business Report, A The Interview (trenas); 1045 M Instant Guide (background), T/W/F Analysis, H >From Our Own Correspondent..

RADIO AUSTRALIA
1000 D News; 1005 S Keys to Music (enjoying the classics), M-F Asia Pacific (regional current affairs), A Background Briefing; 1030 M Health Report, T Law Report, W Religion Report, H Media Report, F The Sports Factor; 1055 A Reporter's Notebook.

RADIO NEW ZEALAND INTERNATIONAL
1000 D News; 1005 S Mediawatch, M-F Late Edition (the day's news), A Deep Purple (relaxing music/nostalgia); 1035 S Sunday Supplement.

VOICE OF AMERICA (News Now)
1000 D News and Reports; 1023 D Sports; 1030 D News Headlines; 1033 *(no information from VOA available)*; 1055 A Government Editorial.

KWHR, Hawaii
11565 kHz.: 1000 A DXing with Cumbre.

## 1100 UTC 6amET/3amPT

BBC WORLD SERVICE (am)
1100 D World Briefing; 1105 M-F Caribbean Morning Report; 1110 M-F Sports Caribbean; 1115 M-F Caribbean Magazine; 1120 D British News; 1132 S Instant Guide (background), M-F World Business Report, A World Football; 1145 S-H Sports Roundup, F Football Extra.

BBC WORLD SERVICE (eas)
1100 S Play of the Week (cont'd from 1032), M-A News; 1106 M-F Outlook (magazine), A The Ticket (global arts survey); 1132 S Reporting Religion; 1145 M-F Off the Shelf (book readings).

CHINA RADIO INTERNATIONAL
1100 D Real Time Beijing (world/national/city news, business, sports, press, sci-tech, culture, show-biz, music, features); 1115 S China Beat (popular music), A China Roots (traditional music).

HCJB ECUADOR
1100 S Let My People Think, M-F Insight for Living, A Down Gilead Lane; 1130 S Renewing Your Mind, M-F Family Life Today, A Adventures in Odyssey.

RADIO AUSTRALIA
1100 D News; 1105 S Correspondents' Report, M-A Asia Pacific (regional current affairs); 1130 S The Arts on RA, M-F Bush Telegraph (rural life), A The Europeans.

RADIO JAPAN - NHK WORLD
1100 D News; 1110 S Hello from Tokyo (listener contact), M-F Songs for Everyone, A Pop Joins the World; 1115 M-F Asian Top News (headlines from region's radio); 1125 M Japan Music Treasure Box, T Basic Japanese for You, W Japan Musicscape, H Brush Up Your Japanese, F Music Beat.

RADIO KOREA INTERNATIONAL
1130 D News; 1140 S Korean Pop Interactive (requests), M-F News Commentary, A Worldwide Friendship (letters, DX news); 1145 M-F Seoul Calling (magazine).

RADIO NETHERLANDS
1100 S Aural Tapestry (culture), M EuroQuest (Europe in context), T A Good Life (development issues), W Dutch Horizons, H Research File (science), F Documentary, A Amsterdam Forum (conversations); 1130 S Dutch Horizons, M Research File, T/A Music 52-15 (international music), W Documentary, H Aural Tapestry, F A Good Life.

RADIO NEW ZEALAND INTERNATIONAL
1100 S/A RNZ News, M-F Pacific Regional News; 1105 S/A Forces Programme (for NZ personnel serving in PNG & E. Timor); 1108 M-F Dateline Pacific; 1130 M New Music Releases, T Mailbax (letters & DX news) or RNZI Talk (station info), W Tradewinds (Pacific commerce), H The World in Sport, F Pacific Correspondent.

WWCR, Tennessee
5070 kHz.: 1130 A World of Radio.

## 1200 UTC 7amET/4amPT

BBC WORLD SERVICE (am)
1200 D Newshour; 1205 M-F Caribbean Business; 1210 M-F Caribbean Morning Report 2nd Edition; 1220 M-F Caribbean Magazine; 1230 M-F Newshour (cont'd.).

BBC WORLD SERVICE (eas)
1200 D Newshour.

HCJ8 ECUADOR
1200 S Moody Presents, M-F Precept, A Hour of Decision; 1215 M-F Proclaim; 1230 S The Living Word, M-F Renewing Your Mind, A DX Partyline.

RADIO AUSTRALIA
1200 D News; 1205 S The Spirit of Things (spiritual matters), M-H Late Night Live (discussion & interviews), F Sound Quality (innovative music), A The Music Show (classical); 1255 S The Pulse (Aussie music now).

RADIO KOREA INTERNATIONAL
1200 S Korean Pop Interactive (cont'd), M-F Seoul Calling (cont'd), A Worldwide Friendship (cont'd); 1215 M Korea Today & Tomorrow (peninsula issues), T Korean Kaleidoscope (Korean society), W Wonderful Korea (tourism), H Seoul Report (interviews).

RADIO NETHERLANDS
1200 S/A News, M-F Newsline; 1205 S Wide Angle (in-depth), A Europe Unzipped; 1225 S The Week Ahead (on RN), A Insight (comment); 1230 S Vox Humana (culture), M Research File (science), T EuroQuest (Europe in context), W Documentary, H Dutch Horizons, F A Good Life (development issues), A Amsterdam Forum (conversations).

RADIO NEW ZEALAND INTERNATIONAL
1200 S-F RNZ News, A Forces Programme (cont'd.); 1205 S Sportsworld (recap magazine), M-F Late Edition.

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RADIO SWEDEN
1230 S In Touch with Stockholm (listener contact-1st)/ Sounds Nordic (rock music-exc. 1st), M-F Sixty Degrees North (regional report), A Network Europe (Europe magazine-1st week)/Sweden Today (2nd)/Spectrum (arts magazine-3rd)/Studio 49 (topical discussion-4th); 1245 M Sports Scan, T Close Up (profiles of Swedes-1st), H Nordic Lights (1st)/Green Scan (ecology-2nd)/Heart Beat (health-3rd)/The S-Files (things Swedish-4th), F Review of the Newsweek.

## 1300 UTC 8amET/5amPT

BBC WORLD SERVICE (am)
1300 D News; 1306 S Passport Please (national identity-1/25, 2/1, 8)/ Documentaries (2/15, 22, 29), M-F Outlook (magazine), A Pick of the World (BBC's best); 1332 S In Praise of God; 1345 M-F Off the Shelf (book readings), A Write On (letters).

BBC WORLD SERVICE (eas)
1300 D News; 1301 A In Concert (performances); 1306 S From Our Own Correspondent, M Age of Empire (America in the modern world), T Masterpiece (arts ideas), W Passport Please (national identity-1/21, 28; 2/4)/ Documentaries (2/11, 18, 25), H Assignment, F Sports International; 1332 M-F British News; 1345 S Reporting Religion, M-H Sports Roundup, F Football Extra.

CHANNEL AFRICA, South Africa
1300 S/A Channel Africa Extra (weekend variety magazine).

CHINA RADIO INTERNATIONAL
1300 D News & Reports; 1310 S Report on Developing Countries; 1315 A Cutting Edge (sci./ tech); 1320 S CRI Roundup; 1330 S In the Spotlight (cultural magazine), M People in the Know (China's leading personalities), T Biz China, W China Horizons (China outside Beijing), H Voices from Other Lands, F Life in China, A Listeners' Garden.

RADIO AUSTRALIA
1300 D News; 1305 S The Science Show, M-F The Planet (diverse music from around the world), A The Music Show (cont'd); 1355 S Perspective (commentary).

RADIO CANADA INTERNATIONAL
1300 M-F News; 1305 M-F The Current (current affairs-joined in progress).

RADIO NEW ZEALAND INTERNATIONAL
1300 S/A RNZ News, M-F Pacific Regional News; 1305 S Tagata o te Moana, A New Music Releases; 1308 M-F Dateline Pacific; 1330 M New Music Releases, T Mailbox (letters & DX news) or RNZI Talk (station info), W Tradewinds (Pacific commerce), H The World in Sport, F Pacific Correspondent.

RADIO SWEDEN
1330 S In Touch with Stockholm (listener contact-1st)/ Sounds Nordic (rock music-exc. 1st), M-F Sixty Degrees North (regional report), A Network Europe (Europe magazine-1st week)/Sweden Today (2nd)/Spectrum (arts magazine-3rd)/Studio 49 (topical discussion-4th); 1345 M Sports Scan, T Close Up (profiles of Swedes-1st), H Nordic Lights (1st)/Green Scan (ecology-2nd)/Heart Beat (health-3rd)/The S-Files (things Swedish-4th), F Review of the Newsweek.

WHRI, Indiana
15105 kHz.: 1330 A DXing with Cumbre.

WRMI, Florida
15725 kHz.: 1300 A Shortwave Radio Network; 1330 S Viva Miami!

## 1400 UTC 9amET/6pmPT

BBC WORLD SERVICE (am)
1400 D News; 1406 S Talking Point (live phone-in), M Age of Empire (America in the modern world), T Masterpiece (arts ideas), W Passport Please (national identity-1/21, 28; 2/4)/ Documentaries (2/11, 18, 25), H Assignment, F Sports International, A Sportsworld (live action); 1432 M Music Feature, T White Label (new music), W Charlie Gillett (world music), H Music Biz, F John Peel (eclectic).

BBC WORLD SERVICE (eas)
1400 S/A News, M-F East Asia Today; 1406 S Talking Point (live phone-in), A Sportsworld (live action); 1432 M-F Newshour.

CHANNEL AFRICA, South Africa
1400 S/A Channel Africa Extra (cont'd from 1300).

CHINA RADIO INTERNATIONAL
1400 D News & Reports; 1410 S Report on Developing Countries; 1415 A Cutting Edge (sci/ tech); 1420 S CRI Roundup; 1430 S In the Spotlight (cultural magazine), M People in the Know (China's leading personalities), T Biz China, W China Horizons (China outside Beijing), H Voices from Other Lands, F Life in China, A Listeners' Garden.

RADIO AUSTRALIA
1400 D News; 1405 S Books & Writing, M-F Margaret Throsby (interview/music), A The Comfort Zone (design issues).

RADIO CANADA INTERNATIONAL
1400 D News; 1405 S The Sunday Edition, M-F Sounds Like Canada (Canadian magazine); A The House (Canadian politics).

RADIO JAPAN - NHK WORLD
1400 D News; 1410 S Pop Joins the World, A Weekend Japanology; 1415 M-F 44 Minutes (feature magazine); 1454 A Japan: Take Five.

RADIO NEW ZEALAND INTERNATIONAL
1400 D RNZ News; 1410 D Readings; 1430 T Bookmarks, W Diversions, H For a Smile, A This Week in Parliament; 1440 S/M On This Day, F Auckland Issues.

RADIO PRAGUE
1400 D News; 1405 S Mailbox, M-F Current Affairs, A Insight Central Europe; 1410 S ABC of Czech (the language), T Czech Science, W Witness (eyewitness to history), F The Arts; 1415 S Encore [or] Magic Carpet (both monthly) [or] Czech Books (biweekly), M Talking Point (Czech issues), T One on One (interview), W Czechs in History [or] Czechs Today (both monthly) [or] Spotlight (travelogue), H Economic Report, F Stepping Out (Prague nightlife).

RADIO SWEDEN
1430 S In Touch with Stockholm (listener contact-1st)/ Sounds Nordic (rock music-exc. 1st), M-F Sixty Degrees North (regional report), A Network Europe (Europe magazine-1st week)/Sweden Today (2nd)/Spectrum (arts magazine-3rd)/Studio 49 (topical discussion-4th); 1445 M Sports Scan, T Close Up (profiles of Swedes-1st), H Nordic Lights (1st)/Green Scan (ecology-2nd)/Heart Beat (health-3rd)/The S-Files (things Swedish-4th), F Review of the Newsweek.

WRMI, Florida
15725 kHz.: 1400 S Wavescan, A Shortwave Radio Network (cont'd.).

WWCR, Tennessee
15825 kHz.: 1400 S Golden Age of Radio.

## 1500 UTC 10amET/7amPT

BBC WORLD SERVICE (am)
1500 D News; 1506 S Assignment, M Health Matters, T Go Digital, W Discovery (science), H One Planet (ecology), F Science in Action, A Sportsworld (live action from 1406); 1532 S People & Politics, M Quiz or panel game, T Music Review, W/F Westway (drama serial), H The Word (writers & writing) [exc. 26th, World Book Club (discussion)]; 1545 W Heart & Soul (beliefs & values), F What's the Problem? (advice).

BBC WORLD SERVICE (eas)
1500 D News; 1506 S Age of Empire (America in the modern world), M Health Matters, T Go Digital, W Discovery (research), H One Planet (ecology), F Science in Action, A Sportsworld (live action from 1406); 1532 S/M Quiz or panel game, T Music Review, W/F Westway, H The Word (writers & writings) [exc. 26th, World Book Club (discussion)]; 1545 W Heart & Soul (beliefs & values), F What's the Problem? (advice).

CHINA RADIO INTERNATIONAL
1500 D News & Reports; 1510 S Report on Developing Countries; 1515 A Cutting Edge (sci/ tech); 1520 S CRI Roundup; 1530 S In the Spotlight (cultural magazine), M People in the Know (China's leading personalities), T Biz China, W China Horizons (China outside Beijing), H Voices from Other Lands, F Life in China, A Listeners' Garden.

RADIO AUSTRALIA
1500 D News; 1505 S Encounter (religion in Australia), M-F Asia Pacific (regional current affairs), A Educational series; 1530 M Health Report, T Law Report, W Religion Report, H Media Report, F The Sports Factor; 1555 S The Pulse (Aussie new music), A Business Weekend.

RADIO CANADA INTERNATIONAL
1500 D News; 1505 S The Sunday Edition (cont'd.), M-F Sounds Like Canada (cont'd., including *1530 F C'est La Vie* (life in French Canada), *1545 T-F* Out Front (first person views of life), A Vinyl Cafe.

RADIO JAPAN
1500 D News, 1505 S Hello from Tokyo (letters), M-F Songs for Everyone, A Pop Joins the World; 1515 M-F Asian Top News (reports from region's radio); 1525 M Japan Music Treasure Box, T Basic Japanese for You, W Japan Musicscape, H Brush Up Your Japanese, F Music Beat.

RADIO NEW ZEALAND INTERNATIONAL
1500 S/A RNZ News, M-F Pacific Regional News; 1505 S/A Forces Radio; 1508 M-F Dateline Pacific; 1530 M New Music Releases, T Mailbox (letters & DX news) or RNZI Talk (station info), W Tradewinds (Pacific commerce), H The World in Sport, F Pacific Correspondent.

WRMI, Florida
15725 kHz.: 1500 S Shortwave Radio Network, A Shortwave Radio Network (cont'd).

## 1600 UTC 11amET/8amPT

BBC WORLD SERVICE (am)
1600 S-F World Briefing, A News; 1606 A Sportsworld (live action from 1406); 1620 S-F British News; 1632 S World Business Review, M-F World Business Report; 1640 S The Instant Guide (background), M-F Sports Roundup; 1645 M/T/ H/F Analysis, W From Our Own Correspondent.

RADIO AUSTRALIA
1600 D News; 1605 S The National Interest (Australian politics), M-F Bush Telegraph (rural/ outback Australia), A Hindsight (social history).

RADIO AUSTRIA INTERNATIONAL
1605 S/A Insight Central Europe; 1615 M-F Report from Austria; 1625 S/A Listener Letters; 1635 S/A Insight Central Europe; 1645 M-F Report from Austria; 1655 S/A Listener Letters.

VOICE OF AMERICA, Africa Service
1600 S/A Nightline Africa (weekend newsmagazine), M-F News & Reports; 1615 M-F Focus (a topic in-depth); 1623 M-F Sports; 1630 M-F Africa World Tonight.

KWHR, Hawaii
9930 kHz.: 1600 S DXing with Cumbre.

WHRI, Indiana
13760 kHz.: 1600 A DXing with Cumbre.

WRMI, Florida
15725 kHz.: 1600 S/A Shortwave Radio Network (cont'd).

## 1700 UTC 12nET/9amPT

CHANNEL AFRICA, South Africa
1700 S Network Africa (week in review), M-F Dateline Africa (news magazine), A Channel Africa Sport.

RADIO AUSTRALIA
1700 D News; 1705 S Sound Quality (innovative music), M-F Australia Talks Back (phone-in), A The Spirit of Things (spiritual matters); 1755 M-F Perspective (commentary), A The Pulse (Aussie new music).

RADIO JAPAN - NHK WORLD
1700 D News; 1710 S Pop Joins the World, M-F Songs for Everyone, A Hello from Tokyo (listener contact); 1715 M-F 44 Minutes (feature magazine).

VOICE OF AMERICA, Africa Service
1700 S Reporters' Roundtable, M-A News; 1706 M-F Talk to America (global phone-in), A (no information available from VOA); 1730 S Music Time in Africa; 1755 A Government Editorial.

VOICE OF GREECE
1700 A All Greek to Me (Greek popular & traditional music)

SWISS RADIO INTERNATIONAL
1730 S/A Swiss Scene, M-F Newsnet; 1735 A Take 2; 1740 S Culture Zone (the arts-1st/3rd wk) or Out and About (Swiss places-2nd/4th wk), A Sounds Good (Swiss music-3rd/5th wk); 1745 F Business Spotlight.

ALL INDIA RADIO
1745 M Light Music, T Karnatak Instrumental Music, W Folk Songs, H-S Devotional Music.

WBCQ, Maine
17495 kHz.: 1700 A Allan Weiner Worldwide.

WRMI, Florida
15725 kHz.: 1700 S Shortwave Radio Network, A Shortwave Radio Network (cont'd).

## 1800 UTC 1pmET/10amPT

ALL INDIA RADIO
1800 D News; 1810 D Commentary; 1815 W Instrumental Music—Old Masters, H-T Hindustani Classical Vocal Music; 1830 S Sports Roundup (1st wk)/Feature (2nd)/Film Story (3rd)/Discussion (4th), M Faithfully Yours (letters), T Cultural Talk, W Book Review (1st)/Window on Science (2nd/4th)/Times & Lives (biography-3rd), H General Talk, F Focus (magazine-1st)/Horizon (literature-2nd/4th)/Music (3rd), A For Youth (1st)/Indian Classics (books-2nd)/From the Archives (3rd)/Quiz Time (4th); 1840 M DXers Corner (2nd/4th), T Film Songs of Yesteryears, W Hits from Films, H Light Karnatak Music, F Light Instrumental Music; 1850 M Film Songs, F Light Music.

CHANNEL AFRICA, South Africa
1800 S Network Africa (week in review), M-F Dateline Africa (news magazine), A Channel Africa Sport.

RADIO AUSTRALIA
1800 D News; 1805 S-H Pacific Beat (Pacific islands magazine), F Pacific Review, A Best of 'Late Night Live' (interviews); 1830 F Country Breakfast (rural life).

RTE, Ireland
1830 S This Week with Gerald Barry, M-F 5-7 Live (top news of the day), A Saturday View.

VOICE OF AMERICA, Africa Service
1800 S/A News & Reports, M-F Africa World Tonight; 1805 S On the Line (US foreign policy), A Our World (science magazine); 1830 S/A News Headlines, W Straight Talk Africa (continental phone-in); 1833 S Encounter (issues debated), A On the Line (US foreign policy); 1855 S/A Government Editorial.

WBCQ, Maine
17495 kHz.:1800 A Zombo's Mondo Record Party.

WRMI, Florida
15725 kHz.: 1800 S/A Changesurfer Radio; 1830 S/A Shortwave Report.

## 1900 UTC 2pmET/11amPT

ALL INDIA RADIO
1900 D News; 1905 D Press Review; 1910 S Women's World, M/W/F Radio Newsreel, T Of Persons, Places & Things (1st/3rd wk)/Our Guest (interviews-2nd/4th), H Panorama of Progress, A Mainly for Tourists (1st/3rd)/Indian Cinema (2nd)/On the Export Front (4th); 1920 S/M/W/F Film Songs, T Light Classical Music, H Light Instrumental Music, A Karnatak Classical Music; 1930 D Commentary; 1935 S/H/F Film Songs, M Karnatak Vocal Music, T Folk Songs, W/A Light Music.

RADIO AUSTRALIA
1900 D News; 1905 F Rural Reporter, A Australia All Over; 1910 S-H Pacific Beat (regional magazine w/Sport @ 1929); 1930 F Australian Country Style (music).

RADIO NETHERLANDS
1900 S Documentary, A Vox Humana (culture); 1930 S/A News; 1935 S Wide Angle (in-depth), A Europe Unzipped; 1955 S The Week Ahead (on RN), A Insight (commentary).

VOICE OF AMERICA, Africa Service
1900 S News & Reports, M-F News, A Hip Hop Connections (music); 1906 M-F Border Crossings (music—exc. W *Straight Talk Africa* cont'd.); 1923 S Sports; 1930 S Music Time in Africa (part 2), M-F World of Music, A News Headlines; 1933 A Press Conference USA.

VOICE OF NIGERIA
1900 S Youth Forum, M Our Cities, T Our Environment, W Who Are the Nigerians?, H Listeners' Letters, F Nigerian Scene, A Folktales; 1915 H Wheel of Progress, F Business Weekly, A Nigerian Newsletter; 1930 S Window on Abuja, M Perspectives, T African Monarchy, W Theatre on the Air, H Women and Development, F Weekend Magazine, A Time for Highlife; 1945 S From the Bookshelf, T Listeners' Letters.

SWISS RADIO INTERNATIONAL
1930 S/A Swiss Scene, M-F Newsnet; 1935 A Take 2; 1740 S Culture Zone (the arts-1st/3rd wk) or Out and About (Swiss places-2nd/4th wk), A Sounds Good (Swiss music-3rd/5th wk); 1945 F Business Spotlight.

WWCR, Tennessee
15825 kHz.: 1900 A Presidential Radio Address/Democratic Response.

## 2000 UTC 3pmET/12nPT

RADIO AUSTRALIA
2000 D News; 2005 F Pacific Review, A Australia All Over; 2010 S-H Pacific Beat (regional magazine w/Sport @2029), 2030 F The Buzz (technology).

RADIO NETHERLANDS
2000 S Vox Humana (culture), A Amsterdam Forum (conversations); 2030 S/A News; 2035 S Wide Angle (in-depth), A Europe Unzipped; 2055 S The Week Ahead (on RN), A Insight (commentary).

SWISS RADIO INTERNATIONAL
2000 S/A Swiss Scene, M-F Newsnet; 2005 A Take 2; 1740 S Culture Zone (the arts-1st/3rd wk) or Out and About (Swiss places-2nd/4th wk), A Sounds Good (Swiss music-3rd/5th wk); 2015 F Business Spotlight.

VOICE OF NIGERIA
2000 S News Bulletin, M-F Sixty Minutes, A African Hour; 2015 S Sports Roundup; 2030 S In the News.

VOICE OF AMERICA, Africa Service
2000 S/A Nightline Africa (weekend magazine), M-F Africa World Tonight.

ALL INDIA RADIO
2045 D Press Review; 2050 S/T Instrumental Music, M/F Folk Songs, W Light Music, H Classical Indian Vocal Music, A Regional Indian Devotional Music.

## 2100 UTC 4pmET/1pmPT

ALL INDIA RADIO
2100 D News; 2105 D Commentary; 2111 S Regional Film Songs, M/A Classical Indian Vocal Music, T Karnatak Vocal Music, W/H Instrumental Music, F Orchestral Music; 2120 S Sports Roundup (1st wk)/Feature (2nd)/Film Story (3rd)/Discussion (4th), M Faithfully Yours (letters), T Cultural Talk, W Radio Newsreel, H Panorama of Progress, F Focus (magazine-1st wk)/Horizon (literature-2nd/4th)/Indian Music (3rd), For Youth (1st)/Indian Classics (books-2nd)/From the Archives (3rd)/Quiz Time (4th); 2130 M DXers Corner (2nd/4th), T/W Film Songs, H Classical Half-Hour, A Old Film Songs; 2140 F Film Songs; 2145 M Film Songs; 2150 S Karnatak Vocal Music.

BBC WORLD SERVICE (am)
2100 D Newshour*.
[*Special service to the Caribbean on 5975, *11675, 15390 kHz.*: 2115 M-F Caribbean Report. Special service to the Falklands on *11680 kHz.*: 2130 T/F Calling the Falklands.]

DEUTSCHE WELLE
2100 News; 2105 S Hard to Beat (sport), M-F Newslink Africa, A Religion & Society; 2115 S Inspired Minds, A German by Radio; 2130 S Hits in Germany [or] Melody Time, M A World of Music, T Arts on the Air, W Living in Germany, H Cool (youth culture), F Focus on Folk, A Africa This Week; 2145 W Europe in Capitals.

RADIO AUSTRALIA
2100 D News; 2105 F Verbatim (oral history), A Australia All Over (cont'd); 2110 S-H AM (morning news magazine); 2130 S Country Breakfast (rural life), M Earthbeat (ecology), T

Innovations (new products), W Educational series, H All in the Mind (the brain), F In Conversation (about science); 2145 A Asia Sunday.

RADIO JAPAN - NHK WORLD
2100 D News; 2110 S Pop Joins the World, M-F Songs for Everyone, A Weekend Japanology; 2115 M-F Asian Top News (headlines from region's radio); 2125 M Japan Music Treasure Box, T Basic Japanese for You, W Japan Musicscape, H Brush Up Your Japanese, F Music Beat; 2154 A Japan: Take 5.

RADIO PRAGUE
2100 D News; 2235 S Letter from Prague, M-F Newsview, A Insight Central Europe; 2110 S Mailbox, M One on One (interview), T Witness (oral history), W ABC of Czech (language), H Economic Report, F The Arts; 2120 S Readings from Czech Literature, T Talking Point (Czech issues), W Czechs in History or Spotlight (travelogue), F Away from Politics (poetry).

VOICE OF AMERICA, Africa Service
2100 D News; 2106 S/A Jazz America, M American Gold, T Roots and Branches, W Classic Rock, H Top 20, F Country Hits.

WWCR, Tennessee
15825 kHz.: 2100 H DX Partyline, 2130 H World of Radio.

WHRI, Indiana
9495 kHz.: 2130 A DXing with Cumbre.

## 2200 UTC 5pmET/2pmPT

ALL INDIA RADIO
2200 D News; 2210 D Commentary; 2215 S Women's World, M/F Radio Newsreel, T Of Persons, Places & Things (1st/3rd wk)/Our Guest (interview-2nd/4th), W Book Review (1st)/ Window on Science (2nd/4th)/Times & Lives (biography-3rd), H General Talk, A Mainly for Tourists (1st/3rd)/Indian Cinema (2nd)/On the Export Front (4th); 2225 D Film Tune.

BBC WORLD SERVICE (am)
2200 D News; 2201 A Play of the Week; 2206 S Passport Please (notional identity-1/25, 2/1, 8)/ Documentories (2/15, 22, 29), M Health Matters, T Go Digital, W Discovery, H One Planet, F Science in Action; 2232 M Quiz or panel game, T Music Review, W/F Westway (drama serial), H The Word (writers & writings) [exc. 26th, World Book Club (discussion)]; 2245 W Heart & Soul (beliefs & values), F What's the Problem? (advice).

RADIO AUSTRALIA
2200 D News; 2205 F Asia Pacific (regional current affairs), A Correspondents' Report; 2210 S-H AM (morning news magazine); 2230 F AM Saturday (morning news magazine), A Music Deli (international); 2240 S-H Australia Wide (nationol report); 2254 A-H Perspective (commentary).

RADIO PRAGUE
2230 D News; 2235 S Mailbox, M-F Current Affairs, A Insight Central Europe; 2240 S ABC of Czech (the language), T Czech Science, W Witness (eyewitness to history), F The Arts; 2245 S Encore [or] Magic Carpet (both monthly) [or] Czech Books (biweekly), M Talking Point (Czech issues), T One on One (interview), W Czechs in History [or] Czechs Today (both monthly) [or] Spotlight (travelogue), H Economic Report, F Stepping Out (Prague nightlife).

RVi, Belgium
2200 S Radio World, M-F News, A Music from Flanders; 2204 M-F Flanders Today (incl.press review, reports & 'CD of the Week'); 2208 S Tourism in Flanders; 2214 S Brussels 1043 (letters).

WBCQ, Maine
7415 kHz.: 2200 S Radio Free Euphoria, M Jean Shepherd, F Pan Global Wireless; 2230 F Pab Sungenis Project.
9330 kHz.: 2200 A Allan Weiner Worldwide.

WHRI, Indiana
5745 kHz.: 2200 S DXing with Cumbre.

WRMI, Florida
15725 kHz.: 2200 A Shortwave Radio Network.

## 2300 UTC 6pmET/3pmPT

BBC WORLD SERVICE (am)
2300 D The World Today; 2332 F Global Business, A The Interview.

CHINA RADIO INTERNATIONAL
2300 D News & Reports; 2310 A Report on Developing Countries; 2315 F Cutting Edge (sci/ tech); 2320 A CRI Rooundup; 2330 S People in the Know (China's leading personalities), M Biz China, T China Horizons (China outside Beijing), W Voices from Other Lands, H Life in China, F Listeners' Garden, A In the Spotlight (cultural magazine).

RADIO AUSTRALIA
2300 D News; 2305 F Country Breakfast (rural life), A All in the Mind (the broin); 2310 S H Asia Pacific (regional current affairs); 2330 S Business Report, M The Europeans, T Rural Reporter, W The Arts on RA, H The Buzz (technology issues), F Hit Mix (pop/rock), A Innovations (new products).

RADIO AUSTRIA INTERNATIONAL
2305 S/A Insight Central Europe; 2315 M-F Report from Austria; 2325 S/A Listener Letters; 2335 S/ A Insight Central Europe; 2345 M-F Report from Austria; 2355 S/A Listener Letters.

RADIO BULGARIA
2300 D News; 2310 A Views Behind the News, S Folk Studio (Bulgarian folk music), M-F Events and Developments (current affairs review); 2320 M Sports; 2325 M-F Timeout for Music; 2330 F Bulgarian Plaza (cultural magazine) or Walks and Talks (interesting places); 2335 M-F Keyword Bulgoria (Bulgaria and things Bulgarian), H Answering Your Letters; 2345 M Magazine Economy, T Arts and Artists; W History Club, H The Way We Live, F Radio Bulgaria Calling (for radio hobbyists).

RADIO CANADA INTERNATIONAL
2300 S/A The World This Weekend, M-F The World at 6; 2330 S Inside Track (sports anthologies) M-F As It Happens (interviews with newsmakers), A Madly Off in All Directions.

RADIO NEW ZEALAND INTERNATIONAL
2300 S-H Midday Report, F/S News; 2312 F Focus on Politics, A This Week in Parliament; 2333 F The Sampler (latest CDs), A Spectrum (life in NZ).

RADIO ROMANIA INTERNATIONAL
2300 D Radio Newsreel; 2310 S Focus, M-F Commentary, A The Week; 2315 S Sunday Studio, M Pro Memoria (history), T Business Club, W Society Today, H Cards on the Table (debate) or The Romanian Next to You (interview), F Challenge for the Future or Terra 2001, A World of Culture; 2320 M Political Flash, T European Horizons, A RRI Encyclopedia; 2325 S Romanian by Radio, M/W/F Business Update, T Tourist News, H Listeners' Letterbox, A Roots (culture/traditions); 2330 S Romanian Itineraries, M Pulse of Transition, T Mother Nature (ecology), W Visit Romania, F Practical Guide, A Radio Pictures; 2335 S Listeners' Letterbox, M Performing Arts, T Youth Club, W Partners in a Changing World, F Cultural Survey, A Romanian Itineraries; 2340 M Pages of Romanian Literature, T/H Skylark (folk music), W Stage and Screen, F Spectator (voice of the people), A Bucharest Along the Centuries; 2345 M Romanian Hits, W Romanian Musicions, F Romanian Folk Music At Its Best, A DX Mailbag; 2350 S Romanian Folk Music At Its Best, M Sports Roundup, T Athlete of the Week, W Sports Club, H Football Flash, F Sports Weekend.

RADIO PRAGUE
2330 D News; 2335 S Mailbox, M-F Current Affairs, A Insight Central Europe; 2340 S ABC of Czech (the language), T Czech Science, W Witness (eyewitness to history), F The Arts; 2345 S Encore [or] Magic Carpet (both monthly) [or] Czech Books (biweekly), M Talking Point (Czech issues), T One on One (interview), W Czechs in History [or] Czechs Today (both monthly) [or] Spotlight (travelogue), H Economic Report, F Stepping Out (Prague nightlife).

SWISS RADIO INTERNATIONAL
2330 S/A Swiss Scene, M-F Newsnet; 2335 A Take 2; 1740 S Culture Zone (the arts-1st/3rd wk) or Out and About (Swiss places-2nd/4th wk), A Sounds Good (Swiss music-3rd/5th wk); 2345 F Business Spotlight.

VOICE OF TURKEY
2300 D News; 2310 D Press Review; 2315 S Tunes Spanning Centuries, M Last Week, T Live >From Turkey, W Review of the Foreign Media, H Big Powers & the Armenian Problem, F Archaeological Settlements in Turkey, A Outlook; 2320 M Hues & Colors of Anatolia, W Letterbox, A The Stream of Love or DX Corner; 2325 S/F Music, H In the Wake of a Contest; 2330 M/A Music; 2335 S Turks in the Mirror of Centuries, M From Past to Present, W Turkey's Off the Beaten Track Sites, H The Culture Parade, F The Travel Itinerary of Anatolia, A Turkish Arts.

WBCQ, Maine
5105 kHz.: 2300 M-F Radio Caroline (the original Europirate radio station).
7415 kHz.: 2300 W World of Radio, F Pab Sungenis Project (cont'd), A Radio Timtron Worldwide; 2330 W Think Tank North America (the bizarre), H Uncle Ed's Musical Memories, F Wanton Display of Control & Disruption.

WHRI, Indiana
9495 kHz.: 2330 A DXing with Cumbre.

WWCR, Tennessee
12160 kHz.: 2300 S Travel Channel Radio.

WHRA, Maine
17650 kHz.: 2300 F DXing with Cumbre; 2330 A DXing with Cumbre.

*Thank You ...*

**Additional Contributors to This Month's Shortwave Guide:**

Rich D'Angelo, *NASWA Flash Sheet*; Ehard Goddijn Radio Netherlands; Glenn Hauser, Enid, OK, *DX Listening Digest*, *World of Radio;* Jose Jacob VU2JOS, India; Michael Murray, UK; Anker Petersen, *DX Window;* Harold Sellers, Canada, ODXA/DX Ontario; Adrian Sainsbury, Radio New Zealand Intl; Robert E. Thomas, Bridgeport, CT; Larry Van Horn, MT Asst. Editor; *BBC On Air; BCL News; BCDXC; CIDX; Cumbre DX; DX News; Fineware; Hard Core DX; NASWA Journal; Observer; Worldwide DX Club.*

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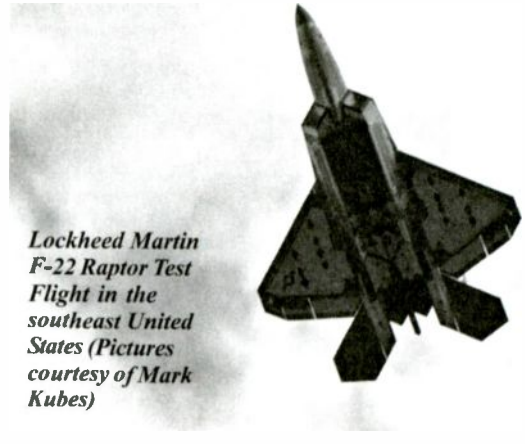
# Mil Monitoring in Brasstown

I have had quite a few requests from folks in and around the southeast United States asking if I could pass along some of the military air frequencies we hear in our local area. Well, without further ado, here is a sampling of some recent 225-400 MHz activity from *MT* headquarters in Brasstown, North Carolina.

225.150 USAF JStars (E-8) aircraft
USAF Have Quick training channel – Nationwide
225.450 Civilian Contractor Lockheed Martin flight test support (F-22 Raptor Test) – Nationwide
225.800 USAF Blue Air exercise frequency/AWACS Tadil A and C voice coordination – Nationwide
225.875 USAF Air Combat Command (ACC) Air-to-air voice coordination – Nationwide
225.925 USAF Air Logistics Center (ALC) Depot Maintenance Control Center/339FLTS Air-to-air – Robins AFB, GA
228.900 NORAD Southeast Air Defense Sector (SEADS) discrete (Callsign: OKIE SAM)
229.075 USAF ACC Command Post – Shaw AFB, SC
229.300 Civilian Contractor Lockheed Martin flight test support – Nationwide
233.700 USN VR-46 Squadron Common – NAS Atlanta/Dobbins AFB. GA
235.400 NASA T-38 Air-to-air – Nationwide
236.000 USAF Survival rescue training – Nationwide
236.500 FAA Atlanta ARTCC Newport, TN RCAG – Ultra High Altitude
236.700 FAA Atlanta ARTCC Crossville, TN RCAG – High Altitude
237.150 USAF AWACS voice communications – Nationwide
239.350 FAA Atlanta ARTCC Columbus, GA RCAG
239.975 USAF 94AW/700AS Air-to-air – Dobbins ARB, GA
240.600 Civilian Contractor Lockheed Martin flight test support – Nationwide
249.800 USMC VMFA-142 Maintenance – NAS Atlanta/Dobbins ARB, GA
251.850 Civilian Contractor Lockheed Martin flight test support (F-22 Raptor Test) - Nationwide
252.000 NORAD Southeast Air Defense Sector (SEADS) Discrete (Callsign: OAKGROVE)
252.100 USAF Command Post – Nationwide
252.200 USAF 94AW/700AS Squadrons Operations/Air-to-air - Dobbins ARB, GA
252.500 USAF 94AW/700AS Air-to-air – Dobbins ARB, GA
254.300 FAA Atlanta ARTCC Crossville, TN RCAG– Low Altitude Discrete
254.350 FAA Atlanta ARTCC Athens, GA RCAG – Low Altitude
254.450 FAA Dobbins ARB/Atlanta TRACON Approach/Departure
255.400 FAA Flight Service Station – Nationwide
255.725 Civilian Contractor Lockheed Martin flight test support – Nationwide
259.100 FAA Memphis ARTCC Jackson, TN RCAG – Low Altitude Discrete
259.700 NASA Space Shuttle Air-to-ground (AM) – Worldwide
261.200 USAF AWACS Tadil A and C voice coordination – Nationwide
261.500 FAA Atlanta ARTCC Birmingham, AL RCAG – Low Altitude
262.450 USAF Have Quick training channel – Nationwide
264.200 FAA Atlanta ARTCC Hampton, GA RCAG – Special Sector Navy Tactical Operations
265.400 NORAD Atlanta area Combat Air Patrol (CAP) aerial refueling/Ground Controlled Intercept (GCI)
266.300 Civilian Contractor Lockheed Martin flight test support – Nationwide
269.100 FAA Atlanta ARTCC Owning, SC RCAG – High Altitude
269.500 FAA Atlanta ARTCC Newport, TN RCAG – Low Altitude Discrete
269.550 FAA Atlanta ARTCC Newport, TN RCAG
270.600 FAA Atlanta ARTCC Chattanooga, TN RCAG – High Altitude
271.100 USAF Tactical air control post – Nationwide
272.000 USAF 4FTW/50FTS-41FTS Operations/Air-to-air – Columbus AFB, MS
USAF Special Operations – Nationwide
273.600 FAA Atlanta ARTCC Macon, GA RCAG – Low Altitude Discrete
274.750 USAF
275.200 Civilian Contractor Lockheed Martin flight test support – Nationwide
275.350 USN Blue Angels flight demonstration team – Nationwide
276.500 USAF Air refueling established tracks: AR-216 Boomer <Primary>
276.675 USAF F-15 Flight demonstration team – Nationwide
279.000 NASA Space Shuttle UHF Air-to-ground (AM) – Worldwide
279.200 FAA Atlanta ARTCC Hampton, GA RCAG – Special Sector Navy Tactical Operations
279.500 FAA Atlanta ARTCC Crossville, TN RCAG – Ultra High Altitude
279.725 USAF AWACS working Shaw AFB, SC F-16s and NORAD Callsign: OAKGROVE – Southeast US
282.425 Immigration and Customs Enforcement (ICE) Air-to-air/Air-to-ground (Aircraft Callsign: OMAHA)
282.800 DoD Search and Rescue – Nationwide
283.400 USMC VMFA (AW)-224 Air-to-air – MCAS Beaufort, SC (Callsign: HAWK)
283.750 USAF Air Mobility Command (AMC) C-21 aircraft Air-to-air – Nationwide
285.100 USN VAW-77 Squadron Common – NAS Atlanta/Dobbins AFB, GA
287.300 USAF 117ARW/106ARS Command Post – Birmingham IAP, AL (Callsign: DIXIE)
287.450 Have Quick communications – Nationwide
288.200 USAF AWACS Tadil A and C voice coordination – Nationwide
289.000 USMC VMFA-142 Air-to-air – NAS Atlanta/Dobbins ARB, GA
290.500 FAA Atlanta ARTCC Montgomery, AL RCAG – High Altitude
290.700 NORAD Southeast Air Defense Sector (SEADS) Discrete (Callsign: OAKGROVE)
290.800 FAA Atlanta ARTCC Jasper, AL RCAG
291.750 FAA Atlanta ARTCC Jonesville, SC RCAG – High Altitude
292.000 USAF AMC Airlift Control Element (ALCE) Air-to-air – Nationwide
295.800 USAF Aerial refueling established tracks: AR-633A/B Boomer <Primary>
296.950 USAF AWACS voice communications – Nationwide
296.800 NASA Space Shuttle Air-to-ground (AM) – Worldwide
297.000 USAF AMC ALCE Air-to-air- Nationwide
297.400 FAA Atlanta ARTCC Uniontown, AL RCAG – Birmingham MOA
299.200 FAA Atlanta ARTCC Chattanooga, TN RCAG – High Altitude
299.500 USN VFA-203 Blue Dolphins (F/A-18) Air-to-air – NAS Atlanta/Dobbins ARB, GA
301.400 FAA Atlanta ARTCC Tri City, TN (Whitetop Mountain RCAG) – High Altitude
302.000 USMC VMFA-142 Air-to-air – NAS Atlanta/Dobbins ARB, GA
302.400 NORAD Southeast Air Defense Sector (SEADS) Discrete (Callsign: OAKGROVE)
303.000 USAF 134ARW Command Post – McGhee-Tyson Airport (Knoxville TN)
303.100 USAF AWACS Tadil A and C voice coordination – Nationwide
303.950 USAF 33FW/58FS Air-to-air – Eglin AFB, FL
304.700 USN VAW-77 Air-to-air – NAS Atlanta/Dobbins AFB, GA
305.800 USMC VMFA (AW)-224 Squadron Common – MCAS Beaufort, SC
306.200 FAA Atlanta ARTCC Anniston, AL RCAG – Low Altitude Discrete
306.250 FAA Atlanta ARTCC Birmingham, AL RCAG – High Altitude
306.300 FAA Memphis ARTCC Nashville, TN RCAG – Ultra High Altitude
307.350 FAA Atlanta ARTCC Hickory, NC RCAG – Ultra High Altitude
307.900 FAA Atlanta ARTCC Mt. Oglethorpe, GA RCAG – Low Altitude surface to 10,000 feet
311.000 USAF ACC Wing Command Post – Worldwide <Primary>
313.600 USAF AWACS Tadil A and C voice coordination – Nationwide
314.600 Civilian Contractor Lockheed Martin flight test support – Nationwide
317.575 USAF/USN Ground Controlled Approach – Dobbins AFB/NAS Atlanta



*Lockheed Martin F-22 Raptor Test Flight in the southeast United States (Pictures courtesy of Mark Kubes)*

317.700 FAA Atlanta ARTCC Atlanta, GA (Austell RCAG) – Low Altitude
317.950 USAF AWACS voice communications – Nationwide
319.100 FAA Atlanta ARTCC Montgomery, AL RCAG – Ultra High Altitude
319.250 FAA Atlanta ARTCC Owning, SC RCAG – Low Altitude
319.400 USAF AMC ALCE Air-to-Air
319.700 USAF Aerial refueling route AR-633A/B Boomer <Secondary>
319.900 FAA Atlanta ARTCC Tri Cities, TN RCAG – Low Altitude Discrete
320.600 USAF Checkup Air exercise frequency/AWACS Tadil A and C voice coordination – Nationwide
321.000 USAF ACC Wing Command Post – Worldwide <Secondary>
322.950 USAF Thunderbirds flight demonstration team – Nationwide
323.000 FAA Atlanta ARTCC Augusta, GA RCAG – Low Altitude Discrete
324.650 USAF AWACS voice communications – Nationwide
327.150 FAA Atlanta ARTCC Athens, GA RCAG – Low Altitude
327.800 FAA Memphis ARTCC Nashville, TN RCAG – Ultra High Altitude
328.550 USMC VMFA-142 Air-to-air – NAS Atlanta/Dobbins ARB, GA (Callsign: GATOR)
333.300 DoD Unofficial air-to-air common – Nationwide
333.350 USN VFA-203 Blue Dolphins (F/A-18) Air-to-air – NAS Atlanta/Dobbins ARB, GA
335.650 FAA Atlanta ARTCC Macon, GA RCAG – High Altitude
335.575 USAF/USN Ground Controlled Approach – Dobbins AFB/NAS Atlanta
335.900 USAF Air Force Materiel Command (AFMC) Air-to-air – Nationwide
335.950 USAF Common air exercise frequency/AWACS voice communications – Nationwide
336.900 USMC/USAF Various squadrons air-to-air – North/South Carolina
337.850 USN VFA-203 Squadron Common – NAS Atlanta/Dobbins AFB, GA
340.200 USMC VMFA-142 Squadron Common – NAS Atlanta/Dobbins AFB, GA
USN/USMC Control Tower/Ground Control – Nationwide
341.750 USAF AWACS Have Quick Timing (TOD) – Nationwide
342.500 DoD Metro (Weather) – Nationwide
343.550 USAF AFMC Air-to-air – Nationwide
343.750 USAF Air Combat Maneuvering (ACM) Pass/Kill discrete frequency – Bulldog MOA, GA
343.800 FAA Atlanta ARTCC Greensboro, NC RCAG – High Altitude
344.600 DoD Metro (Weather) – Nationwide
345.050 USMC VMFA-142 Air-to-air – NAS Atlanta/Dobbins AFB, GA
345.400 Civilian Contractor Lockheed Martin flight test support – Nationwide
349.400 USAF AMC Command Post – Nationwide
350.325 FAA Atlanta ARTCC Birmingham, AL RCAG – Discrete
350.575 USMC VMFA-122 Air-to-air – MCAS Beaufort, SC (Callsign: NICKEL)
353.700 FAA Atlanta ARTCC Gadsden, AL RCAG – Low Altitude
353.800 FAA Atlanta ARTCC Chattanooga, TN RCAG – Low Altitude Discrete
FAA Memphis ARTCC Fayetteville, AR RCAG – High Altitude
354.050 FAA Atlanta ARTCC Huntsville, AL RCAG – Ultra High Altitude
354.700 USMC VMFA-224 Air-to-air – MCAS Beaufort, SC
355.000 USAF Wideband FM channel paired with 267.600 – Nationwide
355.100 USN VFA-203 Blue Dolphins (F/A-18) Air-to-air – NAS Atlanta/Dobbins ARB, GA
355.150 USN VFA-203 Blue Dolphins (F/A-18) Air-to-air – NAS Atlanta/Dobbins ARB, GA
357.600 FAA Atlanta ARTCC Columbus, GA RCAG – Low Altitude Discrete
358.200 USAF Red Air exercise frequency
360.200 USN/USMC Control Tower/Ground Control – Nationwide
360.750 FAA Atlanta ARTCC Macon, GA RCAG – Low Altitude: surface to FL290
363.100 FAA Atlanta ARTCC Chattanooga, TN RCAG – High Altitude
363.875 USAF AFMC Air-to-air – Nationwide
364.200 NORAD Airborne Interceptor Communications Common (AICC) – Nationwide
364.800 FAA Jacksonville ARTCC – Tactical support use frequency (FL450)
369.900 FAA Atlanta ARTCC – Tactical support use frequency (FL450)
370.875 USAF/USN Tower - Dobbins ARB/NAS Atlanta, GA
370.900 FAA Atlanta ARTCC Black Jack Mountain, GA RCAG (Marietta) – Low Altitude Discrete
371.850 FAA Atlanta ARTCC Glade Springs, VA RCAG – Low Altitude Discrete
371.950 FAA Atlanta ARTCC Hampton, GA RCAG – High Altitude
372.200 USAF Pilot to Dispatcher (PTD) – Nationwide
376.900 USMC VMFA-122 Air-to-air – MCAS Beaufort, SC (Callsign: NICKEL)
377.050 FAA Atlanta ARTCC Mt. Oglethorpe, GA RCAG – Low Altitude Discrete
379.525 USAF 94AW/700AS Command Post – Dobbins AFB/NAS Atlanta, GA
380.150 FAA Atlanta ARTCC Hampton, GA RCAG – Ultra High Altitude
380.350 FAA Atlanta ARTCC Foothills, GA (Toccoa) – High Altitude
381.300 USAF ACC Command Post – Nationwide
381.350 USAF AWACS working Shaw AFB, SC F-16s and NORAD Callsign: OAKGROVE – Southeast US
381.650 FAA Atlanta TRACON Blackjack Mountain, GA Departure Control
382.600 Civilian Contractor Lockheed Martin flight test support – Nationwide
384.550 USAF F-15 Airshow Demonstration West frequency – Nationwide
384.800 Civilian Contractor Lockheed Martin flight test support – Nationwide
388.175 USAF AWACS/JStars JTIDS Coordination frequency – Nationwide
396.900 USN/USMC VFA-203/VMFA-142 ACM Air-to-air – NAS Atlanta/Dobbins ARB, GA (Callsigns: Dolphins/Omars)
399.760 Russian military navigation satellites (carrier only) paired with 149.910 MHz
399.840 Russian military navigation satellites (carrier only) paired with 149.940 MHz
399.920 Russian military navigation satellites (carrier only) paired with 149.970 MHz
400.000 Russian civilian navigation satellites (carrier only) paired with 150.000 MHz
400.080 Russian military navigation satellites (carrier only) paired with 150.030 MHz

**Legend:**

AFB ..... Air Force Base
ARB ..... Air Reserve Base
ARTCC ..... Air Route Traffic Control Center
AWACS ..... Airborne Warning and Control System
DoD ..... Department of Defense
JSTARS ..... Joint Surveillance Target Attack Radar System
NAS ..... Naval Air Station
NASA ..... National Aeronautics and Space Administration
NORAD ..... North American Aerospace Defense Command
RCAG ..... Remote Communications Air-Ground Facility
SEADS ..... Southeast Air Defense Sector
TADIL ..... Tactical Digital Information Links
TRACON ..... Terminal Radar Control
USAF ..... U.S. Air Force
USCG ..... U.S. Coast Guard
USMC ..... U.S. Marine Corps
USN ..... U.S. Navy

## ◆ Frequency Changes

Ken Windyka reports that the Westover JARB (KCEF), Massachusetts, Tower frequency has changed from 348.4 to 348.750 MHz. Also the Westover Metro frequency has changed from 342.5 to 274.750 MHz.

And we have an update on the Fort Leonard Wood trunk frequencies we published in the December issue. Ken Cechura writes that 409.2375 MHz is not part of that system, but 410.2375 is a valid frequency. Those of you who monitor that trunk system please take note and update your files.

And that just about does it for this month's *Milcom* column. Until next time 73 and good hunting.

# BOATS, PLANES, AND TRAINS

*Ron Walsh, VE3GO*
*ronwalsh@monitoringtimes.com*

# Monitoring the Great Lakes

*Gale force winds - Storm warning - Ferry drifting without power* - You never know what you will hear when you monitor marine radio!

My name is Ron Walsh and this is the first of a regular column on marine monitoring. I hope to provide useful radio information for the ship enthusiast and radio monitor. I have been a Great Lakes marine enthusiast and ship photographer for about 50 years. My radio listening career began in 1959 with a Hallicrafters S-38.

My amateur radio license was obtained in 1976. I was originally VE3IDW but now hold the call VE3GO. My monitoring station is located in Kingston, Ontario, right at the junction of the St. Lawrence River and Lake Ontario. I am a relief captain on the local Thousand Island tour boats and a member of the Canadian Coast Guard Auxiliary.

We will start with frequencies for the Great Lakes region but plan to cover other areas in the future, especially as we begin to receive input from our readers. Although the Great Lakes marine frequencies are almost all VHF, many of you probably live within "earshot" of at least some radio signals, and there is still a great deal of interesting monitoring to be heard.

## ❖ Canadian Coast Guard

The Canadian Coast Guard stations are all consolidated and use phone lines to connect to their peripheral towers. Thus, VBR Prescott, Ontario, is called from the western end of Lake Ontario to the east of Cornwall, Ontario. The three operators use eight towers to cover Lake Ontario, Upper St. Lawrence River, Trent Canal and Lake Simcoe areas. They monitor channel 16 for emergencies along with several duplex channels. The channels alternate between the peripheral towers, but channels 24 and 26 ) are the most common. A complete list of frequencies is available on the Canadian Coast Guard website at **http://www.ccg-gcc.gc.ca/cen-arc/mcts-sctm/vhf_e.htm**.

They also monitor some simplex channels for Coast Guard operations. Channel 82A is most commonly used for search and rescue traffic. Channel 65A is also used. They also use the marine satellite service to monitor the arctic region, as they are a 24/7 operation.

The SAR (Search and Rescue) helicopters are dispatched from the Joint Rescue Co-ordination Centre (JRCC) in Trenton, Ontario. They use channel 82A when talking to the search vessels but will also be heard on channel 19A. It is useful to monitor these frequencies because they often report in when going on land missions as well. Like all aircraft their altitude gives them a great radio range.

One channel I often monitor is channel 83A, known as the Seaway Channel. This is usually used when something out of the ordinary has happened.

## ❖ A versus B

We should probably clarify the difference between A and B channels. Some channels are simplex, meaning you transmit and receive on the same frequency. Channel 6 is an example: transmit and receive is on 156.3 MHz. However, channel 26 is a duplex channel. The ship transmits on 157.3 MHz – the A side, while it receives on 161.9 MHz – the B side. The B frequency is always the higher frequency.

The shore station does just the reverse, transmitting on B and receiving on A. This was so the shore transmitter could be left on during phone calls and would not jam the ship transmissions.

Since the shore stations do so few phone calls any more, many of these duplex channels are now being used in the simplex mode. For example, Canadian marine coast stations provide a continuous marine broadcast for weather and notices to mariners. They use channel 83B and channel 21B for this service. If you want to try your French, channel 23B (161.75 MHz) is used.

Surprisingly, these channels have appeared on some Family Radio Service (FRS) radios which have a NOAA/ Environment Canada weather band capability. On standard marine radios, the International / US (Canada) switch selects the A or B channel. While in the International position all duplex channels listen on the B frequency and transmit on A. In the U.S. (and Canada) position some channels (for example, 82) transmit and receive on the A frequency. A table of Marine VHF frequencies will show you which channels are duplex.

If a vessel goes to channel 82 and you do not hear him, look on the A or lower frequency. Some shipping companies also use the A channels for private communication, particularly around ports, canals, etc. The Welland Canal locks use channel 17 upbound, and channel 66A downbound, according to the direction of vessels.

The United States Coast Guard uses an A frequency for their marine broadcasts. They use channel 22A after announcing the broadcast on channel 16. In my area, the Coast Guard also uses channel 21A , 23A and channel 81A. Buffalo Coast Guard radio has a tremendous signal and is heard all over the southern Great Lakes. I

*Coast Guard Cutter Bittern on a mission*

**Table 1: Maritime Frequencies**

| Channel Number - Frequency |
|---|
| 09 - 156.450 Commercial |
| 10 - 156.500 Commercial |
| 11 - 156.550 Commercial |
| 12 - 156.600 Port Operations |
| 13 - 156.650 Port Operations |
| 14 - 156.700 Commercial |
| 14 - 157.700 Commercial |
| 15 - 156.750 Environmental |
| 16 - 156.800 Calling/distress |
| 17 - 156.850 Admin/Enforcement |
| 19 - 156.950 Commercia |
| 21A- 157.050 Coast Guard |
| 22A - 157.100 Coast Guard |
| 23A - 157.150 Coast Guard |
| 24 - 161.800 Radio telephone |
| 25 - 161.850 Radio telephone |
| 26 - 161.900 Radio telephone |
| 27 - 161.950 Radio telephone |
| 28 - 162.000 Radio telephone |
| 65A - 156.275 Can. Coast Guard |
| 66 - 156.325 Port Operations |
| 70 - 156.525 DSC |
| 81A - 157.075 Coast Guard |
| 82A- 157.125 Coast Guard |
| 81A- 157.175 Coast Guard |
| 84 - 161.825 Radio telephone |
| 85 - 161.875 Radio telephone |
| 86 - 161.925 Radio telephone |
| 87 - 161.975 Radio telephone |
| 83B - 161.775 Coast Guard |
| 21B -161.650 Coast Guard |
| * Not all channels used in all areas. |

would appreciate hearing from you which channels they use in other areas.

## ❖ Other active frequencies

The St. Lawrence Seaway Traffic control station monitors and controls shipping traffic on the Seaway. They use channels 11 , 12 and channel 1. Port authorities often use these channels as well to direct traffic. As an example, the Hamilton Harbour Master is on channel 12.

Channel 13 is used for bridge-to-bridge communications by commercial vessels only. It is used for traffic control in the Upper St. Lawrence to avoid interference. As I write this, there is a lot of traffic on the Seaway, including a vessel being towed following an accident.

Around ports and canals, non-marine frequencies can also be of use. For example, the St. Lawrence Seaway has several frequencies for their own use – 170.71 MHz being a common one.

Frequencies in the 450 MHz band are often used aboard ships. Search around when you are in a port area. About five years ago, I heard about a shipping accident while listening on the Ontario Provincial Police Frequencies. I was out of range of the ship but could hear all the details on the police channel. Remember that many police agencies have marine units as well.

## ❖ Where to start

A must for monitoring is, of course, Channel 16 . The emergency channel is still monitored on the Great Lakes. All distress communications and calling are heard here first. At the present time, the Canadian Government has no plans to introduce DSC (Digital Selective Calling) on the Great Lakes, but I am told the FCC may be considering the option. Channel 70 will be the DSC frequency. The American use of channel 9 for pleasure craft calling has not yet been adopted in Canada.

Ship to ship channels are also good targets. Channels 8 and 10 are the common channels for Commercial Shipping. The mail boat on the Detroit River uses channel 10. Channel 6 (156.3MHz) is often used by commercial ships as well as pleasure craft.

One target for my monitoring is the AIS (Automatic Identification System) instituted by the St. Lawrence Seaway this season. It transmits on marine frequencies and shows each ship's location, speed etc. This shows up on the electronic charts now used by many ships; we'll report more on this service in a future column.

You can also see many of the ships in the Seaway by going to the map at **http://www.greatlakes-seaway.com**. Look under Navigation and click on Vessel Transit. They do not list tankers, naval or Coast Guard vessels.

## ❖ Equipment

I use a Kenwood R-5000 with a VHF converter to monitor the active marine frequencies. I also have a Bearcat 780 HLT scanner to cover all the channels and services. I use a vertical and a discone as antennas. My Yaesu FT-897 also covers the marine frequencies and is used for longer-range reception.

From my location in Kingston, Ontario, I can receive signals from the eastern lake and upper St. Lawrence well. I often get longer range when conditions are right. I have heard western Lake Ontario and as far as Montreal to the east on VHF.

A good predictor of VHF inversions are the NOAA (Environment Canada) weather frequencies. When I start hearing signals on frequencies not used in this area, I can be certain marine signals will come in from an increased distance as well.

## ❖ Gone but not forgotten

Like everyone, I miss the HF stations which once covered the lakes. WLC Rogers City was the last to go, but I also miss the private HF stations that some shipping lines had. Upper Lakes Shipping used to operate XJP52 on 4, 6, 8 and 16 MHz but it disappeared about a year before WLC. Our own VBH Kingston is also just a memory. All that remains are a few ground rods.

One good source for marine HF is on the amateur radio bands. For example, Ron, VA3RJC, is aboard the freighter *Algosteel* and I have asked him to give me information about his operating. He is often heard on 7055 and 3755 kHz USB.

My HF antennas are back up and I plan to monitor the marine HF bands here for interesting traffic. I am using a RACAL RA6778C and dipoles to get back into the HF scene. For those who are new to marine HF, 2182 kHz and 4125 kHz are good frequencies to begin your monitoring. 2182 is still a distress frequency and 4125 is also good for calls.

5696 kHz and 8983 kHz are very useful to monitor USCG activities on the east coast. CAMSLANT Chesapeake booms into this location. Coast Guard aircraft can also be heard. The USCG broadcasts weather on 2670 kHz. The Canadian Coast Stations use 2598 kHz and for broadcasts. All of the above are USB.

Those who like digital modes can try the various NAVTEX stations on 518 kHz. This is a SITOR mode signal for weather and notices to shipping.

I still have a listing for 2080 kHz for Lake Erie. I used to hear USCG helicopters from Traverse City, or Detroit, Michigan, on 5692 and 5696. I do not know if these frequencies are still in use and reader input would be appreciated.

## ❖ Resources and upcoming columns

For those of you who are interested in Great Lakes shipping, I recommend the web site **http://www.boatnerd.com**. This site lists the happenings on the lakes and information about the ships, canals etc.

I would like to hear from readers regarding good sources for maritime information, people to contact, and topics you would like me to research. I would be happy to make on the air contact with any amateur radio operators who are marine enthusiasts. I welcome any information, photographs and active frequencies for your area, as we plan to include a list of frequencies every month.

Plans for future columns include the Canadian Arctic and East Coast stations while the arctic stations are on the air; a visit to VBR Prescott Marine radio, and to JRCC Trenton to look into Canadian SAR procedures. VA3RJC has offered some information on amateur radio on a lake freighter. We'll go on board some of the vessels and see the communication equipment.

As I sign off, my radio is giving information about the vessel still being towed up the St. Lawrence River. I am also monitoring the end of the year rush of ocean vessels as everyone tries to deliver just one more cargo before the seaway freezes for the winter.

73s and good listening

*VBR Prescott marine radio, pictured above and below.*

Doug Smith, W9WI
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# VOA operates QRO!

"QRO" is a ham radio abbreviation meaning "high power." Here in North America, we consider 50,000 watts "high power" on the AM broadcast band. Overseas AM broadcasters use transmitters that far exceed that magic 50,000-watt figure. One such broadcaster is the Voice of America. Charles Lewis S9SS engineers their transmitter facility in Sao Tome & Principe in West Africa; Charles forwarded a wealth of information about VOA's operation there.

The VOA operates three domestic-band stations in Sao Tome. The largest is a 600,000-watt (yes, 600 kilowatts!) station on 1530 kHz. 1530 uses two 334-foot towers to create a directional pattern covering most of Africa. VOA programs in English, French, Portuguese, and Hausa are broadcast. A second AM transmitter operates on 945 kHz at 20,000 watts; this carries the local Radio Nacional de Sao Tome e Principe programs. VOA also operates a 100-watt FM transmitter (atop a 2,000-foot mountain!) carrying the *VOA Music Mix* program. The latter two transmitters are intended for the local population within Sao Tome.

What does a 600,000-watt transmitter look like? See the picture. The first three cabinets house a single CQK-650-1 vacuum tube and the associated tuning networks. The fourth cabinet contains a high-power solid-state digital switch and RF impedance matching network. The rightmost cabinet contains control circuits.

In older AM transmitters, amplitude modulation was achieved by using the audio to control the high voltage applied to the final amplifier tubes. The "high level plate modulation" scheme is simple and works well, but it's relatively inefficient and lossy. When you have 600,000 watts floating around, losses add up to a LOT of heat to get rid of. (They also add up to a lot of wasted electricity purchased from the local utility. Or in VOA's case, locally generated with expensive diesel fuel.)

A different modulation system is used in the 600,000-watt Thomcast transmitter. Instead of a single high-voltage supply, the transmitter has 48 600-volt supplies in series. Each supply can be turned on or off by the control circuits. At a positive voice peak, all 48 supplies are turned on for a high voltage of roughly 30,000 volts. At a negative peak, they're all turned off for a high voltage of zero. And when there is no audio – just a dead carrier – half the supplies are on. The 48 supplies are connected to the control circuits via fiber-optic lines; no other technology could handle the 30,000-volt potential differences!

Having only 48 voltage steps would lead to considerable noise and distortion in the transmitted signal, so one of the 600-volt supplies is pulse-duration modulated. It's turned on and off at a supersonic rate; the more power you want, the greater proportion of the time you leave it turned on. This fills in the gaps between the voltage steps.

To further improve efficiency, the 600,000-watt transmitter uses something called "controlled-carrier" operation. (If you were a ham back in the 1950s or 1960s and had a Heathkit DX-35, DX-40, or DX-60 transmitter, you're familiar with this system on a *much* smaller scale!) In AM transmission, a "carrier" signal is necessary for receivers to retrieve the audio. In most transmitters, the strength of the carrier is always the same. But it doesn't have to be. It only has to be stronger than the audio. The VOA transmitter (and the old Heathkit ham rigs!) automatically control the strength of the carrier, maintaining it just high enough to ensure receivers can properly retrieve the signal.

While the switched-mode modulation and controlled-carrier operation greatly improve efficiency, 600,000 watts is still a *lot* of power! 50,000-watt transmitters are usually air-cooled; a fan blows air across cooling fins on the tube (much like the CPU cooler in a computer). This isn't enough at the 600kW power level. To keep the tube cool, water is circulated through it. Water is also used to cool the tuning components, among other transmitter parts.

But remember: there's 30,000 volts on this tube! You don't just pump tap water through that kind of device. Tap water is a dangerous conductor at 125 volts, let alone 30,000. A special "de-ionizing system" is necessary. Some of the water circulating through the transmitter is passed through a tank containing a special resin; this filters out the ions. A meter is provided to keep track of how conductive the water is; if conductivity rises above the acceptable level, more water is diverted to the resin tank.

*The 600,000-watt Thomcast transmitter at VOA Sao Tome.*

So with 600,000 watts, can VOA Sao Tome be heard in the U.S.? If you're on the Atlantic Coast, the answer is yes. A superficial scan of a few copies of the National Radio Club's "DX News" shows a handful of loggings of this station, with comments like "loud and clear, burying WSAI." Between 0300 and 0430 UTC, VOA-1530 should be parallel to a number of shortwave frequencies to Africa, including 4960, 6035, 6080, 7290, 7415, 9575, and 9885 kHz.

There's more of interest to the AM DXer at VOA Sao Tome, but there isn't much more space in this month's column. Stay tuned!

## ❖ Bits and Pieces

**Expanded-band:** We have another new expanded-band station on the air. KMMZ-1640 Enid, Oklahoma, has been testing with soft oldies and comedy. Patrick Griffith has already received a QSL from this station. The address is 316 East Willow, Enid OK 73702.

**Whoizzit?** Lawrence Puckett WB5CEW near Jackson, Mississippi, has been hearing a Spanish-language station on 850, carrying cumbia music. The station loops in the direction of Houston, Texas, and Lawrence has heard it identify in English with a K callsign. (Unfortunately interference made it impossible to hear the rest of the call.) DXers elsewhere have positively identified this station as KEYH in Houston.

**Digital Comes to Mexico:** Mexican broadcasters saw a comparative demonstration of the competing digital radio technologies at their CIRT (Cámara Nacional de la Industria de Radio y Televisión) convention in October in Mexico City. Eureka-147 tests are already underway in Mexico, and XM and Sirius satellite radio work south of the border. U.S. equipment makers lent XHFAJ-FM (91.3) IBOC digital equipment for the tests.

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

# OUTER LIMITS

THE CLANDESTINE, THE UNUSUAL, THE UNLICENSED

George Zeller
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# Why Do Pirates Operate?

Of all the questions that are sent into the *Outer Limits* column, by far the most common is a simple question, "Why do pirates operate, even though the government does not allow unlicensed broadcasting in virtually all countries?" This month, Artie Bigley sends in a typical answer to this question. He notes that a local pirate, **WUPT**, has been operating in the Fort Myers, FL, area on 91.9 MHz FM. The station has gained some notoriety, since it intentionally plays music that is considered obscene by commercial radio stations and the FCC. The Fort Myers *News-Press* has even dubbed this one "X Rated Radio."

Many pirates take to the airwaves to fill market niches like this one that are not being filled by regular licensed commercial broadcasters. The same motivation is there for many of the shortwave pirates that we cover in this column every month.

Pirates regularly complain that the USA government has allowed a handful of large corporations to buy a significant percentage of the commercial radio stations in the USA, making the fare audible on regular licensed broadcasters even blander than it was previously. Further, several of these broadcasters have been intentionally censoring programming on their stations for political purposes in recent months. Given this newly concentrated ownership of radio stations in the United States, the motivation leading to pirate broadcasting is actually increasing right now, despite the threat of governmental busts and fines.

Interestingly, in the case of **WUPT**, they are using the call letters of a now-silent UHF station that operated on Channel 25 in Crystal Falls, MI. That defunct station still had a web site on the internet as of column deadline at *MT*. You might want to see if that web site is still there by checking **http://www.northpine.com/broadcast/captures/mi/wupt.html** on your internet dial.

Yet another use of the WUPT call is an Alaska rock and roll band that also maintains a web site at **http://www.bands411.com/wupt/band.cfm?showmain=yes&bandid=1988** on the internet. Pirates inevitably claim that they are increasing the diversity of radio programming in North America, but the government and licensed commercial radio stations still complain that they broadcast without a license, and are therefore in violation of federal laws.

Such groups tend to feel that pirates are mainly symbolized by the QSL that we print here this month., from Fred Flintstone's old pirate station. Regardless of how you feel about this political argument, pirate broadcasters can provide considerable entertainment for DXers looking to spice up their hours spent tuning their radio dials.

## ◆ Radio Oasen Cut

For several years an overtly fascist radio station, **Radio Oasen**, has broadcast in Denmark on 101.2 MHz FM. The station's quasi-clandestine National Socialist news and feature programming has been funded by the government of Denmark. This has been part of the Danish government's funding for a variety of noncommercial radio stations. The station has been broadcasting since 1996, but the government has announced that they will no longer be funding this particular station, given the fact that many groups have taken offense to the Nazi programming on the station. It is unclear if the station will remain on the air once the government subsidy disappears, since more than half of their operating budget was funded by the government of Denmark.

This situation shows clearly that governments can control the programming content of stations that they fund. That point is obvious, but as we have seen with **WUPT**, governments also regulate program content of stations through their allocation of licensed frequencies.

## ◆ World Music Radio Returning

**World Music Radio**, a classic pirate radio pioneer in Europe, primarily from the Netherlands in the 1960s, has announced its forthcoming return to shortwave. Somewhat in the vein of USA licensed broadcaster **WBCQ**, WMR claims that it will be the first licensed private shortwave radio station in Denmark. Noted European DXer Stig Hartvig Nielsen is supposed to play a major role in this one's return to the airwaves. They claim that their format will be classic rock and "world music," but full programming details are still being worked out.

In addition to their shortwave signal, the station says that it hopes to operate an streaming audio from their web site at **http://www.wmr.dk/** on the internet as well as an FM band transmitter in Denmark. They say that their address for correspondence is currently PO Box 112, DK-8900 Randers, Denmark.

Check out their web site from time to time for breaking news on this interesting development.

## ◆ Rhino Radio

Clandestines who broadcast some programming in English are a rare breed. But, some North American DXers have been hearing the anti-Uganda **Rhino Radio** on 17870 kHz. Their program for more than a half hour before 1600 UTC often consists of English language anti-Uganda government broadcasts. Additional information on this one is available via their **http://www.radiorhino.org** internet web site.

## ◆ South American Pirates

Although their schedules are irregular, it always pays to check on weekends for the South American pirates **Radio Blandengue** and **Radio Cochiguaz**. Blandengue has been using variable frequencies around 14578 kHz, while Cochiguaz often uses their old standby of 11430 kHz. These pirates from another hemisphere can sometimes put surprisingly good signals into North America, and they welcome reports via the Santiago address below. Broadcasts are normally in either upper sideband or lower sideband mode, so you will want to check both possibilities. Another possibility to check out is Argentina pirate **Radio Bosques**, which has announced that it plans to move its broadcasts in 2003 to frequencies within the 7810-7870 kHz range.

## ◆ What We Are Hearing

Our readers heard all of these North American pirate broadcasters this month, with apparently somewhat reduced volumes of shortwave pirate broadcasting lately. All pirates operate on a sporadic schedule, but shortwave pirate broadcasting increases noticeably on weekends, and during major holiday periods. The new main North American pirate frequency of 6925 kHz, plus or minus 30 or 40 kHz, is the place to scan for the pirates. The old 6955 and 6950 kHz frequencies are increasingly abandoned by pirates because of licensed stations in China and Peru.

**Grasscutter Radio-** Normally this one is a rock music pirate, which is a real staple format in pirate radio today. (Uses *grasscutterradio@yahoo.com* e-mail)

**Iron Man Radio-** Scruffy's rock music station sometimes supplements its programming with an imaginary traffic report and occasional cameos from other pirates. (Belfast)

**James Bond Radio-** Several *MT* readers wrote in to report that they heard this apparently new station with rock and pop music and references to James Bond. Thus far the ID on this one is tentative, despite widespread loggings. (None known)

**Old Turkey Radio-** This one appeared with Thanksgiving holiday fare once again this year,

*continued on page 79*

# SATELLITE SERVICES

**MT TRANSPONDER GUIDE** www.monitoringtimes.com/mtssg.html

*All Frequencies MHz*

Robert Smathers
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## SES Americom Americom-1

*C-Band - 103 degrees West longitude*

| | | |
|---|---|---|
| 1(H) | 3720 | Data Transmissions |
| 2(V) | 3740 | **SES-Americom** (digital)<br>Deutsche Welle TV<br>Deutsche Welle Radio 1 (German)<br>Deutsche Welle Radio 2 (English)<br>Deutsche Welle Radio 7 (French and other languages)<br>ERT – Greece<br>MegaCosmos<br>ERAsport<br>SES-Americom Occasional video services |
| 3(H) | 3760 | Public Broadcasting Service Alaska/ Carribean service (digital) |
| 4(V) | 3780 | **Fox Sports Net – Rainbow Network Communications** (digital)<br>Fox Sports Net Ohio<br>Fox Sports Net Chicago<br>Fox Sports Net New England<br>Fox Sports Net Florida<br>Fox Sports Net Alternate 1<br>Fox Sports Net Alternate 2 |
| 5(H) | 3800 | **Globecast** (digital)<br>Go! TV<br>Wizebuys TV<br>Globecast Occasional video feeds<br>German TV<br>Xtreme Shopping Network<br>Latin Broadcasting Corp. Radio<br>Radio Paz<br>Deutsche Welle Radio<br>WZMQ-FM Key Largo / WMFM-FM Key West – La Gran Cadena radio |
| 6(V) | 3820 | WNBC-TV, New York City – Primetime 24 NBC (VC2+) |
| 7(H) | 3840 | **Pax Network Operations Center** (digital)<br>Pax Television – East<br>Pax Television – Mountain<br>Pax Television – Pacific<br>Pax Television Occasional feeds<br>The Worship Network<br>Praise TV<br>Faith Television |
| 8(V) | 3860 | In-Demand Pay-Per-View (digital) |
| 9(H) | 3880 | Occasional video / National Jewish Television (occ) / Housing and Urban Development Television (occ) |
| 10(V) | 3900 | WKRN-TV, Nashville, TN – Primetime 24 ABC (VC2+) |
| 11(H) | 3920 | Univision feeds (digital) |
| 12(V) | 3940 | Wisdom Television (digital) |
| 13(H) | 3960 | In-Demand Pay-Per-View (digital) |
| 14(V) | 3980 | In-Demand Pay-Per-View (digital) |
| 15(H) | 4000 | Total Living Network (digital) / CTN (digital) |
| 16(V) | 4020 | Occasional video |
| 17(H) | 4040 | (none) |
| 18(V) | 4060 | **Fox Sports Net – Rainbow Network Communications** (digital)<br>Fox Sports Net New York<br>Fox Sports Net Bay Area<br>Madison Square Garden Network<br>Fox Sports Net Base<br>Fox Sports Net Alternate 1<br>Fox Sports Net Alternate 2 |
| 19(H) | 4080 | American Forces Network (digital) / Data Transmissions |
| 20(V) | 4100 | MTV 2 |
| 21(H) | 4120 | Telefutura East, Telefutura Mountain, Telefutura Pacific (digital) |
| 22(V) | 4140 | WSEE-TV, Erie, PA – Primetime 24 CBS (VC2+) |
| 23(H) | 4160 | Occasional video |
| 24(V) | 4180 | Data Transmissions |

## SES Americom Americom-1

*Ku-Band - 103 degrees West longitude*
(see January 2004 *MONITORING TIMES*)

## SES Americom Americom-2

*C-Band – 105 degrees West longitude*
(Per current FCC rulemaking, the C-band portion is turned off)

## SES Americom Americom-2

*Ku-Band – 105 degrees West longitude*

| | | |
|---|---|---|
| 1(V) | 11720 | DISH Network services |
| 2(H) | 11740 | DISH Network services |
| 3(V) | 11760 | DISH Network services |
| 4(H) | 11780 | DISH Network services |
| 5(V) | 11800 | DISH Network services |
| 6(H) | 11820 | (none) |
| 7(V) | 11840 | DISH Network services |
| 8(H) | 11860 | DISH Network services |
| 9(V) | 11880 | DISH Network services |
| 10(H) | 11900 | DISH Network services |
| 11(V) | 11920 | DISH Network services |
| 12(H) | 11940 | (none) |
| 13(V) | 11960 | DISH Network services |
| 14(H) | 11980 | DISH Network services |
| 15(V) | 12000 | DISH Network services |
| 16(H) | 12020 | DISH Network services |
| 17(V) | 12040 | DISH Network services |
| 18(H) | 12060 | DISH Network services |
| 19(V) | 12080 | DISH Network services |
| 20(H) | 12100 | (none) |
| 21(V) | 12120 | (none) |
| 22(H) | 12140 | DISH Network services |
| 23(V) | 12160 | DISH Network services |
| 24(H) | 12180 | DISH Network services |

## Telesat Canada Anik F1

*C-Band - 107.3 degrees West longitude*

| | | |
|---|---|---|
| 1A(H) | 3720 | Occasional video |
| S1A(H) | 3720 | South-American beamed transponder |
| 1B(V) | 3740 | Data Transmissions |
| 2A(H) | 3760 | Canadian Broadcasting Corporation (CBC) Television (digital) |
| S2A(H) | 3760 | South-American beamed transponder |
| 2B(V) | 3780 | Telesat Canada services (digital)<br>Musimax<br>Radio Mutual<br>Magneotheque radio<br>ASN<br>RDS<br>Canal Nouvelle |
| 3A(H) | 3800 | Data Transmissions |
| S3A(H) | 3800 | South-American beamed transponder |
| 3B(V) | 3820 | Occasional video |
| 4A(H) | 3840 | (none) |
| S4A(H) | 3840 | South-American beamed transponder |
| 4B(V) | 3860 | Occasional video |
| 5A(H) | 3880 | Occasional video |
| S5A(H) | 3880 | South-American beamed transponder |
| 5B(V) | 3900 | Cancom (digital) / Global Television (digital) |
| 6A(H) | 3920 | Radio Canada (digital) |
| S6A(H) | 3920 | South-American beamed transponder |
| 6B(V) | 3940 | Cancom (digital) / Aboriginal People's Television Network (digital) |
| 7A(H) | 3960 | CBFT-TV (SRC Network – Montreal) (digital) / Data Transmissions |
| S7A(H) | 3960 | South-American beamed transponder |
| 7B(V) | 3980 | Cancom (digital) |
| 8A(H) | 4000 | Occasional video |
| S8A(H) | 4000 | South-American beamed transponder |
| 8B(V) | 4020 | Occasional video |
| 9A(H) | 4040 | Canadian Broadcasting Corporation (CBC) occasional video feeds (digital) |
| S9A(H) | 4040 | South-American beamed transponder |
| 9B(V) | 4060 | Telesat Canada services (digital)<br>Meteo Media<br>TV5 USA<br>TV5 France<br>Blue Bonnet<br>Occasional video<br>Telemedia Radio – CITE Montreal<br>Telemedia Radio – CKAC Montreal<br>RDI<br>Radio Quebec |
| 10A(H) | 4080 | Data Transmissions |
| S10A(H) | 4080 | South-American beamed transponder |
| 10B(V) | 4100 | Telesat Canada services (digital)<br>CTV Red Network<br>CTV Blue Network<br>CTV Green Network<br>Newsworld International<br>The Weather Network<br>Occasional video |
| 11A(H) | 4120 | Occasional video |
| S11A(H) | 4120 | South-American beamed transponder |
| 11B(V) | 4140 | Occasional video |
| 12A(H) | 4160 | Canadian Broadcasting Corporation (CBC) occasional video services (digital) |
| S12A(H) | 4160 | South-American beamed transponder |
| 12B(V) | 4180 | Occasional video |

## Telesat Canada Anik F1

*Ku-Band - 107.3 degrees West longitude*

| | | |
|---|---|---|
| T1(V) | 11714 | Star Choice DBS (digital) |
| T2(V) | 11744 | Star Choice DBS (digital) |
| T3(V) | 11775 | Star Choice DBS (digital) |
| T4(V) | 11807 | Star Choice DBS (digital) |
| T5(V) | 11836 | Star Choice DBS (digital) |
| T6(V) | 11867 | Star Choice DBS (digital) |
| T7(V) | 11897 | Star Choice DBS (digital) |
| T8(V) | 11928 | Star Choice DBS (digital) |
| T9(V) | 11960 | Star Choice DBS (digital) |
| T10(V) | 11990 | Star Choice DBS (digital) |
| T11(V) | 12020 | Star Choice DBS (digital) |
| T12(V) | 12051 | Star Choice DBS (digital) |
| T13(V) | 12081 | Star Choice DBS (digital) |
| T14(V) | 12113 | Star Choice DBS (digital) |
| T15(V) | 12140 | Star Choice DBS (digital) |
| T16(V) | 12172 | Star Choice DBS (digital) |
| T17(H) | 11725 | Star Choice DBS (digital) |
| T17S(H) | 11725 | South-American beamed transponder |
| T18(H) | 11756 | Star Choice DBS (digital) |
| T18S(H) | 11756 | South-American beamed transponder |
| T19(H) | 11786 | Star Choice DBS (digital) |
| T19S(H) | 11786 | South-American beamed transponder |
| T20(H) | 11817 | Star Choice DBS (digital) |
| T20S(H) | 11817 | South-American beamed transponder |
| T21(H) | 11850 | Star Choice DBS (digital) |
| T21S(H) | 11850 | South-American beamed transponder |
| T22(H) | 11880 | Star Choice DBS (digital) |
| T22S(H) | 11880 | South-American beamed transponder |
| T23(H) | 11910 | SRC occasional video feeds (digital) |
| T23S(H) | 11910 | South-American beamed transponder |
| T24(H) | 11940 | Canadian Broadcasting Corporation (CBC) occasional video feeds (digital) |
| T24S(H) | 11940 | South-American beamed transponder |
| T25(H) | 11971 | Star Choice DBS (digital) |
| T25S(H) | 11971 | South-American beamed transponder |
| T26(H) | 12002 | Star Choice DBS (digital) |
| T26S(H) | 12002 | South-American beamed transponder |
| T27(H) | 12033 | Star Choice DBS (digital) |
| T27S(H) | 12033 | South-American beamed transponder |
| T28(H) | 12063 | Star Choice DBS (digital) |
| T28S(H) | 12063 | South-American beamed transponder |
| T29(H) | 12094 | Star Choice DBS (digital) |
| T29S(H) | 12094 | South-American beamed transponder |
| T30(H) | 12124 | Star Choice DBS (digital) |
| T30S(H) | 12124 | South-American beamed transponder |
| T31(H) | 12155 | Star Choice DBS (digital) |
| T31S(H) | 12155 | South-American beamed transponder |
| T32(H) | 12180 | Star Choice DBS (digital) |
| T32S(H) | 12180 | South-American beamed transponder |

## Satelites Mexicanos Morelos 2

Ku-Band - 109.1 degrees West longitude

| | |
|---|---|
| T01K(H) | 11764 |
| T02K(H) | 11888 |
| T03K(H) | 12012 |
| T04K(H) | 12136 |

This satellite operates in an inclined orbit. No activity has been observed.

# BELOW 500 kHz

DXING THE BASEMENT BAND

*Kevin Carey, WB2QMY*
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# Try Longwave!

February can be a bleak month in many parts of North America. It's often very cold, windy and lacking in sunshine. If bad weather gets you down, why not turn to your radio hobby to brighten your outlook? With its many facets, monitoring can keep you busy for months without ever covering the same ground twice.

If you've decided on longwave for a change of pace, February is a great time to begin. Natural static levels are usually low, enabling even daytime signals to reach over respectable distances. Whether your interest is in navigation beacons (a mainstay for many), Lowfer experimenters, broadcasters or military signals, there is something for you on longwave. How do you get started?

## Getting on the Band

Many receivers of recent design include longwave coverage as a stock feature. Of the current crop of tabletop units, several receive down to 100 kHz, with some going as low as 30 kHz. (A few top-end receivers even dip down to 5 kHz!) My 12-year-old Drake R8 is typical of a tabletop receiver. It serves as my "workhorse" for longwave reception and tunes down to 100 kHz. Its coverage can be extended down to 5 kHz with an aftermarket, outboard converter. R8's, their successors, and many other tabletop receivers can often be found on the used market at reasonable prices.

If you have a good receiver that lacks longwave coverage, consider using an LF converter. Converters are an excellent way to get an older rig (or ham transceiver) onto the longwave band. They take a large swath of the LF spectrum and move it to a more convenient tuning range, such as the 80-meter ham band (3.5 to 4.0 MHz). These small units connect inline between the antenna and your existing radio, and require no modification to your rig whatsoever.

A word of caution is in order for transceiver owners: *Never transmit into a converter or it will be immediately destroyed.* To prevent damage, it's best to disconnect the microphone and key from your transceiver before installing the converter. Also, adopt a "hands-off" policy on the front panel "MOX" or "Tune" switch. (Trust me – I speak from costly experience.)

Converters are available from several sources. Three well-known firms offering them (or converter/antenna combinations) are: LF Engineering Co. **(http://www.lfengineering.com)**, Palomar Engineers **(http://www.palomar-engineers.com)**, and Ramsey Electronics **(http://www.ramseyelectronics.com)**.

## Antennas

It's been said that a proper antenna is the single most important factor in your receiving setup. I agree with this, but if you're just starting out, don't be afraid to try your shortwave or ham antenna on longwave. The truth is, any hunk of wire, 50 feet or longer, will provide *some* reception on longwave. It may not provide great reception, particularly if you are in a high-noise environment, but it will get you started.

Hams often use an existing wire antenna for LW reception. In the case of a dipole, both legs of the antenna can be tied together in the shack by jumpering the center conductor and shield of the feedline. This increases the electrical length of the antenna and will provide considerably stronger signals. I started my LF exploration with an 80-meter dipole connected in this way. The results were very good.

As you delve further into the hobby, you'll probably want to try something more advanced, such as a directional loop or active antenna. These antennas provide even stronger signals and better signal-to noise ratios. LF Engineering Co. and Palomar Engineers, mentioned earlier, are two sources for these types of antennas.

## Identifying Signals

Sooner or later, you're going to want more details about the signals you hear. Fortunately, the keying speed on most beacons is so slow that you can simply jot down the dots and dashes and look up the letters on a Morse Code chart. Armed with an ID, you can look up the station's location in a directory or an online database. A useful online resource is **http://www.airnav.com**. Please note, however, that this site omits the important (to us) two-letter "compass locator" beacons.

While online resources are helpful, I'm unaware of any all-inclusive listing of North American beacons on the Web. Many listeners prefer a printed guide for reasons of convenience, and because they don't want to boot their computer for every DXing session. (A computer can also be a potential source of interference, especially when you're digging for weak signals.) Those interested in a printed guide may wish to consider the *BeaconFinder*, advertised elsewhere in this issue. Now in its 2nd edition, the guide has been completely revised to include additional charts, country lists, and other resources to help you ID your catch quickly.

## Reader News & Loggings

Brock Whaley (GA) checks in with an impressive list of loggings from the state of Georgia,

***Mike Leahan (WI) sent this photo of SLY (344 kHz) near Hayward, WI. Although not visible here, the antenna consists of two parallel wires strung between the cross-arm utility poles. The shed houses the beacon transmitter.***

plus a few nearby states. All signals were heard between 11 AM and 12 Noon Local time using a Sony 2010 receiver, Palomar Engineers converter, series tuner and a 120 foot longwire antenna.

Brock points out that all of these stations were heard on a regular speaker, without the need for headphones. It is interesting to note that six of the beacons listed have a voice broadcast in addition to their Morse IDs. Beacons with voice have become a rarity in recent years.

**Selected Beacon Loggings**
*(All in GA unless otherwise noted)*

| | | | |
|---|---|---|---|
| 198 | DIW | Dixon, NC | 2 kW |
| 205 | LNH | Millen | 25 W |
| 208 | HOT | Homerville | 25 W |
| 212 | OKZ | Sandersville | 25 W |
| 216 | CLB | Wilmington, NC | 1.5 kW |
| 221 | BJT | Athens | 25 W |
| 234 | EQQ | Newnan | 25 W |
| 241 | GIW | Greenwood, SC | 25 W |
| 244 | DDA | Commerce | 25 W |
| 245 | JYL | Sylvania | 25 W |
| 248 | FRT | Spartenburg, SC | 400 W |
| 252 | DB | Dublin | 25 W |
| 257 | CEU | Clemson, SC | 25 W |
| 266 | BR | Atlanta | 50 W |
| 271 | PIN | Pine Mountain | 25 W |
| 278 | EOE | Newberry, SC | 25 W |
| 280 | MQW | McRae | 25 W |
| 285 | JZA | Jasper | 25 W |
| 292 | (DGPS Data) | Kensington, SC | |
| 301 | (DGPS Data) | Macon | |
| 307 | (DGPS Data) | Hacketsburg, AL | |
| 309 | EEX | Swainsboro | 25 W |
| 316 | FF | Peachtree City | 25 W |
| 319 | (DGPS Data) | Savannah | |
| 329 | CH | Charleston, SC | 400 W |
| 339 | OP | Thomaston | 25 W |
| 341 | AA | Thomson | 25 W |
| 344 | FT | Atlanta | 50 W |
| 347 | AJR | Cornelia | VOICE 25 W |
| 350 | BEP | Perry | VOICE 25 W |
| 353 | VV | Greensboro | VOICE 25 W |
| 356 | BAX | Waynesboro | 25 W |
| 365 | FKV | Gainesville | 25 W |
| 370 | VOF | Covington | VOICE 25 W |
| 375 | AT | Atlanta | |
| 379 | BRA | Ashville, NC | |
| 380 | UMB | Milledgeville | VOICE 25 W |
| 385 | EMR | Augusta | |
| 388 | OYD | Rome | |
| 392 | JNM | Monroe | VOICE 25 W |
| 404 | BMW | Winder | 25 W |
| 412 | JHH | Griffen | 25 W |
| 415 | DJD | Canton | 25 W |
| 419 | TX | Lawrenceville | 25 W |
| 426 | IZS | Montezuma | 25 W |
| 435 | IIY | Washington | 25 W |

That's it for February. See you next month.

# ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

*T.J. "Skip" Arey, N2EI*
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# Microwaves Ain't Just for Cooking

When it comes to general amateur radio operations I tend to be a bit of a Luddite. My particular cup of ham radio tea is CW ragchewing on the lower HF bands. If my Grandfather had been a ham he would have been doing the same thing.

But amateur radio is supposed to be, in part, about experimentation and innovation. We are obliged by the very authority we have to operate to contribute to the advancement of the radio art.

Now if you tune around where I like to play you don't hear all that much innovation going on. Other than experiments in low power, DSP and "minimalist equipment" the low bands have been pretty much figured out from a technical standpoint. (Yeah, it's perfectly okay to go out and do something innovative and make me a liar... Just make sure you write about it here in *MT*.) The path to the future, for amateur radio, has always been punctuated by movement further up through the radio frequency spectrum.

Hams began to get serious about VHF communications not long after they got their privileges back after World War Two. (Today, just about every ham has a 2 meter handitalkie clipped to their belt thanks to the work of those early innovators.) Since then it has been a constant quest to find new radio ground higher up the band. Today, hams who want to push the envelop do their thing in the *microwave* bands.

Now, when most of us think of the term microwave we get this vision of the box in the kitchen that we use to heat soup and make popcorn. Generally, the term microwave is applied to any signal above 1 GHz. The RF signals in that little electronic oven are in the microwave range (around 2.5 GHz to be exact, just above the 13 cm ham band). Hams also have a band in the 33 cm range at 902 MHz-928 MHz that most folks consider "close enough for government work" and if you operate up there you can consider yourself a bona fide microwaver.

With some geographical limitations that are not of consequence to this article, the microwave ham bands are as follows:

902 -928 MHz
1.24-1.3 GHz
2.30-2.31 & 2.39-2.45 GHz
3.3 - 3.5 GHz
5.65 - 5.925 GHz
10 - 10.5 GHz
24 - 24.25 GHz

There are even higher frequency realms where practical hamming is still somewhat out of reach but if you want to try to get there it's perfectly legal at:

47.0 - 47.2 GHz
75.5 - 81.0 GHz
119.98 - 120 GHz
142 - 149 GHz
241 - 250 GHz

and anywhere above 300 GHz you can make a signal squeak!

Sound impossible? Remember that hams originally got their frequencies "below 200 Meters" because the so-called experts said they were impractical for commercial use. Who knows what some enterprising and tenacious amateur might come up with in the future?

## ❖ Modes Matter

The common modes of communication on these bands are CW and SSB with some experimentation in the newer digital communications modes. And while any ham with a Technicians Class ticket or higher can theoretically run a *full gallon* – 1.5 kW of power – you'll be hard pressed to find anyone using more than 20 watts, as cost for amplification in the microwave ranges can be prohibitive. Hams, instead, improve their odds by using high gain antennas, low loss cabling and connectors, and taking advantage of some tricks of the atmosphere such as tropospheric ducting and scattering.

The microwave bands are a place for cutting edge experimentation. You'll find very few *appliance operators* up this high. There are some commercial transceivers in the 1.2 GHz and even the 10 GHz and 24 GHz range, but beyond that, most hams either build their own gear or, more practically, use *transverters* to convert a signal in and out of more common transceivers (usually something in either the 10 meter or 2 meter range).

If you own an HF or VHF multimode transceiver, it is possible to get on to any of the microwave bands for a relatively reasonable cost. Transverters sell new in the neighborhood of $200 and antennas are easily made or are of reasonable cost largely due to their small overall size. A station can be further improved with the addition of receiving preamplifiers and transmitter power amplifiers. So it is possible to start small, based around an existing ham shack, and grow into the microwave side of the hobby over time.

## ❖ Antenna Talk

Let's talk about those microwave band antennas for a bit because, for me, that is the most exciting area of ham experimentation related to the bands above 50 MHz. Since the antennas are physically small, it can be a lot of fun to try to improve upon existing ideas.

Most microwave enthusiasts lean toward an antenna design known as the *loop yagi*. While these are available commercially, many designs for home construction can be found. Also, since the antennas are small and light, it is fairly easy to group them in arrays of two, four or more to further increase gain.

The real fun comes when you move up through the 2.3 GHz region and traditional antenna designs begin to become impractical. Now you are in the world of parabolic dishes! Nothing says "serious ham radio" like your own microwave dish. Up in the 10 GHz range hams make use of *pyramidal horn* antennas to achieve gain and directivity.

Some people joke that ham radio up in these higher ranges has more to do with plumbing than with radio. I have to admit, it helps to be handy with a pair of tin snips. But the resulting equipment and its performance can be quite remarkable for home brew gear.

## ❖ Microwave Propagation

The signals in the microwave ranges are similar to those of most VHF and higher frequencies in that they are primarily line of sight. Traditional notions of ionospheric propagation get thrown out the window in the microwave world. Microwave signals are not refracted by the atmosphere. As I mentioned briefly earlier, microwavers stretch their signal paths mainly by way of a phenomena known as *tropospheric ducting*.

What happens here is that unique weather conditions can exist between two areas allowing unusually long distance communica-


***Many hams use transverters to get their existing transceivers to operate in the microwave ranges***

tion for these frequencies. Ducts in excess of 2500 miles have been utilized to set band records in the microwave regions. While the atmospheric science behind these ducts is still not fully understood, it is known that they are related to the activity and movement of large high pressure systems. Many microwave-savvy hams become as adept at reading weather maps as they are at tuning their rigs.

Given the "line of sight" nature of the microwave bands they also lend themselves to the practice known as *hilltopping*. Remembering that the higher your antenna is the longer your line of sight will be, many microwavers take their whole station out to higher elevations, often coordinating efforts with other hams going to other higher locations. This is very common during VHF contests where working the maximum number of *grid squares* can significantly improve an operator's overall score.

When you think things through, it's easy to see why many microwave stations are set up so that they can be easily used in the portable world as well. Most stations are limited to modest power, hence they are small in size and have reasonable power requirements. The antennas are physically small and relatively light. The shortest run of feedline possible is required to prevent signal loss.

Note: in the 10 GHz range and above, it is not uncommon for the transceiver to be mounted directly at the antenna, essentially eliminating the feedline. A fairly common sight for a microwave station is to have the rig and antenna mounted on a photographer's tripod for ease of manipulation. At the higher microwave ranges the antenna is likely to be either a dish or a horn, so this makes for a quick and easy way to operate.

## The Moon's the Limit

I would be remiss in not mentioning that the microwave bands up through 10 GHz have been used for Earth-Moon-Earth (EME) communication. This points to another effect related to microwave signal propagation. Microwave signals can reflect off of metallic surfaces. Signals have been known to be practically reflected off of the surface of water towers, traffic signs and even airplanes.

## Microwave Groupies

While the skills needed to set up a modest microwave station are within the scope of most hams, this is an aspect of the ham radio world that is seldom done solo. Given the nature of the microwave beast, it pays to be gregarious. It helps to get to know the other microwave enthusiasts in your area. After all, since it is a bit tricky to get a signal to travel great distances in the microwave ranges, it helps to set up schedules and make arrangements to get in the line of sight of one another's stations. Many major metropolitan areas have amateur clubs that emphasize VHF activity.

If you do find yourself *trawling* for signals in the microwave bands, you will be happy to know that the common practice is to use standard *calling frequencies* generally agreed upon, based upon band and mode. Ideally, these frequencies will be places where active microwave hams in your regions will congregate and monitor. Once you've thrown out your callsign and gotten a response, it is then easy to agree to QSY to another place, freeing up the calling frequency for other amateurs.

A really great way to learn about the microwave bands as well as the other VHF and higher bands is to find your area VHF contest group. I've occasionally lent my *fist* to my area VHF club to help them run up their CW totals.

Even though you are not knowledgeable about the equipment and the bands, operating is operating. Shouting CQ TEST into a microphone is the same essential practice on any band in hamdom. By helping out you will be sure to get to know a couple of folks who will help *Elmer* you into the microwave world. I find microwave operators to be a fairly gregarious bunch that like to share their ideas with one another. After all, it take two to communicate in this hobby.

Maybe the most exciting thing of all about microwave communication is that there are still new worlds to conquer. Distance records are constantly being challenged as hams strive to understand better ways to operate. Since so much of the equipment is experimental and home made, innovation is commonplace. You could find yourself actually advancing our understanding of how radio works. Most importantly, you will be finding new ways to have fun in the greatest hobby in the world.

I'll see you on the bottom end of 40 meters, or maybe one of these days you might catch me up at 300 GHz. Stranger things have happened!

### UNCLE SKIP'S CONTEST CORNER

**10-10 International Winter Contest (Phone)**
Feb 7 0001UTC - Feb 8 2400UTC

**Minnesota QSO Party**
Feb 7 1400UTC- 2359UTC

**Delaware QSO Party**
Feb 7 1700UTC – Feb8 0500UTC &
Feb 8 1300UTC - Feb 9 0100UTC

**North American Sprint (Phone)**
Feb 8 0000UTC - 0400UTC

**YL-OM Contest (CW)**
Feb 14 1400UTC - Feb 16 0200UTC

**FISTS Winter Sprint**
Feb 14 1700UTC – 2100UTC

**North American Sprint (CW)**
Feb 15 0000UTC - 0400UTC

**QRP ARCI Winter Fireside Sprint (SSB)**
Feb 15 2000UTC - 2400UTC

**ARRL School Club Roundup**
Feb 16 1300UTC -Feb 21 0100UTC

**ARRL International DX Contest (CW)**
Feb 21 0000UTC - Feb 22 2400UTC

**YL-OM Contest (SSB)**
Feb 21 1400UTC - Feb 22 0200UTC

**CQ 160-Meter Contest (SSB)**
2 Feb 28 200UTC - Feb 29 1600UTC

**FYBO Winter QRP Field Day**
Feb 28 1400UTC - Feb 28 0200UTC

**North Carolina QSO Party**
Feb 29 1700UTC – Mar 1 0300UTC

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# Useful Antenna Concepts

## ❖ An Antenna Which Exists Only in Theory:

The "isotropic antenna," an antenna which exists only in theory, has been found useful in investigating and discussing antenna theory. This antenna is considered to be a point source of electromagnetic radiation and reception (radio signals, TV signals, etc.). It is completely non-directional in that it is said to transmit and receive equally well in all horizontal (compass) directions, and all vertical (both up and down) directions.

The responsiveness of an antenna in various directions is known as its "radiation and reception (R&R) pattern." The amount of this responsiveness, for both transmitting and receiving, is described in terms of the antenna's "gain,"(responsiveness). The R&R pattern of an isotropic antenna would be a sphere, indicating that it had equal gain in every direction from the antenna.

The non-directional R&R pattern of the isotropic antenna serves as a basis of comparison in describing the patterns and gain levels of real-world antennas. Of course real-world antennas are the ones we can touch with our hands, hook up to our radios, and use to support radio communications. R&R patterns of real world antennas show the antenna's gain in all horizontal directions, or at all vertical angles. This gain is measured in "dBi," which stands for "decibels of gain compared to an isotropic antenna."

In texts on antenna theory, the R&R patterns of the antennas discussed are often described as if the antenna were in empty space, far from any real-world environmental factors. When we study antennas described in this theoretical way we sometimes forget that their patterns, when they are in the real world, are usually very different from that which they would have in empty space. Objects such as metal buildings, fences, etc, if near the antenna, can change the antennas R&R pattern.

However, the proximity of the antenna to earth is usually the most influential factor causing this change (compare figs. 1A, 1B and 1C).

## ❖ Some Real-World Antenna Characteristics

Resonant and Non-Resonant Antennas :

Antenna elements possess inductance and capacitance which combine to make the element a tuned circuit. Antennas which are intentionally tuned to a particular frequency are said to be "resonant" at that frequency. These antennas are in fact tuned to perform maximally on that frequency. Actually an antenna responds to a band of frequencies centered around the frequency at which it is resonant. Some antennas are made broadly responsive such that they are tuned to a broader band of frequencies rather than peaking sharply at one single frequency. Antennas can be made broad banded by various means including the use of larger-diameter elements, and the use of multiple elements of varying resonant lengths.

Most of our familiar antenna designs are resonant: examples include the half-wave dipole; quarter-wave, grounded vertical; the quarter-wave ground plane; the Yagi-Uda beam; the cubical quad beam; the resonant long-wire beam, the resonant rhombic, and the resonant V.

Non-resonant antennas are not tuned to a particular frequency, and tend to perform well over a wide portion of radio-frequency spectrum. The common means of making an antenna non-resonant is to provide a resistance connected between the antenna and the ground. This resistance dissipates non-radiated RF energy traveling on the antenna as that energy reaches the end of the antenna. Examples of non-resonant antennas which function in this fashion include the non-resonant (terminated ) rhombic, and the non-resonant (terminated) V.

Frequency-independent antennas are an interesting variant of resonant antennas because, even though they are resonant, they have bandwidths comparably to those of non-resonant antennas. Their remarkable bandwidths are attained by special techniques such as having multiple elements progressively resonant over a range of frequencies, or special tapered spiral construction. Examples of frequency-independent antennas include the popular log-periodic dipole array (LPDA), and the conical, equi-angular spiral antenna.

## ❖ Single-Band, Multi-band, and All-Band Antennas:

Simple wire antennas, such as the halfwave dipole, are single-band antennas; however, they can be modified to function on more than one band. Tuned circuits called "traps" can be used to respond at specific frequencies to electrically isolate portions of an antenna's elements, and produce resonance

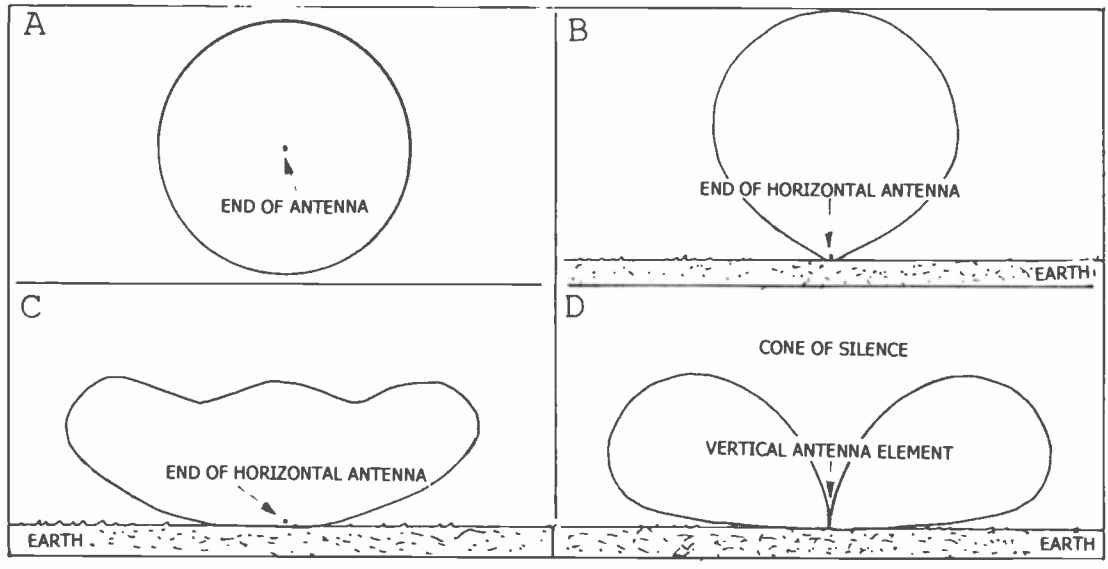


*Fig 1. Approximate vertical patterns for a half wave dipole in free space (A), the same dipole antenna as in A, but now sited on earth 1/4 wavelength above the earth. (B), the same dipole as in A and B, but now sited 1/2 wavelength above the earth. (C), The vertical pattern of a quarter-wave ground plane antenna. (D).*

**This Month's Interesting Antenna-Related Web site:**

The Marine Corps kindly makes its 192-page *Field Antenna Handbook* available for free here:
**http://www.armymars.net/ArmyMARS/Antennas/Resources/usmc-antenna-hb.pdf**

different from that of the entire length of the element. Another technique is the use of multiple elements, each element resonant on a different band.

We sometimes encounter the term "all-band" antenna. Of course no antenna can cover all possible bands with really good results. In the past this term was sometimes used to describe a trap antenna which covered all the amateur-radio portions of the HF band. Some operators use an antenna, such as a long wire, in conjunction with a matching circuit (antenna tuner). By use of the tuner the resulting antenna system can cover such a wide range of frequencies that the combined antenna and tuner are sometimes referred to as an "all band" antenna system.

## ❖ Non-Directional, Omni-Directional, and Directional Antennas:

The isotropic antenna mentioned above is the only really non-directional antenna. All real-world antennas have some difference, however slight, in their responsiveness in different directions. Some antennas, such as the grounded quarter wave vertical, and the vertical ground plane antennas, do give an essentially non-directional R&R pattern in the horizontal plane, responding in all compass directions equally. Such patterns are called "omni-directional."

Antennas with omni-directional patterns have very low responsiveness directly overhead producing a "cone of silence" (fig. 1D) directly above the antenna. This feature is useful to pilots flying to an airport by following signals from such an antenna. When the signal fades quickly out they know they are directly over the antenna.

There are many designs for "beam" antennas whose R&R patterns concentrate their responsiveness in particular directions. When properly oriented, a beam antenna transmits a stronger signal in a desired direction and reduces interference in directions where no communication is desired. Similarly, during receiving, beams concentrate their responsiveness in the desired direction while reducing responsiveness in other directions. This favors the desired signal, and reduces interference from signals arriving from the non-desired directions.

## ❖ Antennas for HF DX vs Close-in Communications

The vertical R&R pattern of an HF or lower frequency antenna is your best indicator of the distances at which it is likely to support DX communications well. Those with lower-angle patterns usually perform better for DX, and those with higher-angle patterns are better for close-in work. For this reason vertical antennas are generally considered good HF DX antennas.

However, for most antennas – particularly linear, horizontal antennas, their vertical R&R patterns are heavily influenced by the height of the antenna above the earth (compare figs 1B and 1D). Horizontal antennas described by their manufacturers as "good DX antennas" will likely be poor for DX work unless mounted above earth at least a half wavelength as measured at their operating frequency. Mounted a quarter wavelength above earth the antenna will support closer-in communications well.

## ❖ Higher Gain and Lower Gain Antennas

Above 10 to 30 MHz or so, received noise is usually low enough that higher gain gives higher quality of reception. However, below these frequencies we generally find that high gain is not particularly important. More important is whether you want all-around, omni-directional responsiveness, or want communication in one specific direction. And do you want communication with nearby stations, or is DX your goal?

The horizontal and vertical directivity of an antenna are usually more important than its gain. In fact some antennas, like the Beverage and table-top loops, are very useful because of their highly directive patterns even though they are low-gain antennas. The quarter-wave ground plane antenna has relatively low gain, yet is extremely useful in many applications because of its omni-directional pattern.

## ❖ And So

The concepts covered above are the main ones needed to select an antenna for your application. There are various other antenna concepts that are also of interest, and we will cover them at some future date.

# RADIO RIDDLES

**Last Month:**

I asked: "Physical length" is length you can measure with a ruler or tape measure. The equations given for this month's antenna elements give the physical length you must make the antenna's elements. But what are the "electrical lengths" of the elements? Are they the same as the physical lengths? Or are the two kinds of lengths different, but somehow related to one another? Or is there even such a thing as electrical length?

Well, yes there is such a thing as electrical length. We discussed resonant antennas above. The common means of making a linear antenna element resonant is to make its electrical length equal a half wavelength at its frequency of operation. The physical length of the half wavelength dipole is around 117 feet on 4 MHz, or 16 feet on 29 MHz. Other frequencies would yield other physical lengths for their electrical half wavelength. But the element's electrical lengths would be a half wavelength in each case. So, as you can see, electrical length is a useful measurement, and is measured in wavelengths.

**This Month:**

What is over a mile tall, travels faster than a speeding bullet while keeping its feet in the ground, and yet progressively leans forward so much that it eventually topples onto the earth? Hint: It's not a tired, giant Super-radio-man.

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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# The "Human" Side of Radio Restoration

Now that we've completed the unexpectedly difficult Hallicrafters S-40A restoration job, let's take on a much simpler receiver for a change of pace. Our new project, a little RCA Victor Model 1AX1 a.c.-d.c. radio, is what we call an "All-American Five" set. In other words it uses the standard octal-base tube complement found plugged into thousands of small table model radios of the 30s and 40s: 12SA7 oscillator-mixer, 12SK7 i.f. amplifier, 12SQ7 detector-first audio, 50L6 audio output and 35Z5 rectifier.

We worked with a Philco "Transitone" a.c.-d.c. set as our first restoration project (beginning in the November 2000 issue of *MT*). But although the circuitry was similar, this is our first encounter with the actual "All-American Five" series of tubes. The Philco used Loktal-based equivalents.

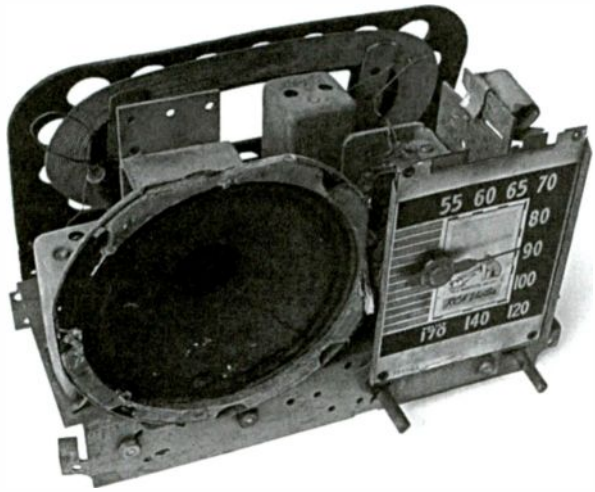
Why would I want to regress to a set that is both of a fairly simple type and not all that different from one that we've already discussed? Well, for one thing I love doing restorations of "junkers" – which this one is – and for another, the issues to be dealt with are a little different from the purely electrical ones we worked with on the Philco. There are physical/mechanical problems that haven't come up in any of our restorations up to now, and there are also some interesting issues that I'll call "human," for want of a better word.

Like the S-40A, this little RCA is a radio that I remember fondly from my younger years. I never actually owned an S-40A, but the RCA set is the same model I received as a birthday present back in the dim past. It was the first radio that belonged personally and wholly to me and I loved it! The Model 1AX1 first hit the market in 1940, the same year that Hitler started World War II in earnest by simultaneously invading Holland, Belgium and Luxembourg.

So in addition to such programs as *Jack Armstrong, All-American Boy, I love a Mystery, Lights Out,* and *The Shadow*, I also followed the changing fortunes of the Allies on the battlefields of Europe and the Pacific. But even though I loved the radio, I was also a kid. Little by little through careless handling, the Bakelite cabinet became cracked and chipped and – bit by bit – fell apart. Eventually, my radio was reduced to little more than a bare chassis with a few fragments of the cabinet clinging to the bottom and sides.

*Years after I had purchased the 1AX1 chassis, a proper cabinet turned up at another flea market. It was an exciting find!*

By then the set was relegated to my "radio workshop" in the basement, where I continued to enjoy listening it. But one day I read an article on how to align i.f. transformers by ear. Immediately getting out my screwdriver, I began tweaking the RCA's trimmers with great enthusiasm – and soon the signal disappeared into never-never land, whence it never returned.




*I found the little RCA 1AX1 chassis sitting under a flea market table in sadly neglected condition. But it was the same model I'd owned as a kid and it was all there except for the cabinet. So out came my wallet.*

## ◆ Nostalgia and Serendipity

I hadn't thought much about my ill-fated childhood radio as the years passed but one day, five or six years ago, I saw a chassis of that model under someone's table at a radio meet. It was filthy and stripped of tubes. Also, the line cord was cut off – a sure sign that the radio had NOT been retired in working condition. But once I spotted it I had to have it, and I don't suppose it cost me more than a buck or two.

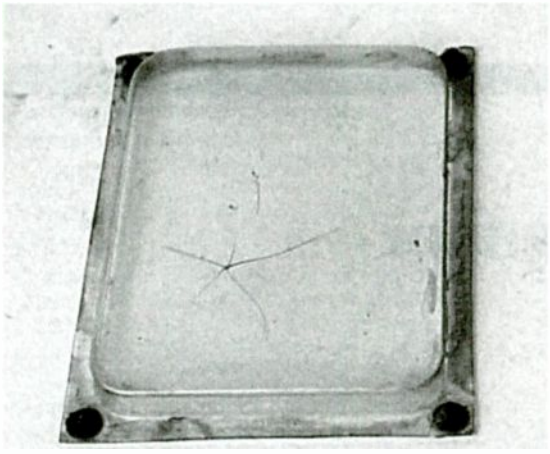
Examining it at home, I realized that – sad looking though it was – all of the parts were there and the radio had not been messed with electrically. I put it aside thinking that I would undertake a restoration if I ever found the proper cabinet for it. And that's just what happened at last year's Antique Radio Club of Illinois big late-summer meet! I sitting at a seller's table that I was sharing with a friend when I happened to look up at a table across the way. Out in plain sight was not just one, but a pair of the unmistakably correct cabinets!

Prior to seeing those cabinets, I wouldn't have been able to draw you a picture of the one I was looking for – but once I spotted them I knew they were correct. I went over and looked, and sure enough the cabinets were RCA models. I immediately produced the required five bucks and made one of them my own. Later, at home, I was gratified to find that my acquisition fit the radio perfectly – and another restoration project was born!

It's probably no news to you many of us are drawn to these old sets because they can be doorways through which we can go to revisit the past. A little more subtle form of attraction is the opportunity to exercise serendipity – or the art of acquiring needed items, sometimes in unlikely places, by being sharp-eyed and alert. It's really a trip when a part needed to complete a restoration turns up suddenly after a long dry spell!

## ◆ Now for the Detective Work

Studying the tube layout pasted to the bot-



***The cracked and discolored dial window was removed from the cabinet, taking great care not to lose the tiny "press-in" fasteners.***

tom of the cabinet, I could see immediately that, even though it was the correct style and fit for my radio, this cabinet had originally housed a different model. That model used the "All-American" five series of tubes, but also had a ballast tube (or plug-in resistor). My set (as well as the one I remembered) had sockets only for the five tubes. An i.f. transformer was mounted in the spot where the ballast socket would have been. And there was an unused chassis cutout next to the speaker that would have accommodated the transformer had the space it now occupied been needed for the extra tube socket. In fact, the transformer was shown in that position on the chart that came with my cabinet.

Looking up the model number (46X1) shown on the tube layout chart, I studied the Rider's schematic with interest. I couldn't imagine why ballast (normally needed to make up a voltage drop deficit in a series tube heater string that is connected directly across the line) would be needed with an "All American Five" tube set. The voltages of the heaters in this set add up to 121, a good match for standard line voltage.

It turned out that the ballast had been installed only to provide voltage drop to run the pilot light! Normally voltage for the light is taken from a tap on the 35Z5 filament provided for that purpose. But on this radio the tap was left hanging, unused! I sure can't understand why a fairly expensive part like a ballast would have been installed when it wasn't needed!

But if my radio wasn't a 46X1, just what model was it? As it happens, I've just received review copies of the latest additions to Mark Stein's 4-volume set *The Complete Price Guide to Antique Radios: Table Top Radios.* This valuable series contains thumbnail-sized photos and estimates of value for thousands of table models made, roughly, during the period 1930 through 1960. A formal review of the four Stein books will appear in an upcoming "Radio Restorations" column. But if you'd like to know more about them now, I'd suggest a visit to Mark's web site at **http://www.radiomania.com**.

I immediately began to thumb through the RCA sections and soon came upon another RCA model in the identical Brown Bakelite cabinet. It was identified as the Model 1AX1. An ivory-cabinet version was known as the Model 1AX2. The service data for the 1AX1 (or 2)was in the same Rider's volume (XII) as that for the 46X1 – which was handy. Looking at the schematic, I saw that it matched my radio. There was no ballast; the pilot light operated off the 35Z5 heater tap in normal fashion. Bingo!

And that brings me to another facet of the "human" satisfactions offered by radio collecting and restoration – the fun of doing detective work. Tracing the lineage of an unidentified set can not only be engrossing in its own right, but also deepen one's knowledge of the process of evolution and change in radio design. Someday I hope to find out why RCA engineers decided to wire in that unnecessary pilot light ballast!

## On to the Workbench!

It took only a few minutes to assess the physical problems of the little RCA radio chassis. The most obvious were the overall coating of gummy dirt and the missing tubes and pilot light. Also, and this is perhaps a small point, the cardboard backing supporting the loop antenna was warped so that it no longer stood up straight. Then I noted that the speaker cone was torn and the paper also seemed very fragile – quite dried out, I suppose.

Examining the speaker a little more closely, I tried gently pushing in on the voice coil at the apex of the cone. It seemed to be rubbing a little, bringing up the possibility that it might have to be recentered. Ordinarily, I would simply remove such a problem speaker and replace it with one of the same size. But this speaker was a "dynamic" one – the first we have run into so far. Such speakers have an electromagnet wired into the radio's power supply circuit instead of a permanent magnet.

An exact replacement for a dynamic speaker is difficult or impossible to find. In the first place, the use of such speakers in small table radios was quite limited; it went on for just a few years before the less expensive permanent magnet ("PM") units were developed. So there aren't that many loose ones around.

Not only that, the field coil of a dynamic speaker doubled as a choke coil for the power supply. The field coil of a replacement speaker would have to have exactly the same d.c. resistance as the original or the radio's plate and screen voltages would be incorrect. Unfortunately there was little standardization of this value, so even if one was lucky enough to find a replacement dynamic speaker of the right physical size, it probably would not have the correct field coil resistance.

Dynamic speakers can be replaced by PM speakers if the lacking field coil is replaced in the power supply circuit by a power resistor of the correct resistance value. But I didn't like the idea of thereby bastardizing the radio and losing what is really a fairly rare feature. I decided to do my best to save the original unit.

My newly-acquired cabinet also had a few problems. Thankfully, there were no cracks or chips, but the surface of the Bakelite was dull and scuffed here and there. Also, the plastic dial window was yellowed and broken. Of course my empty cabinet had no back cover – which is an essential feature, considering the shock hazards presented by the bare chassis of an a.c.-d.c. radio. But even complete radios of this type are often found without their covers, which were made of a cardboard material that broke easily and usually didn't outlast the first couple of tube changes.

Checking the Internet for a source of replacement dial windows, I found that Bill Turner of 1117 Pike St., St. Charles, Mo. 63301 (636-949-2210; *dialcover@wbtv.net*) would make and supply one for $14.00 postpaid. He works from a tracing of the dial window opening. I sent one along with a check and received the replacement with lightning speed, almost by return mail.

I also did some reading about the refurbishing of Bakelite cabinets. Bakelite is really funny stuff. It seems to be very hard and tough, and up to a point this is true. In fact, the material is so dense that it is almost impossible to repair cracks by gluing them. Yet the beautiful polished surface one sees on mint sets is really somewhat fragile.

Next time we'll talk about how this surface was created in manufacture and why one must be careful cleaning it. In the meantime, if you are considering cleaning a Bakelite cabinet, don't even think of using anything stronger than a mild solution of dishwashing detergent (the kind used in sinks, not machines)!

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# Uniden BCT8 Scanner

The Uniden BCT8 is a trunk tracking scanner with features primarily useful to drivers. It is the successor to the BCT7, enhanced with trunk tracking capabilities, a full numeric keypad, BCT8-to-BCT8 cloning, and the ability to be controlled or configured by a computer.

The BCT8 provides 250 user programmable channels. Like some of the other Uniden models, there is a service search capability.

What sets the BCT8 apart from other models is that the BCT8 comes preprogrammed with frequencies specific to each state (Hawaii excepted) and an alert feature which emits a beep and flashes a red lamp when activity is detected on a police mobile extender frequency. The latter is a clue that a police vehicle is nearby.

## ❖ What You Get

Though the BCT8 is chiefly a mobile scanner, it comes equipped for tabletop usage, too. A 117 VAC wall wart power supply comes standard and two mobile DC cords.

One mobile cord plugs in the cigarette lighter and the other has bare wire leads which can be connected to a 12 VDC power source. Oddly, a mobile mounting bracket is not included. As the owner's manual indicates, an MB-007 mobile bracket is available and must be ordered separately.

The BCT8 employs a BNC antenna connector on the rear panel and the radio is furnished with a telescoping antenna as well as a suction cup wire antenna for use inside a window or windshield.

## ❖ Frequency Coverage

BCT8 frequency coverage includes Citizens Band, the 10 and 6 meter ham bands, commercial aircraft, and the more common land mobile bands. UHF military air, television, FM broadcast, and the 72 MHz bands are not included.

The radio coerces VHF-high frequencies to the nearest 5 kHz step, which doesn't account for federal government assignments. For instance, the BCT8 rounds off the 165.2375 MHz US Customs frequency to 165.2400 MHz.

## ❖ Memory and Modes

For scanning conventional systems, the BCT8 provides 250 user programmable channels in 5 banks of 50 channels each. The numeric keypad makes frequency entry much easier than on Uniden's other highway scanners. A per-channel rescan delay is available. One channel per bank may be designated as a priority channel.

The BCT8 supports a variety of trunked systems:

Motorola Type II 800 MHz, VHF-high band, and UHF
Motorola Type I and hybrid
EDACS wide band 9600 baud
EDACS SCAT
LTR

Only one trunked system may be programmed per bank, so the radio accommodates up to five trunked systems at a time. Each bank supports five talk group ID lists of 10 IDs each, for a total of 50 talk groups per system.

## ❖ Scanning and Searching

Memory scanning works in the BCT8 like it does in most other models. You can scan through five private banks of memories and lock out both banks and individual channels so they are skipped.

In addition, you can enable the preprogrammed highway frequency bank during the scan operation, permitting you to scan a mixture of both highway and personally programmed frequencies.

More general purpose scanners provide a limit search which permits the user to program a lower and upper frequency limit and search between them. While the BCT8 does not support a general purpose limit search, it does provide a restricted band search. The band search employs a fixed step size and mode and fixed frequency limits to search any one of these bands: 25 - 28, 28 - 30, 30 - 50, 50 - 54, 108 - 137, 144 - 148, 148 - 174, 400 - 420, 450 - 470, 470 - 512, and 806 - 956 MHz (excluding the cellular phone bands).

Service Search hunts through banks of preprogrammed frequencies. You may choose from these service banks: local police and county sheriff, fire and emergency medical service, news media, weather, citizens band, civilian air band (excluding the 108 - 117.9875 MHz navigation frequencies), railroad, marine band, and government transportation.

Perhaps future models might include FRS and MURS service search banks, but the BCT8 does not.

The BCT8 displays both channel designations and frequencies when receiving a signal during citizens band, railroad, and marine band service search.

A Hold/Resume button permits pausing on a frequency or talk group during searches and while memory scanning. The Data Skip feature tries to recognize nonvoice signals and ignore them after a brief delay while scanning or searching.

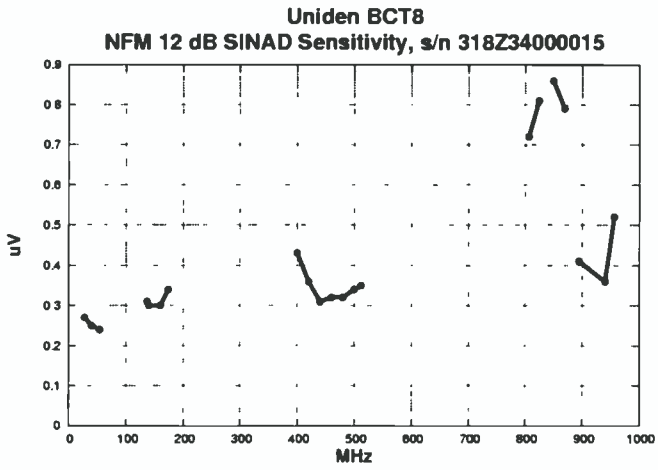

## ❖ Owner's Manual

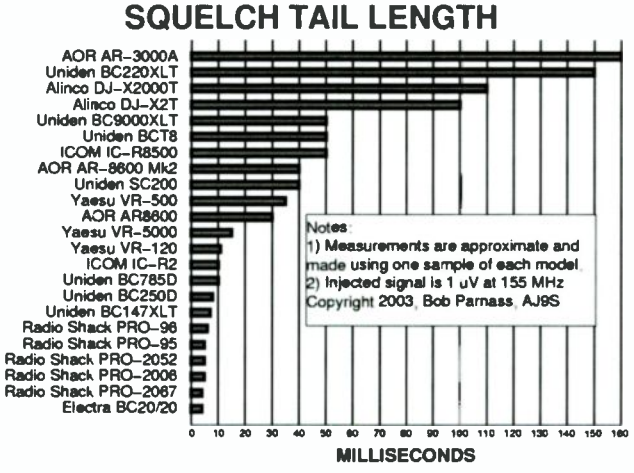
The BCT8 owner's manual provides enough information to operate the scanner. Two separate frequency booklets are included with the scanner, but there is no accounting of exactly which frequencies are preprogrammed into the BCT8.

The specifications section is minimal and fails to provide the intermediate frequencies, sensitivity, and other performance figures.

## ❖ Performance

The audio from our borrowed BCT8 (serial number 318Z34000015) is crisp and clear. We measure about 1.6 watts




## MEASUREMENTS

Uniden BCT8 Scanner
S/N 318Z34000015
List price $319.95
Uniden America Corp.
4700 Amon Carter Blvd.
Fort Worth, TX 76155
tel. (800) 554-3988
**http://www.uniden.com**

**Frequency coverage (MHz):**
25 - 54
108 - 174
400 - 512
806 - 823.9875
849.0125 - 868.9875
894.0125 - 956

**Step sizes (kHz):**
fixed, not user selectable

**Modes:**
AM, NFM, not user selectable
NFM modulation acceptance: 13 kHz

**Audio output:** 1.6 watts into 8 ohms @ 10% distortion

**Attenuator:** none

**Image Rejection Due to 1st IF (380.7 MHz):**
46 dB @ 40 MHz
41 dB @ 155 MHz
45 dB @ 460 MHz
45 dB @ 860 MHz

**Squelch tail near threshhold**
(1 uV @ 155 MHz): 50 ms.

at 10% distortion into an 8 ohm resistive load connected to the external speaker jack.

There is a 50 millisecond squelch tail (noise burst) the squelch control is set at its threshold. We prefer a shorter tail. The burst becomes shorter as the squelch control is tightened, though our BCT8 requires a correspondingly stronger signal to open the tighter squelch.

The BCT8 uses triple up conversion circuitry and has over 40 dB of image rejection – adequate for mobile use.

Interference from a 162.4 MHz NWR transmission can be heard on various VHF-high band frequencies, which is true for most of the other Uniden scanners we review.

### ❖ Software

The BCT8 is furnished with limited version programming software on a single CDROM. The software requires Microsoft Windows and we didn't try it. Uniden says the supplied software will run only in "Demo mode," restricting access to only the first memory bank unless you register the software with Uniden.

You can enable more features in the software by ordering a software key from the Uniden web site. Uniden will provide you the information required to activate the additional functionality.

### ❖ Other Observations

Unlike the Radio Shack PRO-2067 mobile scanner (Sept. 2000 *MT*), the BCT8's keypad is well lit. This is vital for use in a dark car.

The ribbed volume and squelch knobs are easy to grip, though they feel a little loose.

We prefer the BCT8's metal clamshell cabinet to the plastic cabinet on some earlier mobile scanners, like the Relm MS200.

### ❖ Overall

The BCT8 is targeted for mobile scanning. Therefore, a mobile mounting bracket should be included with the radio instead of an extra cost option.

We were impressed with the BCT8. It doesn't have text labels, CTCSS and DCS squelch like the upscale models. But, the BCT8 is a good radio for mobile use and its preprogrammed frequencies make it a good choice for a newcomer.

*The Uniden BCT8 is available from Grove Enterprises for $189.95. Call 800-438-8155 or visit http://www.grove-ent.com*

*Outer Limits continued from page 69*

reminding us that Christmas, New Years, and other holidays are good times to check for pirates. (Uses *oldturkeyradio@yahoo.com* e-mail)

**Radio Free Speech-** Bill O. Rights has been back on the air with his advocacy for individual freedoms, of course including the right to operate pirate transmitters. (Blue Ridge Summit)

**Ragnar Radio-** Last month we mentioned that this one sometimes features country music. But, no sooner was the ink dry on last month's *MT*, that they switched to rock music formats for the rest of 2003. (Uses *rangarradio@yahoo.com* e-mail)

**Undercover Radio-** Dr. Benway, "broadcasting from the middle of nowhere," has been adding more of a rock music emphasis to his shows lately. (Merlin and *undercoverradio@mail.com* e-mail)

**Voodoo Radio-** Although this one is not a new pirate, its rock music is back on the pirate bands despite its very sporadic schedule. (Elkhorn)

**Voice of Captain Ron Shortwave-** Captain Ron normally features rock music, with comedy sketches from time to time. (Uses *Captainron6955@hotmail.com* e-mail)

**WHYP-** This memorial station for James Brownyard's licensed North East, PA, operation memorial station continues its programming mix of rock music, comedy sketches, and pirate radio commentary. (Providence)

**WMPR-** This now veteran pirate remains active with a "dance party" format of techno rock music. (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 69, Elkhom, NE 68022; PO Box 109, Blue Ridge Summit, PA 17214; and Box 159, Santiago 14, Chile. Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletins for sending 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**.

### ❖ 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: Dave Balint, Wooster, OH; Kirk Baxter, North Canton, OH; Artie Bigley, Columbus, OH; Cachito, Santiago, Chile; Ross Comeau, Andover, MA; Rich D'Angelo, Wyomissing, PA; Brian Duddy, Nyack, NY; Virginia Enzor, Cary, NC; Harold Frodge, Midland, MI; William Hassig, Mount Prospect, IL; Harry Helms, Las Vegas, NV; Chris Lobdell, Stoneham, MA; Greg Majewski, Oakdale, CT; Larry Magne, Penn's Park, PA; Bill McClintock, Wellington, OH; Mark Morgan, Cincinnati, OH; Adrian Peterson, Indianapolis, IN; Mike Prindle, New Suffolk, NY; Lee Reynolds, Lempster, NH; Fred Roberts, Hamburg, Germany; Robert Ross, London, Ontario; Martin Schoech, Merseburg, Germany; John Sedlacek, Omaha, NE; Ronnie Stroup, Wooster, OH; Niel Wolfish, Toronto, Ontario; and Joe Wood, Gray, TN.

John Catalano, PhD
johncatalano@monitoringtimes.com

# Hands-On DRM Monitoring - Part 4

## Wrap Up and Summary

The past few months we have looked at the new emerging digital radio modulation method, DRM, Digital Radio Mondiale. To be fair, we must keep in mind that as a new technology, DRM is a work in progress. This is the case with all new technologies. To jog your memory just think back to how poorly behaved Windows 3.1 was as compared to Windows 98 SE. Enough said.

Let's do a quick summary of the DRM topics we have covered in this series of articles.

**Who is DRM?** The group of companies, which comprise the DRM consortium include: Atmel ES2, British Broadcasting Corporation, Deutsche Welle, Hitachi Kokusai, Harris Broadcast, JVC Victor Company of Japan, Merlin Communications International Ltd, Nippon Hoso Kyokai (NHK), Radio(s) Canada, France, Netherlands, Sweden, Vatican, Sangean America, Sony, Telefunken and Thales. This list is by no means complete. Check their website at **http://www.drm.org** for more information concerning members.

**DRM Data Structure:** We have taken a broad look at the data structure of a DRM signal and its generation. The DRM Standard paper files with ETSI (the European Telecommunications Standards Institute **http://www.etsi.org**) provides a detailed description of the DRM signal including the data structure.

A DRM signal consists of three channels: the Main Service Channel (MSC), the Fast Access Channel (FAC), and the Service Description Channel (SDC). Figure 1 provides an overview of the encoding process as discussed in the *Computers & Radio* columns of November and December 2003. With lots of processes being performed in during DRM signal encoding you can see why takes a Pentium computer running at 500MHz do the decoding job!

**Benefits & Claims:** According to the official DRM website, some of the benefits of DRM are:

1. FM-like sound quality with the reach of AM;
2. Improved reception quality;
3. Flexible use of radio, whenever and wherever you want it;
4. No change to existing listening habits: same frequencies, listening conditions (fixed, portable and mobile radio) and listening environment (indoors, in cities, in dense forests);
5. Low cost receiver, low energy consumption;
6. Easy tuning with selection by frequency, station name or program;
7. Wide receiver range with more and better features.

Have we found these benefits to be reality at this time? Read on...

## Hardware Requirements

### Standalone DRM Radio

Although promised to be introduced in late 2003, a self-contained, no-PC-needed, DRM radio is not yet widely commercially available. Therefore, the DRM consortium benefit of "low cost receiver, low energy consumption" is clearly not a reality at this time, at any cost. The only way to receive DRM at this time is using a radio and a DRM software program running on a PC.

### What's a DRM Front End?

What grabs the signal out of the ether and provides an output suitable for the decoding computer is called the "front-end." This front end radio must be frequency stable, have low internally generated noise and provide a 12 kHz output at a level compatible with computer sound card input. So where can I fine a suitable "front end"?

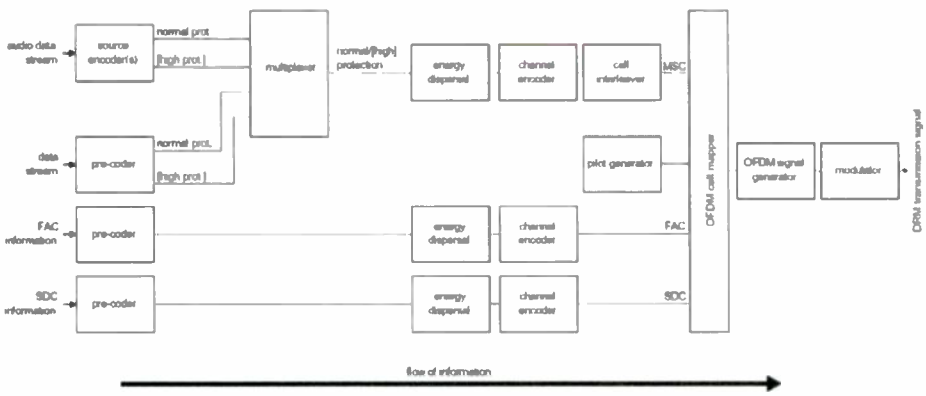



Figure 1: Conceptual DRM transmission block diagram

*Block Diagram of DRM Signal Generation*

### Buy or Modify

The Ten-Tec RX-320 DSP black box PC shortwave receiver has been around since 1998. See **http://www.tentec.com** In my opinion, it was excellent value for money then at around $320 and in the used radio-market it's an even better value. With a good outdoor antenna its shortwave performance is outstanding for any type shortwave listening: broadcast, utility, digital modes and DRM.

For use as a DRM front end, the original RX-320 must be modified to provide the required 12 kHz intermediate frequency (IF) output. Ten-Tec will modify any RX-320 to give it the required DRM 12 kHz output (RX-320D) for $47 including return shipping in the continental USA. See their website for more information at **http://www.tentec.com/TT320.htm**

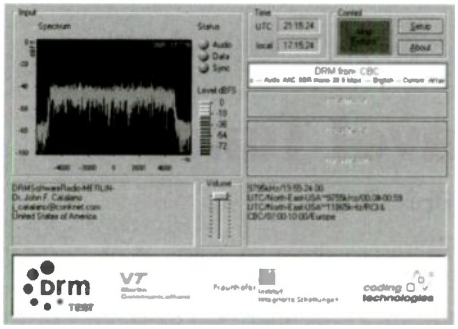
Alternatively, if your receiver meets the initial criteria, as does the RX-320, you can build a small printed circuit board (PCB) that converts your radio's existing 455 kHz intermediate frequency output into the 12 kHz required by the DRM software. A PCB is available from a number of sources. Try looking on **http://home.t-online.de/home/sat-service/sat/DRM/DRM.html**

For do-it-yourselfers (also known as homebrewers) modification details for a number of receivers can be found at **http://www.drmrx.org/receiver_mods.html** At this site you'll find modification details for ICOM IC756, Kenwood R1000, Grundig Yacht Boy400, JRC NRD 525, Yaesu FRG-100, Yaesu FRG-8800, AKD Target HF3, AOR 7030, Sony ICF-SW77, AR 3030, Sangean ATS-803A, Lowe HF225, Ten Tec RX350 and even a DRM Car Receiver.

For most of us the Ten-Tec RX-320 provides the lowest risk, cost-effective route to DRM reception, while providing good quality general shortwave capabilities.

## The DRM Software

The official DRM software requires as a minimum a 500 MHz Pentium computer with 64 MB RAM, 50 MB free hard drive space, with a DRM compatible 16-bit soundcard running Windows 98, 2000 or XP. The software is available from VT Merlin Communications at



*Computer Screen Receiving DRM Canada Broadcasting Corporation's Radio Canada International Current Affairs Program*

**http://www.drmrx.org/** for 60 Euros. It is *very* important that you see their website for details on the soundcard compatibility!

The only connection you need is between the 12 kHz receiver output and the soundcard input of your PC, as in Figure 2 taken from the DRM software manual. If all goes well you will hear beautifully clear audio and see station and programming data scrolling across your screen as shown in Figure 3. Clearly the DRM goals of " FM sound quality audio ....and ... Easy tuning with selection by frequency, station name or program ..." have been met very successfully and impressively!

## The Rest of the Story

Be aware that I had a very difficult time getting to this point of DRM reception! My first computer, a laptop, although having all the required hardware, would not do the job. That turned out to be an incompatible modem ... I think.

Finally, it took my Pentium III 800MHz games computer to do the job that you see in Figure 3. You may be luckier, but if anyone tells you receiving DRM is like "falling off a log" they may also have a bridge to sell you!

### Why Me?

Was the problem just due to my hardware, location or antenna? In an attempt to answer this question we enlisted the help of a number of DRM-capable listening stations to determine how "finicky" the DRM signal is to propagation/listening location. I had three DRM listening stations spread from the New England to the Mid-Atlantic to the South. All were monitoring RCI transmitting from Sackville on Canada's East Coast at the same time. All stations were registering strong signal strengths of RCI. The New England station (me) could not "lock-in" on the DRM signal. The Mid-Atlantic station was receiving solid DRM. And the Southern monitor also had no "lock-in." A fourth station, less than 5 miles from the Mid-Atlantic station (the only station that was receiving DRM audio and data) could *not* get continuous DRM copy.

However, the next night resulted in excellent DRM audio and data at my location. Nothing had changed at my listening site ...that I know of.

### What's Going On?

My experience has left me with many questions concerning DRM monitoring. They fall into three categories that may be related: propagation, electrical noise and the computer system. To summarize:

**Propagation:** The distance to the transmitter did not appear to be directly related to the results. A few miles of local distance between listening stations seemed to affect the results dramatically.

**RF/Electrical Noise:** There can exist many different interfering noise sources that would have a major effect on receiving DRM. These sources can be local AM (MW) radio stations, power line utility broadcasts and home light dimmers to name a few. Usage and severity will vary greatly from hour to hour.

**Your Computer System** is rich in harmonics, of the CPU clock, RAM/ data bus frequencies, CRT/LCD scans and high-powered switched mode power supply hash. When these mix together the result is wide band noise almost from DC to light. Trying to decode DRM's complex data stream is a challenge in an electrically "quiet" environment. Imagine the problems of a noisy PC environment! This noise will vary greatly from PC to PC.

### Goal ...or Foul?

DRM's stated benefit goals include "...Same listening environment (indoors, in cities, in dense forests) and ...AM reach." I think the above multiple site monitoring results and other considerations show that these goals are desires of the DRM consortium, at best.

Looking back, we have covered lots of DRM ground! But some of your DRM questions still need to be covered.

## Freeware? Yes, But ...

One of the most popular questions I have received is, "Is a freeware version of DRM software available?" As one who is always looking for value, I did some real hard Internet searching for free DRM software. Well, I found only one free DRM program. The people at The University of Darmstadt in Germany have worked since 2001 to produce a DRM program called DREAM.

Now before you get all excited let me say that DREAM's goal is not to replace the fully functional commercial program. Instead its avowed intended purpose is just to enable people to become familiar with DRM monitoring and its digital structure and capabilities.

DREAM version 0.9.3 can be run under Windows or Linux operating systems. We'll just take a quick look at trying to use the Windows version. If you are an experienced Visual C++ 6.0 programmer you should have little problems. However, for the rest of us who do not use Visual C++ everyday, you may think twice.

### Dream or Nightmare

To start with you will need Windows, Microsoft Visual C++ 6.0 with the Service Pack 5 and Trolltech QT 2.X. You will needed to download the DREAM DRM software. Then you'll have to download and create the following libraries: FFTW, QWT and FAAD2. Finally you will have to use some C++ skills in putting together the results into an executable program. After spending a considerable amount of time downloading and creating I must confess that I gave up.

In my opinion, in its present form DREAM version 0.9.3 is just not worth the time and effort for most of us interested in monitoring DRM. However, if you would like to give it a try you can find all the DREAM details at: http://www.tu-darmstadt.de/fb/et/uet/fguet/mitarbeiter/vf/DRM/installation.html

## Digital Radio Today

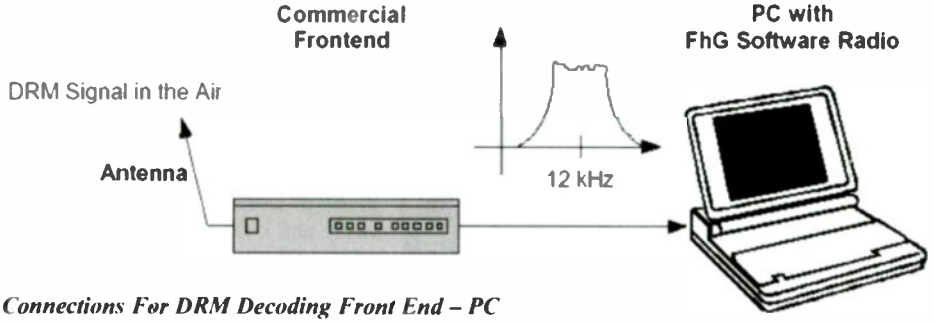
DRM is not the first technology to attempt to reliably broadcast and receive digitized audio and data over shortwave. As long ago as 1993 I was involved with major efforts in digital shortwave technology. None have survived commercially for many of the reasons that we have spoken about this month.

But technology has taken huge leaps in the past few years. What was impossible then is now almost commonplace. DRM may be a prime example with its crystal clear digital audio.

However, one thing may not have changed. As we saw with Windows 3.1, AM stereo and many, many other examples, sometimes overzealous manufacturers try to make an evolving technology a standard before its time. We'll have to watch the development of the very promising DRM technology in fulfilling its declared technical and economic "benefits" during the coming months. Things move fast in the world of technology.

As the Chinese blessing says, "May you live in interesting times." But as the Chinese curse also says, "May you live in interesting times!" The future will tell.

Let me take this time to extend belated January New Years wishes to some of you, on time February New Years wishes to others and months early New Years wishes to still others around the world. Happy and peaceful New Year to all.




*Connections For DRM Decoding Front End – PC*

MT REVIEW

# MFJ Travel Tuner

By Bob Grove

The actual function of an "antenna tuner" seems to remain shrouded in mystery for most hobbyists. Most amateur radio operators seem to think it's mandatory for every HF transceiver, and many shortwave listeners are certain that it's the magical answer to improved reception. There is both myth and misunderstanding, but no magic.

These simple inductance/capacitance adjusters are more correctly called "transmission line impedance matching devices" (shortened to "transmatches" by the American Radio Relay League) than "antenna tuners"; they compensate for inductive and capacitance reactance (mismatches) throughout the antenna system – antenna, transmission line and all – not just the antenna.

The main purpose served by the transmatch is to adjustably cancel these reactances to provide an efficient transfer of power from the transmitter to the antenna without the losses caused by impedance mismatches which produce high voltages on the transmission line along the way. These periodic high and low voltage points exhibited by standing waves are measured as a ratio (VSWR, often shortened to SWR).

Theoretically, in a lossless antenna system, the SWR wouldn't matter, but the practical fact remains that some transmitted power does leak across the insulation in the coax, dissipating as heat, and the higher the voltage, the more power loss.

In addition, transistors are vulnerable to burnout from high voltages, much more so than the old vacuum-tube circuits. This is why modern transceivers invoke automatic power reduction when high SWR is detected.

## How About Receivers?

Shortwave receivers aren't concerned with transmitted power, so do they need transmatches? Generally not. Modern receivers are very sensitive, limited in weak-signal detection only by the accompanying atmospheric noise and co-channel interference. The bigger the antenna, the stronger the signal *and interference* levels.

In nearly all shortwave receiving applications where an external antenna is attached to the receiver, although a signal-strength meter may show higher readings as the tuner is peaked to frequency, this peak is due to a proportionate increase in noise right along with signal. There is no improvement in signal *over* the noise.

But there are exceptions. It is possible for low-cost receivers with poor RF selectivity and dynamic range, such as portables, to benefit from a transmatch when used with an externally-connected antenna. This is because a such a tuner acts as a frequency-selectable RF stage, reducing off-frequency, strong-signal interference from IF images, intermodulation and desensitization, allowing improved weak-signal reception.

## Enter the new MFJ-902 Travel Tuner

MFJ Enterprises is renowned for their low-cost, hobby-radio accessories. Recently they released a transmatch particularly well-suited for compact fixed, portable, backpack and mobile transceivers in the amateur, commercial, experimental, government and military radio services.

With a frequency range of 3.5-30 MHz (80-10 meters) and a power limit of 150 watts, this transmatch works with virtually any high-frequency transceiver on the market. It can be used with coax-fed or random-wire antennas. Although it doesn't have a meter for VSWR adjustment, most modern rigs have, making such an indicator often redundant and unnecessary.

Architecturally, the 902 is a tried and proven L/C "Tee" network. It utilizes a tapped inductor wound on a 3-toroid stack and a pair of 322 pF air-variable capacitors with porcelain insulators. Two SO-239 female connectors on the rear panel invite interconnection to standard PL-259 fixtures. A banana pin plug is included for random-wire applications. A slide switch permits the tuner to be bypassed for direct antenna feed from the radio.

## Let's Try it Out

Connecting the 902 to my Yaesu FT-100D transceiver was easy – a short PL259/PL259 jumper from the tuner to the rig, and the antenna cable to the tuner, and I was ready to go.

But I couldn't detect any difference in tuning, and there was a tell-tale scratching sound coming through the speaker as I rotated a control. Removing the two cabinet screws and lifting the cover, I confirmed my suspicions.


Several plates of a variable capacitor were rubbing together; a wire passing by a soldering lug had been prepared for soldering, but never was; and a tuning knob was slipping on its shaft.

Since no schematic diagram was provided, I had to experiment with and without a shorting clip to be sure the wire was supposed to be soldered to its nearby lug. I know that new products are often prone to initial manufacturing bugs, so I decided to repair the unit myself as a "getting acquainted" experience.

After resetting the bent plates, soldering the ground wire, and filing a flat on the tuning shaft so the set screw could be tightened, I was ready to go.

## How Well did it Work?

It worked very well. The accompanying instructions make adjustments easy, and maximizing my rig's power with the tuner's controls was simple. An excursion across the HF spectrum showed that the tuner worked effectively on a test antenna from 2-30 MHz; it is not designed to work on 160 meters (1.8-2.0 MHz), and it doesn't.

One of the most common criticisms of tuners is their internal resistances; after all, you want all the power to reach the

antenna, not wasted heating the components. In both the bypass and operational modes, the 902 adds less than 0.1 ohms to the path, not much since the series impedance of the antenna system is nominally 50 ohms.

Heavy gauge wire on the toroid coil is a good sign, but will it make a noticeable difference to the RF path in terms of efficient power transfer? We decided to construct a simple test instrument consisting of a 100 watt light bulb to be used as a dummy load, and a metered photocell to read its brightness.

Were there internal resonances that could sap power from the line? Not according to our measurements. The meter registered identical brightness throughout the 2-30 MHz spectrum with the transmitter delivering the same output wattage.

### Applications

I'm already envisioning taking this transmatch along with my FT-100D on my next vacation. It would be an invaluable asset for QRP or full-transceiver output into random-wire motel antennas or even electrically-short mobile and portable whips. Tiny enough to hold in your hand (4-1/2"W x 2-1/4"H x 3"D), it can be stowed in a briefcase or backpack with ease.

MFJ-902, $69.95 plus shipping from MFJ Enterprises, PO Box 494, Mississippi State, MS 39762; 800-647-1800; **http://www.mfjenterprises.com**

# The PowerPort GearHarness

By T.J. "Skip" Arey N2EI

Those of you who have followed my writings in the *On The Ham Bands* column and my previous work with *MT's Beginner's Corner* know that I participate in the radio hobby from DC to Daylight. This is both a blessing and a curse.

I have any number of radios, many of them portable and handheld types, that allow me to listen in on just about anything in the radio frequency spectrum and talk on all the frequencies that I can legally operate on as a ham. However, in doing this, you run up against a unique law of diminishing returns: That being, the more radios you hang on your belt, the more likely your pants are going to fall down! My waistline is good for two medium sized handhelds and then I need to start holding things up with suspenders or something.

When operating in extreme conditions such as search and rescue work, I've even used surplus military Load Bearing Equipment (LBE). You do this for a while and you start to mutter under your breath..."if they can put a man on the moon... why can't they come up with a better way to carry radios."

Well, I am here to tell you that a significantly better way to carry radios and radio gear has come along in the form of:

The PowerPort GearHarness
$36.95
Cutting Edge Enterprises
130 Anacapa Circle
San Luis Obispo, CA 93405
1-800-206-0115
http://www.powerportstore.com

The Powerpoint GearHarness appeared on my Holiday Wish List in the November 2003 issue of *MT*. Since that time I have had the opportunity to take The GearHarness out to every activity short of a parachute jump (I'm working on it) and found it to exceed my every expectation for radio adventure.

This lightweight and durable harness has three pockets. One is in the back and the other two are in the front. There are also two vertical pockets that have multiple uses depending on the activity. Along the bottom, one large zippered pocket runs the entire width of the front of the harness for stowing larger items.

The harness also has multiple connecting points for accessories. The GearHarness has a heavy duty nylon exterior with foam padding and a mesh back for ventilation.

I took mine out of the box and started stuffing radios into it just to see how things might go. It didn't take very long for me to come up with the "hot setup" for my kind of tactical radio operation under extreme conditions.

In the "over the shoulder" pocket I placed my Uniden Bearcat Trunk Tracker handheld that runs constantly with the requisite public service frequencies I monitor during a typical ARES/RACES activity. In some instances I might swap this radio out in favor of an AOR-8000. After all, it's important to keep one ear on what's going on around you.

This radio fed a small speaker that I clipped to one of the three front "snap" tabs. Right below this on the second "snap" tab, I mounted my diminutive Icom R2 that I usually set up for any special frequency monitoring the activity might require above and beyond what the Bearcat or AOR 8K is keeping track of (eg. Marine or Railroad frequencies). Having these other signals coming out of a different radio alerts me to their overall importance better than any priority channel setting.

Finally, in the lower right front pocket I place my main tactical rig, a Yaesu RD-50 feeding either a speaker/mike or headset depending on how free I need to keep my hands. I set the RD-50 up with a longer, non-standard antenna that goes under the lower "snap" tab to keep it out of mischief.

In the left front pocket I loaded a small first aid kit, a few "glow sticks" for evening operations and my Gerber Multi-Tool. The large zippered pocket got filled with tactical maps, emergency service SOPs a few pens and a notepad. I've still got enough room for spare battery packs if the situation warrants it.

With this setup I am able to carry significantly more radio gear that I was ever able to hang off my belt. Further, I am able to carry it in a safe and balanced way that does not restrict my freedom of movement at all. (Perhaps most importantly, I can use the on site sanitary facilities without worrying about one of my radios doing the deep six into a port-a-pottie. That simple bit of insurance more than covers the cost of the GearHarness.)

So far I have used the GearHarness on a number of emergency service drills, hiking, bicycling, light climbing, and working on ladders and roofs. The ability to have all of your radio gear at hand and yet safely out of the way cannot be underestimated. The GearHarness is tactical radio done right!

# How's That Thing Really Work, Anyway ?

# Receivers

By Carl Herbert, AA2JZ

At a recently attended club meeting, a newly licensed operator confided in me: Yes, I passed the test, but I haven't any idea how any of this stuff works! I just memorized enough to get through the test and get my license. Sound familiar to any of you out there?

The neophyte radio amateur had spent hours studying the license manual, practicing the exams, to finally complete the process and gain his or her ticket to proudly display on the wall. This is great! One more member enters the hobby.

But there's a problem here! Many (and some longer licensed hams) haven't a clue as to how their gear performs the functions that it does. This article isn't intended to replace the countless tomes available that teach the engineering functions from the ground up. It's merely an overview of the basic sections of a piece of equipment, how they interact with each other to produce the desired result after turning on the switch. Knowledge is gained one segment at a time. I hope this segment encourages you to further your knowledge in electronics. If not, you should at least have a basic understanding of how a receiver works.

I chose to begin with a receiver. No particular reason, it was the first piece of gear that came to mind. When telling you about a circuit or function, I will try to stay away from the engineering facts that all equipment are built from, and attempt to explain the subject without a lot of technical jargon. My goal is to have you be able to visualize the happenings within your equipment sections, not to design the circuits. You can add all this knowledge to your storage bank later as you gain experience in the hobby. For now, just understanding the basic ideas of how a system works is OK.

## Block Diagrams

Let's begin with a very basic *block diagram* of a receiver. Block diagrams are great because they represent circuits and paths for signal flow. The actual circuit components, their values, and how they are connected, are described in a *schematic*. We won't deal with schematics here. Block diagrams show direction or the logical path followed to achieve results. They also present an easy to understand overview of the device being described. This process will become evident as we progress.

To help you understand how the receiver works we should have a typical example. Let's suppose that we would like to listen to the 80 Meter band, say from 3.500 MHz to 4.00 MHz. While exploring the lower end of the band, we hear AB2AF, Arthur, sending CW on 3.550 MHz. We know what frequency his transmitter is on because the frequency is marked on the front panel of our receiver or the digital readout indicates that frequency. But how does a signal being generated far above the audio spectrum, become transformed to the range usable by our human hearing?

Block A, is the starting point of a receiver. It is the RF INPUT circuit and is connected to the antenna. It is composed of circuits tuned to the desired range of frequencies we wish to receive. By tuned, we mean that the signals passing through coil and capacitor networks are those between 3.500 and 4.00 MHz.

There are often two or three sets of coils and capacitors ganged or joined together to proved the bandpass desired. This is accomplished by having the values of each coil/capacitor pair slightly different from each other. Other frequencies are blocked or tuned out, and aren't passed through the network. The receive antenna is connected to the input side and the away side, or output is connected to the MIXER stage.

Having a tuned input is a good thing. While antennas are often designed to receive selected frequencies, they also receive a wide range of other frequencies. These additional frequencies, if allowed to pass, would have a negative effect on the operation of the receiver.

Thus far, the signal we desire to hear has been intercepted by the antenna, passed through a tuned circuit called the RF INPUT, and made available to the input side of a MIXER circuit.

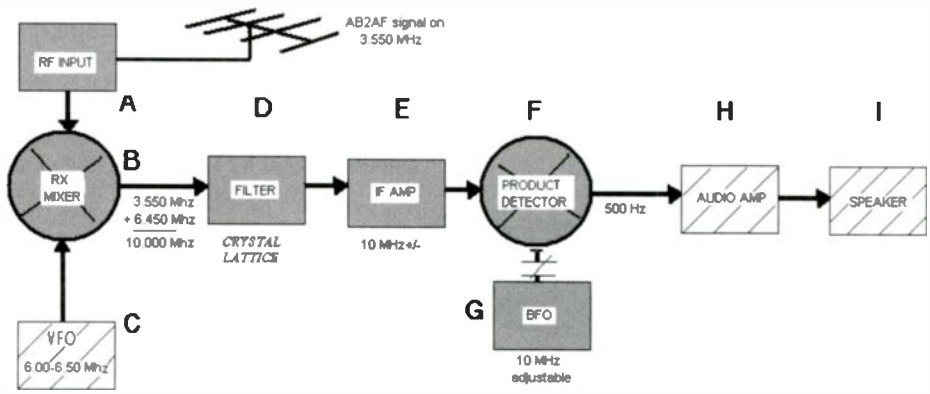
## Mixer Magic!

The output of the RF INPUT circuit is attached to a MIXER stage, shown as Block B. Mixers are commonly identified on a block diagram by a circle with an X through it. The MIXER has two signals feeding it, (1) the frequency we desire to listen to with its variations from being keyed at the transmitter, and, (2) the output from a VARIABLE FREQUENCY OSCILLATOR, Block C.

In the MIXER, these two signals are combined to form an output signal called the INTERMEDIATE FREQUENCY, or I.F. (Blocks D and E) It is the mixer's function to combine these two frequencies and provide a single usable frequency as an output.

Mixers are just what the name implies. They combine frequencies to provide an output. There are four desired output possibilities from a mixer: either of the two originals, and the sum or the difference of the two. For our receiver, we will use an I.F. of 10 MHz. This frequency is commonly used in QRP gear (low powered, often simple receivers and transmitters), and will be explained as we progress through the receiver's circuits.

Arts' signal is being received on 3.550 MHz, is passed through the RF INPUT circuit, and has arrived at the input of the MIXER circuit. The mixer must provide a 10 MHz output to be compatible with the remainder of the receiver. Because the mixer has two input frequencies and one of them is 3.550 MHz, the




A "typical" receiver circuit. The arrows indicate the signal direction.

second frequency is to be supplied by the VARIABLE FEQUENCY OSCILLATOR (VFO), which in our example will be 6.450 MHz. This will enable the mixer to provide a 10 MHz output.

The VFO is a circuit designed to provide a signal to the mixer that is stable, accurate, yet can be varied by the operator. The range of the VFO is carefully selected to enable the mixer to use the frequency to provide an output that will be compatible with the remainder of the receiver's circuits.

For this example, the range of this VFO, to be compatible, will be from 6.000 MHz to 6.500 MHz. Using this range of frequencies from the VFO makes use of what is called the summing principle to achieve the required 10 MHz output. By adding the incoming signal frequency to that of the VFO, the 10 MHz frequency is realized. Your could also use the difference principle, where the VFO would be designed to operate from 13.500 MHz to 14.000 MHz. This would also result in the 10 MHz output needed. Lower frequency VFOs are generally easier to design and operate, and are therefore more commonly used.

Suppose another signal is present on 3.510 MHz – 10 MHz from the low end of the band. You would tune the VFO to 6.490 MHz. The mixer circuit would combine the incoming signal on 3.510 MHz with the VFO signal on 6.490 MHz and provide an output on 10.0 MHz. The output of this receiver's mixer will always be 10 MHz, and have a bandwidth of a few kilohertz above and below the 10 MHz I.F. frequency.

Blocks labeled D and E are the I.F. FILTER and I.F. AMPLIFIER. D contains a bandpass filter designed to allow only the 10 MHz signal provided from the mixer to pass, and E is an amplifier to boost the signal strength. Often the I.F. FILTER is composed of a *crystal lattice network*. This is a series of crystals (in our case 10 MHz) and capacitors selected to allow only the 10 MHz signal to pass. The crystal frequency identifies the center frequency of the filter, while the capacitor values are selected to provide adequate bandwidth of the filter. CW filters are designed to be narrow, in the range of 750 Hz to 1,000 Hz, and SSB filters are in the 2 to 3 kHz range. While the crystals set the frequency that's allowed to pass, the filter will allow frequencies slightly above and below the crystal frequency.

Our signal has now passed through the I.F. FILTER and AMPLIFIER, and is present at the input of the PRODUCT DETECTOR. Block F. It has a new name, but it functions just like the mixer described earlier. It also has two inputs and one output, and can provide one of the four available frequencies as an output. The big difference here is that the PRODUCT DETECTOR is used to mix signals from the BEAT FREQUENCY OSCILLATOR (BFO), labeled Block G, and provides a low level audio output. The BFO works just like the VFO, but with one difference: It provides only one frequency output and is often crystal controlled.

The BFO in our example contains an oscillator circuit using a crystal identical to those used in the crystal lattice filter, 10 MHz. This oscillator output frequency is fed to one of the two inputs of the product detector, and is mixed with the incoming 10 MHz signal from the I.F. Amplifier.

## Hey, Wait Just a Minute !

That's great, you say, but 10 MHz from the I.F. Amplifier and 10 MHz from the BFO gives me the following outputs: 10 MHz, 20 MHz, and zero. Where does the audio part come from?

Easy! Let's tune the BFO slightly off frequency by 500 Hz or so, using the variable trim capacitor in the circuit. Trimmer capacitors could be used to bring an oscillator's output frequency exactly on frequency. But in our case, we will use it to move the output frequency away from the 10 MHz product. Now the outputs from the product detector are 10.000 MHz, 9.9995 MHz, 19.995 MHz and 500 Hz. By using the difference of the two, a 500 Hz output is realized in the audio range, and is usable by the AUDIO AMPLIFIER, Block H that follows.

The process of adjusting stages of a receiver to meet the mathematical requirements of the sections is call the *alignment*. Alignment enables the sections to perform their function, while being acceptable to the remainder of the receiver's circuits.

The audio amplifier section increases the signal to a level great enough to drive the speaker or headphones, enabling the operator to hear the signals. The 500 Hz low level audio is connected to the audio amplifier using a potentiometer (variable resistor) called the volume control. It is often labeled GAIN on the front panel of receivers. Its function is to provide a control for the operator to regulate the amount of low level audio allowed to enter the audio amplifier, creating a comfortable listening level of audio.

Arthur's signal was processed or acted upon mathematically by the receiver's circuits. By careful manipulation of signals and amplification of the resulting products, we can convert a signal from far above the audio range to a sound reproduced by the speaker (!) and easily understood by human hearing.

There are many other circuits that can be incorporated in a receiver to increase its performance. Some of these are audio filters, notch filters, RF amplifiers, AGC (automatic gain control), 'S' meter (signal strength meter), and many, many more. These circuits, while not described here, are used to enhance the operation of the receiver. Add-on circuits are often called the "bells and whistles" of a receiver, and, while they are desirable, the unit could function without them.

*Previously published in 73 Amateur Radio Today Magazine, February 2003*

**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

# How to Survive Any Storm!

*(To the tune of "Bad Boys.") Bad storms! Bad storms! Whatcha gonna do? Whatcha gonna do when they come for you?*

Long-time readers of this column know that your humble correspondent is a huge fan of NOAA weather radio. Most of us get our pockets tapped pretty hard by the government, and one of the best paybacks we get is a network of 480 FM transmitters that broadcast weather information 24-hours a day to fifty states, Puerto Rico, the Virgin Islands, Guam, and Saipan. Seven frequencies are used: 162.550, 162.400, 162.475, 162.425, 162.450, 162.500, and 162.525 MHz. Currently, an estimated 70-80% of the population is within range of a NOAA weather radio station.

If you don't have a weather radio receiver with alert capability in your household, you need one. Having said that, the point is not academic: what *are* you going to do when the alert squawks and you are suddenly informed that Something Bad is about to happen?

Fortunately Warren Faidley has the answer. Faidley is an internationally recognized extreme-weather expert and storm-chasing journalist who has written a new book called *How to Survive Any Storm – Severe Weather Handbook*. Faidley is one of the few people on the planet who has survived both an F-5 tornado and a category 5 hurricane. He habitually puts himself in the path of severe weather to capture images that all of us have seen on TV and in publications.


Before you decide that Faidley is in need of deep counseling and powerful medication: you should know this – he is not a guy with a death wish. Far from it; I have interviewed him, and he strikes me as (a) a very nice and knowledgeable person and (b) a fellow who loves what he does and wants to continue doing it. He's gotten himself into, and out of, more hairy severe weather situations than most of us will see in a lifetime. In short, his credentials for writing *How to Survive Any Storm* are impeccable. In the argot of the street, "He da man!"

*How to Survive Any Storm* (*HSAS*) is a 5.5 inch x 8.5 inch format book that runs 213 pages. It's divided into 25 chapters and five appendices, plus a short biography of Faidley. Chapters include: Storm Warning Systems, Storm Forecasting Data, Pre-Storm Planning, and Evacuations. Chapters five through 17 focus on specific threats: severe thunderstorms, flood and rain storms, lightning, tornados, hurricanes, blizzards, hailstorms, wind, dust, fires and wildfires, storm survival in a vehicle heat waves, and marine weather. The last few chapters cover post-storm survival, civil unrest and disasters, storm survival for kids, pets and storms, storm shelters, weather phobias, storm chasing and photography safety, and storm and disaster supplies and kits.

Unlike Faidley's first book, *Storm Chaser* (published in 1996), *HSAS* is not designed to be a sit-in-your-armchair-and-have-a-comfortable-read kind of book. Instead, HSAS presents a lot of information, often in bulleted form, so that it can be quickly and easily accessed when you need it in a hurry.

Having said that, it does make good reading. This is a book that you want to cruise through once when you get it, and then review relevant parts as, say, the winter storm season, hurricane season, or tornado season comes upon you. When a particular severe weather event is threatening – for example, a hurricane coming up the coast – you'll want to review the chapter on hurricanes, typhoons, tropical storms and cyclones and make sure that you are properly prepared.

The information that Faidley presents is down to earth and practical, and I can virtually guarantee that some of what you read will surprise you. For example, most of us have seen the footage of a family taking refuge from a tornado under a highway overpass. Bad idea! An overpass can actually compress and accelerate the tornadic winds. The family in the video footage got lucky, but don't bet your life on duplicating their experience.

Here's another tip, from the chapter on storm and disaster supplies and kits that could easily be worth a thousand times what the book costs: "For insurance or theft purposes, videotape or photograph all valuables and store a copy in a back vault or other safe location away from your home." It won't save your life, but if a disaster destroys your home, you'll be able to document what you lost.

Bottom line, *How to Survive Any Storm* is absolutely jam-packed with information you need, because if you live on planet Earth, sooner or later severe weather will be coming to your neighborhood. I give this book my highest personal recommendation: it is a must-have.

You can get a copy by sending a check or money order for $16.50 plus $4.00 shipping to: Weatherstock, c/o Book Orders, PO Box 31808, Tucson, AZ 85751 or visit **http://www.stormchaser.com/bookorderform.html.**

***Law, continued from page 8***

case. However, the Judge on the case did not feel comfortable with a verbal dismissal.

Although New York law allows a Court to affirmatively dismiss a case just on the verbal authorization of a prosecutor or the Court's own recognition that no law was violated, Judge Hallett preferred that a record was made of how and why the case was dismissed. He directed the parties to provide him with a formal request for dismissal for him to rule on. Terry filed her request and a supporting seven page affidavit the next month.

In it she cited several reasons why the law did not apply to Richard Lalone or the facts of this case. In addition to her argument that the state law did not apply here, Terry reminded the Court that federal law preempts the New York law in these types of matters.

### ◆ Vindication

On August 5th, Judge John Hallett issued the decision of the Court dismissing the charge against Richard Lalone. In his opinion Judge Hallett noted that Section 397, the law controlling possession of radios that can receive radio signals used by the police in New York, "is probably the most poorly drafted section of the Vehicle and Traffic Law." Judge Hallett also took note of the "the exemplary service amateur radio operators have provided to the citizens of Jefferson County [where the case took place], notably during the microburst of 1995, the ice storm of 1998 and the terrorist attacks of 2001."

After months, the charges hanging over Richard Lalone were gone. His case underscores a simple, but important point that is often mentioned when "possession of a radio that can receive radio signals used by the police" is an issue. *If you are in an excluded class because you have a permit or federal license, carry a copy of the complete law in your vehicle in addition to a copy of your permit or license.*

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# What's NEW

**Tell them you saw it in Monitoring Times**

## New Tricks on the PRO-96

Thanks to a tip from Richard Newbould, *MT* learned that the Win96 scanner software for the Pro-96 written by Don Starr can open up nearly every frequency from 17.0-1300 MHz in this radio for reception! In Version 1.25 of the Win96 software, Don added an "extended frequencies" option which seems to enable some sort of hidden test mode that allows reception of the frequency ranges below. Frequencies are sent from Win96, or can be entered directly on the scanner's keypad (including in SR6 - Limit Search).

Some ranges (including cellular) still appear to be "blocked" by the scanner. Here are the ranges that seem to be "opened" using this feature in the software above:

17 - 25 MHz
54 - 108 MHz
225 - 406 MHz
512 - 550 MHz
764 - 806 MHz
960 - 1240 MHz

These extra ranges have fixed step sizes. Below 406 MHz the step is 5 kHz. Above 406 it is 6.25 kHz steps.

Original frequency coverage:

25 - 54 MHz
108-136.9875 MHz
137-174 MHz
216.0025-225 MHz
406-512 MHz
806-960 MHz (except cellular)
1240-1300MHz

But using the Win96 program software from Don Starr, your Pro-96 will now receive the following:

17 - 174 MHz
216.0025-550 MHz
764-1300 MHz (less cellular)

This is major news for scanner buffs and especially the Milcom crowd, as it now allows them to receive the 225-400 MHz military aircraft band on a Pro-96 scanner.

You can download a 15 day demo version at **http://www.starrsoft.com/software/win96/**or contact StarrSoft.com, 781 Pomeroy Avenue, Santa Clara, CA 95051; *don@starrsoft.com*

## Case for PRO-92/PRO-95

Scanner Master makes a custom-made carrying case which fits both the Radio Shack PRO-92 and PRO-95 scanner radios. [* File contains invalid data | In-line.JPG *]The case is manufactured with a thick, rugged leather which protects the scanner from both scratches and most falls. The case includes full keyboard access as well as cut-outs for the speaker, the DC power and PC programming jacks.

The Scanner Master PRO-92/95 case also includes a quick-release swivel unit. The swivel piece stays on your belt while you can turn the radio upside down and pull it, while in the case, off your belt. If the user is worried about the radio staying secure in the case, a quick-release bungee cord can be placed around the BNC jack at the antenna.

List price is $32.95 from Scanner Master Corp., 40 Freeman Place, Needham, MA 02492; 1-800-SCANNER; **http://www.scannermaster.com**

## Antenna Controller

The new MAC-200, the Master Antenna Controller from SGC, may be your answer to

multiple antenna matching. The MAC-200 allows you to control five antennas, three fed by coax, one with balanced line, and one random length line. The built-in antenna tuner provides a match automatically on all antennas. Check it out from SGC; retail price is $319.95. SGC Inc., 13737 SE 26th St., Bellevue, WA 98005; *sgc@sgcworld.com*; 1-800-259-7331.

## Garmin Geko GPS Receiver

The smallest, lightest, waterproof GPS unit on the market is appropriately named the Garmin Geko. With its sleek canopy-green case, the powerful but easy to operate Geko is perfect for the navigation novice. One touch waypoint function, 250 waypoint storage capacity, PanTrack function, PC connectivity. Four interactive games transform the outdoors to a virtual board game. Two AAA batteries provide 12 hours of operation.

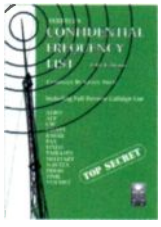
The Geko 101 retails for $114.95 from Scientifics, Dept A031-C999, 60 Pearce Avenue, Tonawanda, NY 14150-6711; 1-800-728-6999; **http://www.ScientificsOnline.com**

The Geko 201model boosts

WAAS capability, adds a user-configuration trip computer, and 10,000 trackpoint storage for $139.95. When you write or call Scientifics, ask for their new 100-page catalog of scientific and educational projects.

## Confidential Frequency List

Published by PW Publishing and edited by Kevin Nice, the new edition of the *Confidential Frequency List* (*CFL*) is a great reference for the utility radio buff. This 13th edition has 586 pages, is perfect bound (not spiral like the last few editions) and was current through August 2003.




This book provides extensive coverage of the radio spectrum from 1605 kHz to 30 MHz, excluding the broadcast and amateur radio spectrums. The bulk of the book consists of a by-frequency listing of utility stations worldwide. There are listings for aeronautical, marine (coast), fixed stations, diplomatic networks, military, press, time stations and much more. In addition to voice communications, this edition also has expanded listings covering the expanding world of HF digital modes, including ALE (Automatic Link Establishment), CW (Morse code), HF E-mail modes, facsimile, NAVTEX and a lot more.

In addition to the by frequency listing, this edition of the *CFL* also includes a world time chart, abbreviation list, NAVAREA map, international allocation of callsigns, ICAO (International Civil Aviation Organization) and World Meteorological Organization (WMO) location identifiers, a reverse station list sorted by callsign, worldwide NAVTEX (Marine weather and safety broadcast) station list and GMDSS (Global Maritime Distress and Safety System) frequency list, and a major world aeronautical route areas (MWARA) frequencies and maps. The one major area of listening not covered by this publications is the world of numbers broadcast. But, if you like chasing signals outside the ham and broadcast bands, then the

# What's NEW

**Tell them you saw it in Monitoring Times**

*CFL* is your passport to the world of utility radio listening.

The *CFL* sells for $31.95 and is available from Universal Radio in Reynoldsburg, Ohio.

– *Larry Van Horn*

## Police Call

*Police Call Frequency Guide, 2004 edition*, edited by Richard Barnett, is the 41st edition of the nation's favorite scanner directory, loaded with information for scanner radio enthusiasts. Each edition covers VHF/UHF land, sea and air frequencies in the frequency range from 30-869 MHz for the specific states as follows:

Vol 1 Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont
Vol 2 Delaware, Maryland, New Jersey, Pennsylvania
Vol 3 & 4 Illinois, Indiana, Kentucky, Michigan, Ohio, Wisconsin
Vol 5 & 8 Arizona, Colorado, Idaho, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, Nevada, Mew Mexico, North Dakota, South Dakota, Utah, Wyoming
Vol 6 District of Columbia, Florida, Georgia, North Carolina, Puerto Rico, South Carolina, Virginia, West Virginia
Vol 7 Alabama, Arkansas, Louisiana, Mississippi, Oklahoma, Tennessee, Texas
Vol 9 California, Oregon, Washington

***Note: There are no volumes that include listings for Hawaii and Alaska.

Each volume includes frequencies for public safety, railroads, forestry, aircraft, highways, transportation services, schools, news media, movie/TV production crews, security companies, rescue services, hotels, sporting events, public utilities, amusement parks and much more.

Listings are alphabetized by location, and include frequency, call sign, base or mobile class, and service. A by-frequency cross-reference allows the listener to look up the most likely source of an unrecognized transmission.

Each volume also includes a *Police Call* Version 5 CD-ROM that has the entire United States directory set (all the material from each of the regional volumes). On the CD are public safety listings by frequency, selected trunk systems data; business listings by state, Grove's Top 1000 Shortwave Frequency list. The information in these listings come directly from databases on the CD.

Maps of various public safety jurisdictions is also on the CD. Additional material on the CD is in Adobe portable document files (PDF) format for use with an Acrobat reader. These additional listings (not taken from the database) include a sampling of U.S. government frequencies; a railroad and aircraft frequency list; the consolidated frequency list; code and signals; glossary of terms and slang; auto racing frequency data; and listings of various FCC radio services (most of which no longer exist after the FCC refarmed the VHF/UHF bands).

The CD is easy to use, and the operational problems experienced in earlier versions appear to have been worked out. It should be pointed out that from the browse portion of the CD, data from the main frequency databases cannot be printed out. All of the PDF files can be printed, but several that we tested were so light they were scarcely readable.

The consolidated frequency list is intended as a reference frequency list for the VHF/UHF land mobile spectrum, showing the type of service allocated for each frequency. It is quite useful for picking search ranges for new listening targets, but several problems were found with frequencies being out of numerical order. Hopefully this useful tool will be improved in the next version of *Police Call*.

While the most important sections of this year's edition have been brought up to date, some of the generic lists are getting very long in the tooth, as mentioned in last year's review. The FCC's refarming of the spectrum is mentioned, but the actual extensive frequency additions on some of the lists are not reflected, including the new railroad and marine band plans. In the aircraft listings many of the frequencies are not identified as to usage and some of the material is out-of-date. The military/government listings need to be completely scrapped. In addition to inaccurate information, there are still listings for bases that have been closed by the Department of Defense, as previously pointed out in last year's review.

But with all this said, the *Police Call Frequency Guide* remains the leading source of scanner frequency listings on the market, and with good reason. Its accuracy remains high, especially considering the rapidly-changing VHF/UHF spectrum assignments.

A *Police Call* directory for your region is available for $19.95 plus shipping (*Monitoring Times* subscribers get free shipping) from Grove Enterprises (7540 Hwy 64 West, Brasstown, NC 28902; 800-438-8155; **http://www.grove-ent.com**).

– *Larry Van Horn*

## Passport 2004

For twenty years, *Passport to World Band Radio* has been a popular publication among beginning and advanced listeners. The 2004 edition, published in October 2003, celebrates *Passport's* 20th anniversary. Larry Magne, Editor-in-Chief, begins this year's edition by reflecting on the first issue and the challenges of early technology available at the time.

Since those early and unsure days, Magne and his dedicated staff have expanded their coverage to become an authoritative source for enthusiasts.

At a glance, *Passport*'s "blue pages" contain graphical listings of stations in by-frequency order, which is advantageous for bandscanning – to a point. Unfortunately, as seasonal frequencies adjust, much of *Passport* – as with other annual radio publications – becomes out-of-date, except for domestic services or those frequencies that rarely change. This is most likely unavoidable; however, it remains a weakness in an otherwise fine publication.


As usual, a large portion of *Passport* is devoted to reviews on shortwave receivers and antennas in all price ranges. This will assist those DXers looking for a professional or nonprofessional receiver.

The "Addresses Plus" section contains by-country listings of a station's key personnel, mail addresses and Web addresses. This is without question a great asset to those wishing to correspond with the station.

*Passport* remains a favorite of hobbyists for frequencies, listening advice, and receiver reviews. It is a wealth of information, at an affordable price. *Passport To World Band Radio 2004* is available for $22.95 through Grove Enterprises at **http://www.grove-ent.com** or 828-837-9200.

*-Gayle Van Horn*

## Product Updates

### Mayah DRM2010

John Figliozzi reports that "Probably as no surprise to anyone, the Mayah DRM2010 is having trouble getting off the ground." The following information is from their North American distributor:

1) There have been no shipments... the product is not ready
2) Estimated now for end of January 2004 production (problem with component suppliers)
3) The target price for the USA is still US$850.00

### PRO-2054 and PRO-2096

It is rumored that Radio Shack will have two new scanners in the very near future, the PRO-2054 and PRO-2096 models. This is based on information being sent to Radio Shack stores. It is anticipated that they will be compatible with the PRO-96, in much the same way that the PRO-2053 was compatible with the PRO-93, from an external software perspective.

**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**

Lawrence Harris
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# A Hint to NOAA

As we have occasionally mentioned during recent months, European amateur weather satellite (WXSAT) monitors had never expected to be able to receive the high resolution image stream (HRIT) from the geostationary European WXSAT METEOSAT Second Generation (MSG)-1 without having to buy extremely expensive receiving equipment. At best, we had been wondering about justifying the cost of buying LRIT reception equipment to receive the new *Low Rate Information Transmission* image stream, the equivalent of second generation wefax.

LRIT is itself excellent, but we unexpectedly found ourselves being able to receive HRIT (as well as LRIT) for the cost of a near-standard, small dish satellite television system, together with some moderately-priced software to decode the new format images. My own system now returns 12-channel high resolution images every 15 minutes, together with images from GOES-10, GOES-12, GOES-9, and Meteosat-5 (located over the Indian Ocean).

This is all as the result of the failure of an amplifier on MSG-1. Because it became distinctly possible that activation of further amplifiers onboard MSG-1 might endanger the mission, the decision to find another way to disseminate the image stream to end-users had to be found. This was achieved by expanding the already existing dissemination of other meteorological data using a commercial communications satellite – HotBird-6. The end result is that European end-users now need only buy the system mentioned, together with additional software – and they can receive an unbelievable flow of superb imagery.

This leads me to wonder whether there is any possibility of NOAA (the National Oceanic and Atmospheric Administration) making a decision to follow this direction? Might they investigate possible dissemination of the new LRIT (and/or possibly HRIT) digital data stream via a communications satellite transponder – thereby cutting the cost of reception by an order of magnitude – making the data potentially available to a huge number of people? Food for thought.

## ◆ Weather Satellites - future plans

Last month I started a feature about long-term plans for changes to the constellations of satellites that will eventually become the constellation of the Initial Joint Polar System. The plans began with the decision to merge the DMSP satellites with the NOAA satellite program. As an early step in the convergence process – designed to bring the two systems together to produce the NPOESS (National Polar Operational Environmental Satellite System), Satellite Control Authority for the existing DMSP satellites was transferred from the U.S. Air Force Space Command to the NPOESS Integrated Program Office in May 1998.

Command, control, and communications functions for DMSP satellites were combined with the control system for NOAA's current (POES) satellites at NOAA's Satellite Operations Control Center (SOCC) in Suitland, Maryland. These satellites are now being controlled by civilian personnel at the SOCC. A backup satellite operations center, manned by USAF Reserve personnel, was established at Schriever Air Force Base, Colorado. The inter-agency effort has provided state-of-the-technology satellite control equipment and resulted in significant budgetary savings, as well as uninterrupted service to end users.

The first NPOESS satellite is expected to be available for launch in the latter half of the decade, approximately 2008, depending on when remaining POES and DMSP program satellite assets are exhausted. NPOESS will provide significantly improved operational capabilities to satisfy critical civil and national security requirements for space based, remotely sensed environmental data.

The satellites will deliver higher resolution and more accurate atmospheric and oceanographic data to support improved accuracy in short-term weather forecasts and severe storm warnings. It will also serve data continuity requirements of the climate community for improved climate prediction and assessment. NPOESS will also provide improved measurements and information about the space environment necessary to ensure reliable operations of space-based and ground-based systems, as well as continue to provide surface data collection and search and rescue (SARSAT) capabilities.

In November 1998, NOAA entered into an agreement with the EUMETSAT (European Organization for the Exploitation of Meteorological Satellites) to participate in the Initial Joint Polar-orbiting Satellite System (IJPS). The agreement calls for cooperation between NOAA and EUMETSAT to provide meteorological data for 'Morning' and 'Afternoon' orbits by complementing each other's polar satellite global coverage. Under this agreement NOAA will also provide some of the instruments on-board the EUMETSAT satellites.

The Initial Joint Polar System will comprise the continuation of the current NOAA satellite series with NOAA-N and -N', together with the new EUMETSAT satellite series Metop-1, -2, -3, the first of which is due for launch in 2005. The satellites will be produced independently by the USA and Europe respectively but will carry a core set of nearly identical instruments to ensure operational data continuity and coherence of the key meteorological observations. My thanks to both EUMETSAT and NOAA for making the information available.

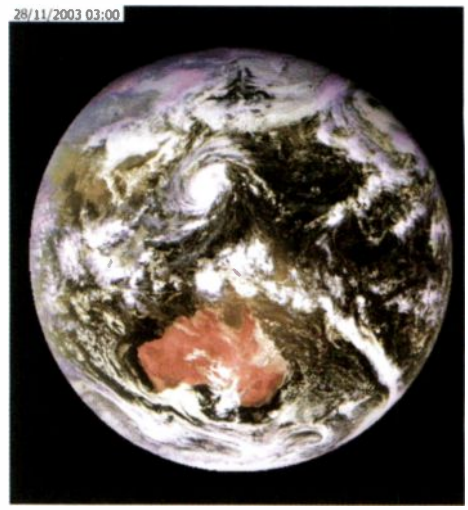


*Fig 1: GOES-9 (GMS) November 28 0300UTC (ã EUMETSAT 2003)*
***Images from GOES-9, located over 204° west longitude, are now added to the LRIT data stream.***

## ◆ WXSAT Equipment suppliers

I welcome information from any manufacturer who supplies equipment for the hobbyist weather satellite market, so if you have information, please pass it to me! I spotted a notification from Timestep to the wxsat-l mailing list concerning their forthcoming equipment readiness for the American LRIT market. They are providing (or are about to provide) two systems: one for the professional user, and one aimed at the hobbyist.

Timestep LRIT Professional
0.9m dish, Wilmanco feed and downconverter, Quorum DSP receiver, DB1 PC Interface card, Timestep DB1 'lite' software, $7,500 availability: now.

Timestep LRIT Consumer
0.9m dish and feed, 0.5dB NF preamplifier, Timestep LRIT receiver, Timestep DB1 'lite' software, Timestep USB Interface, $2,999 Availability: estimated May 2004.

**Frequencies:**

NOAA-12 and -15 transmit APT on 137.50 MHz
NOAA-17 transmits APT on 137.62 MHz
GOES-10 (west) and GOES-12 (east) use 1691 MHz for WEFAX. GOES-12 currently transmitting LRIT data at 45 minutes past each hour.

## INDEX OF ADVERTISERS



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Closing Comments

# MARS - A Different Perspective

By Dino Papas, KL0S/AAT3BE/AAA9TC
Colonel, U.S. Army Retired
Army MARS National Training Coordinator

Kudos to Larry Van Horn (*Closing Comments* October 2003) for continuing to take to task the U.S. Armed Forces Military Affiliate Radio System (MARS) programs. Larry's unique position as a retired sailor, author, assistant *Monitoring Times* Editor, utilities monitor and non-MARS member allow him to make outside assessments of the progress MARS has made over the years and express them to a wide audience.

Let me present the readership of *Monitoring Times* another perspective of the MARS program. As a retired soldier with 26 years of active service, a ham for 34 years, and Army MARS operator, I can offer that the program is continuing to prosper and transition to significantly different missions and horizons.

The service's MARS programs have seen a significant refocusing of their priorities in the last few years. Morale and Welfare message support for servicemen overseas, once the mainstay of MARS operations, has decreased significantly with the advent of inexpensive telephone calling cards and e-mail/internet access for soldiers serving overseas. But for those soldiers deployed to areas of the world where these facilities are not available, the MARS program may be their only expeditious means of maintaining contact with home.

Today, emergency situation reporting and communications support to the services during natural and man-made disasters and a new expanding role in Homeland Security are now the most visible and evolving driving forces for MARS. Frankly, many public exclamations of MARS as a "dying program" are from longtime or former MARS members who continue to resist this fundamental shift to emergency situation reporting and communications support to military organizations and other emergency response agencies. This transition period will last several years as new priorities, expanded training and new emergency operations procedures are inculcated into members, both new and old alike.

The most important MARS customer is the Joint Director of Military Support (JDOMS) in the Pentagon. During presidential declared disasters JDOMS authorizes and coordinates federal military support to states requesting it. MARS operators provide valuable disaster situation information directly to JDOMS using the Essential Elements of Information (EEI) reporting system. JDOMS uses this information along with that gathered from other sources, to make decisions on how best to provide needed support.

In the disaster zone the Defense Coordinating Officer (DCO) works for and with FEMA to coordinate federal military support to relief operations. During my final Army assignment at Fort Bragg, NC, I was the DCO during Hurricane Floyd in 1999. The information provided to JDOMS by MARS operators assisted in the planning and execution of DoD support to North Carolina and other states. I can't think of a better example of a MARS success story. The information I received from JDOMS was worth its weight in gold to me as the soldier on the ground...hard to put a price tag on that.

More and more agencies are recognizing the value of MARS. For example, during Hurricane Isabel, in addition to EEI reporting, MARS was asked to provide points of contact to several military units and response agencies to assist in ensuring the continuity of their communications. Ultimately that support was thankfully not required but the MARS system was prepared to supply it.

Having said all that, the MARS programs do have their problems. The good news is that those problems are identified and being addressed. Larry points us to areas identified by the Army's Inspector General (IG) that, at face value, speak to significant issues – what's missing are the responses to those concerns. Having commanded Army units from platoon through brigade, my experience is that IG observations usually require more analysis to substantiate their validity, identify root causes and develop good problem solutions. Issues of "non-support" and "customers unaware of MARS capabilities" must be explored to find systemic problems which are often the result of customers in fact being aware of the capability but choosing not to take advantage of it.

A similar analogy is amateur radio communications support during emergencies. Larry points out the successes of amateur radio – yet we continue to hear the same kinds of "complaints" about agencies unaware of the potential for amateur radio support or reluctant or unwilling to use it. Should we do away with amateur radio as a waste of taxpayers dollars? Of course not; as hams we keep working at it.

On balance, to those hams interested in a more structured and rewarding way to assist in the security and well being of our nation and in providing support to the servicemen and women of our armed forces, I'd recommend joining MARS. Be part of the solution – the Army MARS program has been and remains a valuable asset to the nation, the Army and its soldiers.

I recently delivered a "MARSgram" to a young soldier from his wife, another soldier serving in Baghdad, Iraq. The soldier, just back from combat tours in Afghanistan and Iraq himself, was very appreciative of our efforts. I, too, had been in the same situation when my soldier wife was deployed to a combat zone and knew how important keeping in contact was. We prepared a reply message that was on the MARS digital circuits in short order back to Iraq. The joy I heard in that soldier's voice as he received good news from his wife made it all worthwhile. To those who believe resources dedicated to the MARS programs aren't worth it I can only say I wish they had been on the phone along with me as I observed that it is in fact worth every penny.

The potential value added of the MARS programs is significant. One way to ensure we have the best program possible and to correct problems, real and perceived, is to work from within the system. It's a volunteer organization...if you don't believe it's for you please find other ways to channel your efforts to support our nation. Take what you hear and read about MARS with a grain of salt, find out more about MARS and make an informed decision for yourself.

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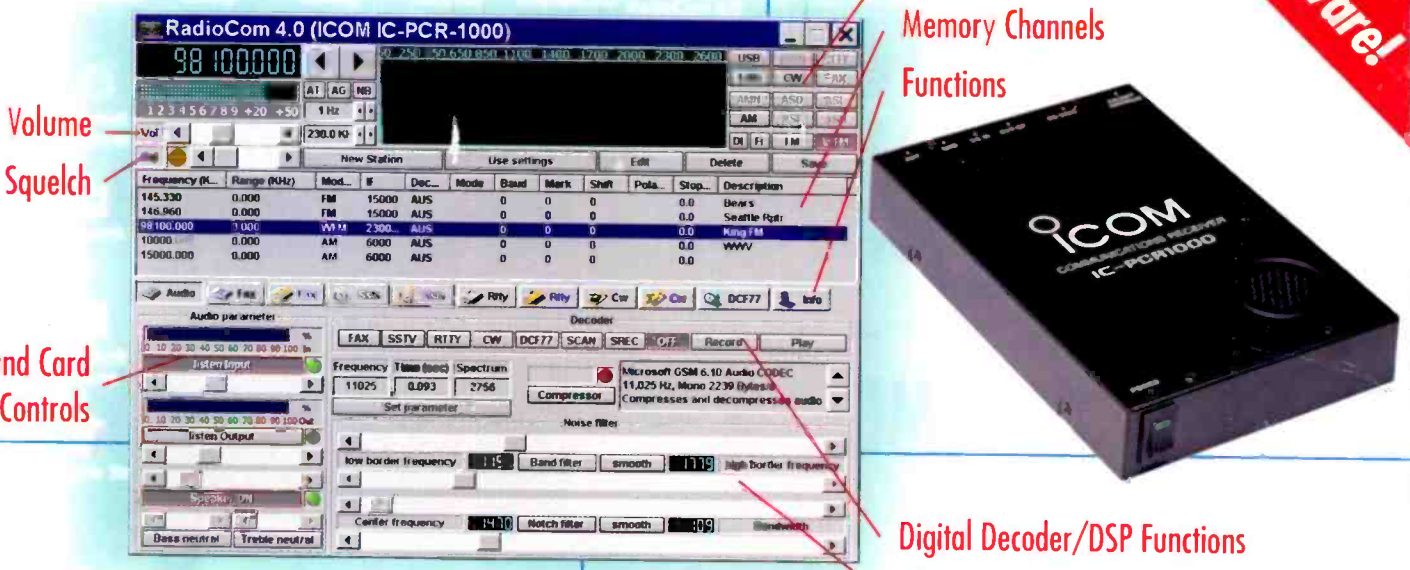


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