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Monitoring Times

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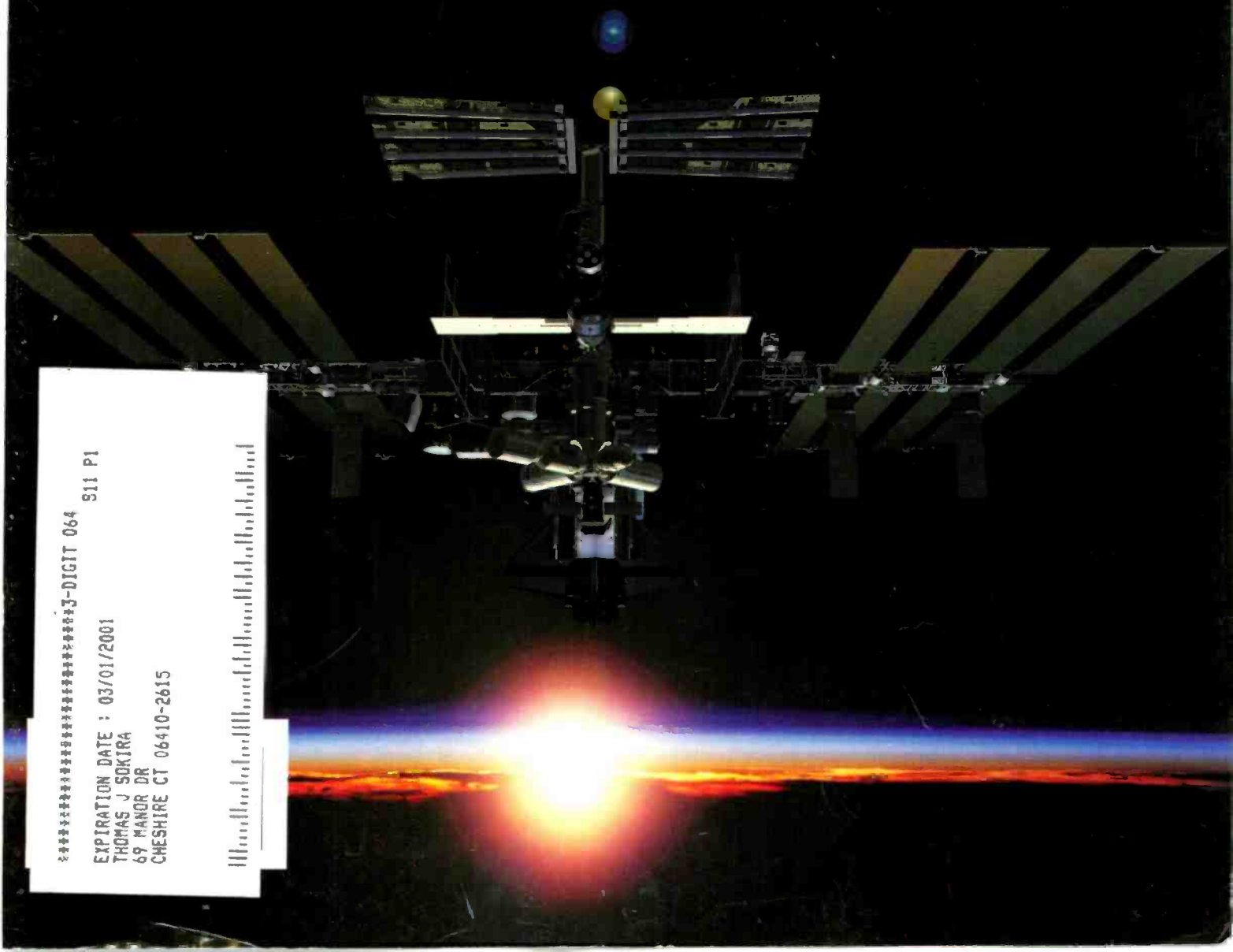
- *Tuning into the amateur radio satellites*
- *Phase 3D - The Next Generation*
- *The Ten-Tec RX-340 DSP Receiver*



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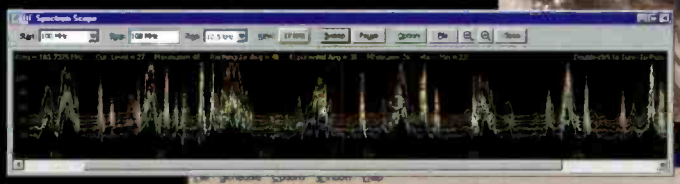

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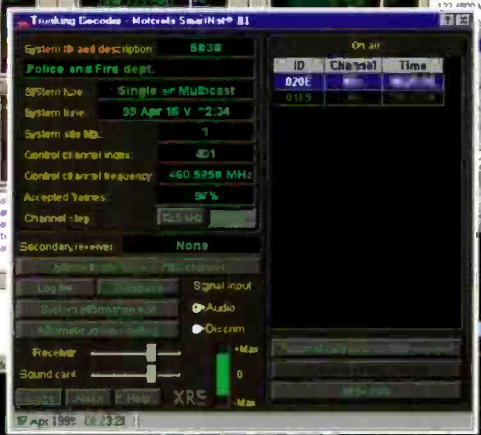

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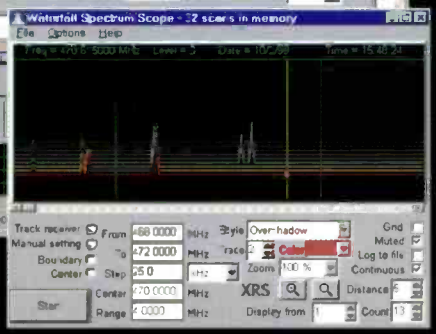

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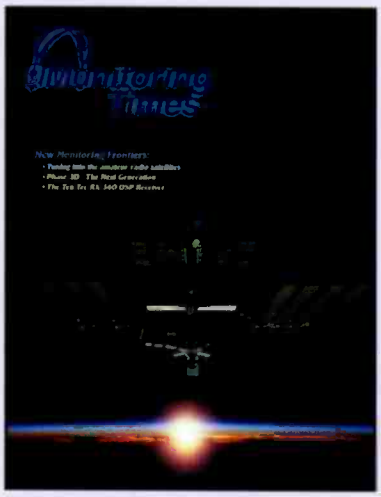

Cover Story

Tuning into Space Action on the AMSATs

By Ken Reitz

Hams have always been forging ahead into new frontiers, and the sky is no limit. Amateur radio operators have been in space for 40 years, on satellites they built themselves. Later on, communications originated from amateur radio operators in space, transmitting from the Russian *Mir* and the US Space Shuttle – and soon from the International Space Station depicted on our cover.

In most cases, it doesn't require fancy equipment or antennas to receive these communications – just a little patience and know-how. In this article you'll find all the reference sources you'll need to get you started listening in to amateur radio satellites and space stations.

On our cover: Artist rendition of the International Space Station, courtesy NASA

CONTENTS

The Titan II stands 103 feet tall and is 10 feet in diameter. It is nearly 150 feet to the bottom of the silo.

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

Publisher
Bob Grove, W8JHD
bgrove@grove-ent.com

Managing Editor
Rachel Baughn, KE4OPD
mteditor@grove-ent.com

Assistant Editor
Larry Van Horn, N5FPW

Art Director
Bill Grove

Advertising Svcs.
Beth Leinbach
(828) 389-4007
beth@grove-ent.com

Reviews:

The new **Ten-Tec RX-340** DSP general coverage receiver is not only listening luxury, allowing you to change nearly any parameter imaginable, but it's also rock-solid and built to military specs. See Bob Grove's review (p.98). Like the RX-340, the **Electra Tiger Scan TSA** scanner is intended to stand up to continuous use, but that's where the similarity ends. The TigerScan is simplicity itself as a single band, 2-channel scanner (p.100). Drake has jumped on the Family Radio Service bandwagon with its tiny **Minitalk-99** which holds its own with the big boys (p.96).

Catalano decided to trot out the earlier model **Ten-Tec RX-320** to see if more software had been written for it in the last few years, and he hit the jackpot with programs that really make this computer-controlled radio sing (p.94). Whether for tracking down inteference or for "fox-hunt" competition, the **Ramsey Mobile Radio Direction Finding System** is an affordable kit you can build yourself (p.102). The Select-A-Tenna, already a standby with AM DXers for years, has added power to become the active **Super Select-A-Tenna** (p.103).

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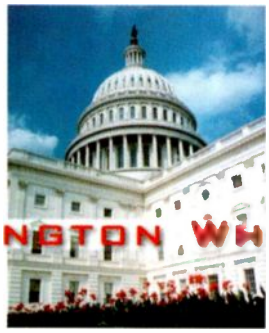

WASHINGTON WHISPERS

Fred Maia, W5YI

The Federal Communications Commission Rulemaking Process

Are you confused about how the Federal Communications Commission operates? Do all those bureaucratic acronyms and procedures make you wonder how Rules are made? Well, you are not alone. This month, let's talk about FCC rulemaking and policies ...and how new telecommunications regulations come about.

Input from the public as well as regulated industry is a crucial part of the FCC rulemaking process. Understanding this process will help you take advantage of the opportunity to comment and express your views on FCC proceedings. If you would like to be part of the FCC rulemaking process, you may want to learn how to file comments with the FCC. When submitting comments in response to a FCC notice or other document, always refer to the document for specific instruction.

Petition for Rulemaking

Suggested changes to FCC rules and regulations originate from sources both within and outside the Commission. When submitted from outside the Commission, they should be in the form of Petitions for Rulemaking. A Rulemaking Number (RM) is assigned to a proceeding after the appropriate FCC Bureau/Office has accepted the Petition for Rulemaking.

The Commission regularly issues a news release listing the Filings accepted by the FCC. The public generally has 30 days to submit initial comments. The RM number must appear on all comments. This is an opportunity to state reasons why a Petition for Rulemaking should be granted or denied.

Notice of Inquiry or Notice of Proposed Rulemaking

After reviewing the comments received in response to a Petition for Rulemaking, the FCC will typically issue either an Order disposing of the petition, a Notice of Inquiry (NOI), or a Notice of Proposed Rulemaking (NPRM). A Docket Number is assigned to all NOIs and NPRMs. The first two numbers of the Docket Number indicate the year in which they were initiated.

A Notice of Inquiry is designed primarily for fact gathering and seeks comment from the public and industry in order to obtain more information. The document describes where and when comments may be submitted. Interested parties may also review what comments were received and, in most cases, submit comments in reply to other parties' submissions.

After reviewing the comments submitted in response to a Notice of Inquiry, the FCC may release an Order explaining why the FCC is not taking further action, or it may issue a Notice of Proposed Rulemaking.

A Notice of Proposed Rulemaking is issued to detail proposed changes to FCC rules or to seek public comment on more focused proposals. The document describes where and when comments may be submitted. As is the case with most Notices of Inquiry, the public may review the comments received and submit comments in reply to other parties' submissions.

Notices of Inquiry and Notices of Proposed Rulemaking both contain Docket Numbers, which are printed in the document header. Identification of this number will assist your research.

Further Notice of Proposed Rulemaking

After reviewing the comments received in response to a Notice of Proposed Rulemaking, and in conjunction with or in lieu of a Report and Order explaining the FCC's actions on the proposed rule changes, the FCC may issue a Further Notice of Proposed Rulemaking regarding issues raised in comments or to provide an opportunity for the public to comment further on a related alternative proposal. The issuance of all subsequent Notice of Proposed Rulemaking will again establish a period for filing comments and reply comments to address the unresolved issues. The next step is a Report and Order.

FCC Open Meeting or Circulation

New FCC rules are usually adopted at an Open Agenda Meetings or by Circulation. Circulation is the procedure whereby items are routed to Commissioners for voting without the need for discussion. Voting is done electronically from each Commissioner's office.

Report and Order

After considering comments and reply comments, the FCC may issue a Report and Order (R&O) amending the rules or may make a decision not to do so. The FCC may issue additional Report and Orders in the Docket if there is an outstanding issue to be resolved at a later date, or if there are additional rulemaking proposals in the Docket. Summaries of R&Os as published in the Federal Register, the daily journal of government actions. Once a proceeding has been adopted, it is assigned an FCC Number. Example: FCC 99-412. (This is the FCC Number assigned to the recent restructuring of the Amateur Service.) Remember, the first two digits reflect the year.

Petition for Reconsideration

After the FCC issues a Report and Order, interested parties generally have 30 days to file a Petition for Reconsideration to request that the FCC reconsider its decision. The agency will consider public comments, replies, and industry concerns before finalizing its initial decision. As a result of the review process, the FCC will either issue a Memorandum Opinion and Order amending its initial decision, or deny the Petition for Reconsideration.

Memorandum Opinion and Order

A Memorandum Opinion and Order is issued by the Commission to deny a petition for rulemaking, modify a decision, grant or deny a petition for reconsideration, or grant or deny an application for review of a decision. A second or third Memorandum Opinion and Order may be issued (2nd MO&O, 3rd MO&O). Other appropriate titles may also be used, e.g., Order on Reconsideration or Order on Review.

Copies of These Documents

All official documents released by the FCC since March 1996 are posted on the Commission's Web Site at **http://www.fcc.gov**. To find a particular document, you can use the FCC Digital Index to search the Digital Digest database for documents posted on the Internet. The Electronic Comment Filing System (ECFS) allows you to view other comments that have been filed in FCC Docket or Rulemaking proceedings. Finding Comments explains how to retrieve comments.

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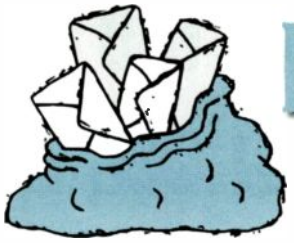

LETTERS TO THE EDITOR

Investing in the Hobby

"I read with some amusement and frustration the various posts on internet news groups concerning Grove/*MT*. I have always been very satisfied with my purchases and the help and friendliness I have found when I talked to you on the phone or via email. It seems to me those who have complained have had a chip on their shoulder and have been treated more than fairly in spite of their attitude.

"I have had subscriptions to another magazine and have bought it from time to time on the newsstand when I didn't subscribe, but I feel *MT* has by far been the better magazine. Sure, the changes in technology and the market have caused many of us to broaden our interests and your magazine has added features to match. You have lost some good writers due to death, retirement, or other reasons, but you have changed/replaced to continue your tradition of an excellent magazine.

"Sure, some issues/articles/writers are more in tune with my interests than others, but I don't expect all to narrowly cater only to my interests. I scan or often read even the articles I don't feel interested in, because I have seen my interests change. I still enjoy scanners, but I also listen to shortwave Ute broadcasts. I seldom listen to commercial shortwave programming, but that may change.

"I consider my subscription renewal to be an investment in my hobby just as much as if I bought an antenna or radio. The larger your circulation, the more you can attract advertisers and writers which help support the magazine and provide us with products and information about them. I intend to stand with you through the dips and peaks. Thank you for the positive view you express of hobbyists rather than focusing on the vocal minority of complainers and doom sayers."

– Ron Biddle, Winston-Salem, NC

Thanks, Ron. It's obvious you have an appreciation of what MT is trying to accomplish and you have chosen to lend your support by renewing your subscription. Clearly, you understand how important this simple step is to the future of any magazine. You are also absolutely right about the need to increase numbers and to attract advertisers – these are critical issues in a time when production costs alone have risen by 15 percent in the past year!

Since you readers have a big stake in the magazine (without you, the magazine doesn't exist!), I think it only fair to give you an opportunity to brainstorm with us on how to increase advertising and subscription revenue. What can you do?

Be a PR person for MT: Time and again it has been proven that you are our best public relations persons. No advertising campaign we have ever conducted has borne as much fruit as avid readers recommending the magazine to their friends. So tell them about us, and give us their names and addresses to receive the current issue as a sample.

Support advertisers: When you buy from MT advertisers, tell them you read about them in MT. Encourage your favorite dealers to take out an ad in MT or to send in their product announcements to see what kind of reader response they might get. MT readers are good consumers, and non-advertisers are missing a market.

Send us your ideas: We know many of you have professional or personal experience with promotions. We would welcome ideas on how to get this terrific publication into the hands of new readers or to recapture lapsed subscribers – without busting the budget. Get creative; dream a little.

Avoid or refute internet gossip: Ron's letter started by mentioning his frustration with the backbiting to be found on the internet. Trust your own experience with Grove/MT over hearsay, like Ron did. My pet peeve? About one reader per month will question – usually in an internet forum – if MT is still in business when his MT doesn't show up on time. In nearly 20 years of publication we have never missed an issue, and only one was as much as a week late ... and that was because the post office wouldn't mail it. We're not perfect, but we'll stand on our record!

- Rachel Baughn

A Plug for *MT* Express

Here is a comment Steve Silverwood, KB6OJS, posted on the Internet in response to a query. It was forwarded to us by Larry Magne. This kind of mention is great PR since it gets read by many folks who didn't even know about *MT* or the *MT Express* alternative.

"FYI, I opted for the *MT Express* subscription. I can download it on the 20th of each month, and read it on my PC. Anything I want to keep in hardcopy form I can print out. Also makes it handy to print the SW BC schedules, which I put in page protectors in a 3-ring binder for reference when camping or traveling. *Very* handy."

More on Mutual Aid Frequencies

In the May issue we reprinted several letters regarding local use of mutual aid frequencies. Judy May reported on Northeast Ohio, but we got it wrong. The frequency used there is 155.37, not 155.47. Here are some other responses:

"The nationwide police allocation of 155.475 is licensed by the State of New Hampshire, on behalf of many communities and is called Statewide Ch 2 Car-Car. The State Police Troop stations may have a base on this frequency and Troop F uses it to communicate with Troop B in Vermont. The NH SP cruisers themselves DO NOT use this frequency. In Rich Barnett's *Scanner Master Pocket Guides* this freq. is listed for mobile use in Maine and for local, mobiles in Rhode Island.

"When you do hear traffic on 155.475 it will be low power chit chat and it's hard to tell who is using the freq. You may only hear one side of the conversation. So if you're in New England it is well worth keeping 155.475 in memory.

Here's two other SP freqs: 156.090 south, 155.91 north. Hope this is of use to my fellow *MT* readers.

– Jim MacDonald

"Here in Alabama, the State Troopers still use the frequency regularly. Mostly used for car to car traffic. They refer to it as National Net."

– R. Meshberg, Huntsville-Madison County Rescue Squad

Oops?

"Great column on the Russian VOLMET network," Michael Ricca wrote Hugh Stegman. "The flag your magazine published is for a country that disappeared about 10 years ago."

Hugh replied, "Oh, I already told them... I must say the Soviet flag was attention getting. It certainly got *my* attention! :-) I know that now Russia uses the Tricolor and CIS uses something about as graphically unlike the old Soviet flag as you can get. I got the last real, flyable USSR

flag in Los Angeles about 5 years ago, and added it to my collection of vanished countries. It's in the same drawer with East Germany."

-Hugh Stegman

"I noticed that the issue of *Monitoring Times* of April 2000 had the April 1999 shortwave listing guide in it?! I've noticed, too, that I've had to correct some 2 dozen of the frequencies! I guess it's *caveat emptor* at all times.

– Rick Levandowski, WB0BNR, Diego Garcia

You nailed us on forgetting to change the year on the footer in that section, but the question of frequency accuracy is more complicated. As most readers know, frequencies and schedules undergo substantial changes in the spring and the fall. The majority of stations do not make their schedule changes available in advance, and so, because of print deadlines, *MT*'s center section is admittedly less accurate for two months during that period while we are receiving schedules and doing our own monitoring. Remember, the frequencies which shift the most are the highest frequencies, and then the lowest; the frequencies within the 8 and 10 MHz range tend to stay fairly stable and should be tried first.

We do shift station schedules in time for Daylight Savings Time for those countries which observe it, but we are not able to change the frequencies until they actually shift, and that means an unavoidable delay before appearing in print.

Other readers think that because they can't hear a frequency, it is an error, but most know that it's the nature of shortwave propagation... or the signal isn't beamed to their area... or the station decided not to use that frequency... or the transmitter is down... or any one of a number of factors. It's what makes shortwave monitoring so much fun!

Happy Retirement to Ike

Ike Kerschner has announced his intention to retire from writing the "On the Ham Bands" column in conjunction with his retirement from his employment. Ike has been writing for *Monitoring Times* since July of 1986 – only Clem Small and Jean Baker have been with the magazine longer! It's a long time to be meeting deadlines, and we are grateful for Ike's enthusiasm, support, and loyalty through the years. Now more than ever you'll probably catch Ike, N3IK, operating on low power or showing up with his homebrew antennas at a booth at hamfests in the Pennsylvania area. (He also usually carries sample MTs; it's a great opportunity to talk about one of his favorite magazines!) Best of luck, Ike!

Your comments, corrections, and opinions are always welcome at Letters to the Editor, PO Box 98, Brasstown, NC 28902, or *mteditor@grove-ent.com*. We appreciate your feedback, and so do your fellow readers!

– Rachel Baughn, editor

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Fire at Netherland's Bonaire Site

On April 23, one of the diesel generators at R. Nederland's Bonaire relay exploded and caused a fire which destroyed all the generators, putting the station off the air abruptly. Fortunately, no one was hurt, and the transmitters were in a separate building. But it looked as if this vital relay for American, African and Australian coverage would be missing for months. RN quickly transferred some of the programming to their own Flevo site in Holland, not fully used during the night.

It happened on a long holiday weekend, but RN personnel then hustled to arrange more substitute relays on the same frequencies insofar as possible; by two days later, RN was again being heard, via Merlin Antigua and Ascension, and even WSHB – morning Spanish only. QSL/site collectors such as Bill Harms raced to hear and try to verify these rare, temporary sites. Webmaster Andy Sennitt kept temporary relay schedule and photos of the devastation at **www.rnw.nl**.

RN was able to rent two temporary generators of somewhat less capacity and get them installed in a temporary building so that RN could put one 250 kW transmitter back on the air as soon as April 29, and resume almost normal operations on two or three transmitters by May 2, only nine days later, even including relays of RVI Belgium.

Permanent replacements costing several million dollars will take longer to install, but will have a greater total capacity than before. As Sennitt says, "Bonaire these days is much more than a relay station. It's also a regional radio and TV technical consultancy for the Caribbean area, and as such is on the road to becoming self-supporting thanks to the income generated. We are one of the largest employers on the island (around 50 people). I understand that when all the repairs have been completed, we will end up with much more generating capacity than we had before, increasing from 2.5 MW before the fire to 4.5 MW. So, Bonaire may actually expand, especially if digital shortwave takes off." *(Glenn Hauser. Also contributing to this summary: Steve Luce, Lee Silvi, Kai Ludwig, RN Operations Manager Rocus de Joode, Bonaire Station Manager Leo Kool)*

permission by Radio Netherlands

GPS - No longer degraded

In a move that took many by surprise, President Clinton announced on May 1st that the signal from global positioning satellites would no longer be intentionally degraded to civilians. Clinton said, "This will mean that civilian users of GPS will be able to pinpoint locations up to ten times more accurately than they do now." The government plans to add two new civilian signals to enhance the civil and commercial service and add up to 18 additional satellites, which are already awaiting launch or are in production.

Clinton added that military threat assessments concluded that setting selective availability (SA) to zero would have minimal impact on national security, especially since the military had demonstrated the capability to selectively deny GPS signals on a regional basis when our national security is threatened. Major benefits of the more accurate signal will be to improve response time when responding to life-threatening emergencies, and to enable faster transmissions over phone lines, which rely upon super-accurate time signals.

New Voices from Space

In addition to listening to amateur radio satellites – our feature topic this month – a new voice should be heard later this fall when ham gear is installed aboard the International Space Station for the first time. The Russian-built Zvezda Service Module is scheduled for launch in early to mid-July, providing the living quarters for the first ISS crew. Then, the initial amateur station hardware will be sent up to the ISS aboard shuttle mission STS-106 in August. Finally, the initial crew of one US astronaut and two Russian Cosmonauts will be launched in October from Russia aboard a Soyuz spacecraft.

The ISS ham radio station will be using a Russian station license and call sign, RZ3DZR. Long-term plans call for obtaining an international call sign for the ISS station. The initial ISS amateur station will provide primarily FM voice and packet on 2 meters and, eventually, on 70 cm using Ericsson hand-held transceivers. It's expected that slow-scan TV, various types of amateur TV, and experimental projects eventually will be added.

Amaters may not be the only voice communications to be heard from the space station: SpaceHab, a commercial space company whose staff includes former astronauts, is pushing to create the first private broadcasting and production studio aboard the Space Station. The company says "Enterprise" would focus on space-related content including space news, education and entertainment. SpaceHab already has negotiated exclusive rights to extensive Russian archives documenting the history of the Russian space progam.

BULLETIN BOARD

July 4: Bressler, PA

Harrisburg ARC's 28th Firecracker Hamfest, at Emerick Gibart Park (near Harrisburg), 8a.m., gen adm $4. Covered and open flea market and vendors, VE testing nearby, food. For information, HRAC answer line 717-232-6087, **www.members.tripod.com/hrac**, *HbgRAC@excite.com*

July 8: South Milwaukee, WI

South Milwaukee ARC "SWAPFEST '00", American Legion Post #434, 9327 S Shepard Ave, Oak Creek WI 53154; Talk-in 146.52 simplex, and local rptrs; 6:30am-4pm; adm $5. Food and beverages available - free beer and soda (for limited time). For more info call (414) 762-3235 or write SMARC, P.O. Box 102, South Milwaukee, WI 53172-0102

July 8: Salisbury, NC

Rowan ARS Salisbury Firecracker Hamfest at Salisbury Civic Center, 8a.m., gen adm $5, Talk-in 146.73 (PL94.8), 146.52 simplex. Contact RARS, POB 593, Salisbury, NC 28145, Jim Morris KA4MPP 704-278-4960 or *rbrown@salisbury.net*

July 9: Pittsburgh, PA

North Hills ARC 15th Annual Hamfest at Northland Public Library, 300 Cumberland Road (10 mi N on Rt 19), 8a.m.-3p.m., Talk-in on 147.09 rptr, Free admission. Old fashioned tailgating hamfest. For information call Keith Ostram KB3ANK 412-821-4135 or see **www.nharc.pgh.pa.us** or email *n3dok@pgh.net*

July 15: Loveland, CO

The North Colorado ARC will host their annual Summer Superfest from 9a.m.-4p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. Talk-in 145.115 (- offset, 100Hz PL) or 146.52 simplex. VE exams, exhibits, forums, and more. General info 970-352-5304.

July 16: Kimberton, PA

Mid-Atlantic ARC Valley Forge hamfest and computer fair, at Kimberton Fire Company Fairgrounds on Rt 113, south of Rt 23, 8a.m., $5 adm. Talk-in 146.835/- and 443.800/+ CTCSS 131.8. For more info call Bill Owen W3KRB 610-325-3995, **www.marc-radio.org/hamfest.html** or email *hamfest-info@marc-radio.org*

July 22: Cincinnati, OH

OH-KY-IN ARS Hamfest at the Diamond Oaks Career Development Campus, 6375 Harrison Avenue; 7a.m.-2p.m., Talk-in 146.670(-) and 146.925(-), Gen adm. $5. Seminar, transmitter hunts, vendors, flea market, VE exams (8a.m., walk-ins OK), refreshments. Contact Lynn Ernst WD8JAW, 606-657-6161, *wd8jaw@arrl.net* or visit **www.qsl.net/k8sch**

July 23: Special Event Station W2ZZJ

Stratford, NY - The Fulton County Dr. Mahlon Loomis Committee will operate W2ZZJ on 23 July to commemorate the 174th anniversary of the birth of Dr. Loomis. Ops from 1300-2000 UTC on the General Class portion of 75, 40, and 20 meters, and on the Novice 10 meter phone bond. Also, on area 2-meter FM repeaters. For a certificate and literature, send QSL, contact #, and a #10 SASE (55 cents) to George P. Sadlon, W2ZZJ, 5738 STHWY 29A, Stratford, NY 13470. **http://members.xoom.com/mahlon/**

July 26-28: Kissimmee, FL

REACT (Radio Emergency Associated Communications Teams) Int'l Convention at Ramada Plaza Hotel Gateway Inn. The Disaster Communications Assistance Team (DCAT) van will be present. FCC seminar led by Mr. Riley Hollingsworth, medical training and certifications, workshops, contests, awards, etc. Contact Walt Young, 321-254-1202 *wyoung@spacecoast-react.org* or **www.spacecoast-react.org/conv2000.htm** Hams are invited to call the DCAT van K4EOC on 28.335; send QSL to 2000 REACT Convention, PO Box 260292, Melbourne, FL 32936-0292 for a commemorative certificate.

July 28-30: Special Event Station W9ZL

Appleton, WI - Fox Cities ARC will operate from world's biggest fly-in EAA Airventure 2000 at Wittman Regional Airport in Oshkosh, WI. SSB and RTTY in general portions of phone bands 9am-4pm CDT daily. QSLs to Wayne Pennings WD9FLJ, 913 N. Mason, Appleton, WI 54914 for certificate.

COMMUNICATIONS

The Ups and Downs of Ham Radio

An article last fall in a Dayton, OH, paper, lamented that a worldwide shortage of amateur radio operators is becoming a danger to emergency operations. Palm Beach Co, FL, Emergency Manager Bill O'Brien admitted, "The hams are usually the last-ditch communications with the shelters," and also with Caribbean islands hit by hurricanes.

The age of the ham population and the internet were given as the prime culprits for shrinking numbers. However, the headlines on an Albany, NY, paper this spring announced "Ham radio thrives in Internet age." Computers and the Internet are just another tool to be embraced by hobby tinkerers and experimenters, it said.

However, the biggest boost to amateur radio has been the restructuring which went into effect April 15th of this year. "Indications are that more than a year's worth of General and Extra Class amateurs could upgrade their license on April 15th alone!" said the May 1st *W5YI Report*."

For some in this rush to upgrade, it could be as long as six weeks from test to ticket. The ARRL is processing up to 500 applications a day using extra help and working overtime and weekends. Are you still waiting? You can check the status of ARRL-VEC test session processing at **www.arrl.org/arrlvec/status.html**.

Compton Ditched

In our May column, we speculated about whether 9-year-old ComptonGamma Ray Observatory would be preserved or ditched after one gyroscope failed. Not wanting to risk another Space Lab scenario, scientists made the difficult decision. In March, the Compton became the largest satellite to be intentionally burned up in a controlled reentry.

New Health Studies

After George Carlo was hired by the Cellular Telephone Industry Association (CTIA) to oversee research on the safety of cellular phones, he managed 40 studies around the nation. Two of those studies produced some disturbing results which he felt required more research. (The CTIA disagreed.) Until that research is done, Carlo cautions consumers that they should use a headset or earphone, purchase a low-power phone and keep conversations short.

Currently, the Food and Drug Administration (FDA) allows a "specific absorption rate" of 1.6 watts per kilogram. However, one study showed that with 24-hour exposure to radiation within the legal limit can break down DNA. The CTIA says it will cooperate with the FDA to follow up on this study.

The National Cancer Institute and World Health Organization plan their own studies. So does the State of California: A State Senate committee has endorsed a measure to require the state Department of Health Services to review the research and decide how to advise Calif. consumers.

Possible conclusions about electromagnetic fields around power lines and human health are equally muddy. The National Institute of Environmental Health Sciences reported that six years of studies have produced little hard evidence, and yet "lingering concerns" remain. Some statistical connection does seem to exist between the fields and childhood leukemia and chronic lymphocytic leukemia in adults exposed to EMF through their work, such as electric utility workers, machinists and welders.

National Cancer Institute researcher Kenneth Cantor has begun an epidemiological study of radio amateurs to evaluate whether causes of death among amateurs differ from those of the general population. A similar study done 15 years ago by Samuel Milham seemed to suggest evidence that RF energy caused "an excess of leukemia."

Cantor's study will include seven times as many men and women as the earlier Milham study; in the event of "apparent associations" a follow-up study will be conducted, which the Milham study did not attempt.

Act of God?

Vatican Radio SW transmitters near Rome at Santa Maria di Galeria are being investigated over claims that electromagnetic pollution is causing cancer among local residents. The Vatican maintains that Italy has no jurisdiction due to the site's extra-territorial status (Bruce Johnston, *Daily Telegraph* via Mike Barraclough)

On the First Day, God Created Static

A *Washington Post* story quoted Charles L. Bennett, WA3PEU, of the Goddard Space Flight Center. The article said Cosmic Microwave Background photons that were around 300,000 years after the "Big Bang" about 15 billion years ago make up about 1 percent of the static noise picked up by a home TV antenna today.

"Communications" is compiled by Rachel Baughn, editor, from newspaper clippings sent in or emailed by our readers. Thanks to this month's contributors: Anonymous, Albany, NY; Bown, Salt Lake City, UT; Fred Chesson, Waterbury, CT; Dale Demerest, Zeeland, MI; William Hochstatter, Colfax, WA; Kevin Klein, Neenah, WI; David Parsons, Tucson, AZ; Doug Robertson, Oxnard, CA; Brian Rogers, Melvindale, MI. *Via email:* Roger Cravens, Patrick Griffith, Maryanne Kehoe, Gayle and Larry Van Horn, Robert Wyman, *ARRL Bulletin, W5YI Report*

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New Monitoring Frontiers

Tuning into Space Action on the AMSATs

By Ken Reitz KS4ZR

While amateur radio operators eagerly anticipate the successful launch of the latest and most sophisticated amateur radio satellite, known as Phase 3D, some 20,000 hams around the world have been enjoying operating the sizable constellation of existing AMSATs for the last ten years. Using every conceivable mode of operating from Morse code (CW) to Single Side Band (SSB), from FM voice to digital data, hams are communicating daily on a system of home-made Low Earth Orbit (LEO) satellites built, launched and flown by volunteers using donated parts and equipment. All of this action is taking place in space on satellites zipping over your listening post every day.

With a minimum of equipment, a shortwave receiver or a scanner, and simple antennas, you can begin tuning into the action from space in no time at all. Best of all, since most AMSAT operations take place on frequencies for which Technician Class license holders are eligible, you can actually join in the fun with just a little study and effort.

The Sky's No Limit

The saga of hams in space dates back almost 40 years with the successful launch of the primitive and short-lived OSCAR 1. That was the beginning when the Amateur Radio Satellite Corporation (known now as AMSAT) began its journey of space successes which rivals any commercial venture. Since then a growing cadre of dedicated amateur radio enthusiasts worldwide have combined their talents to produce ever more sophisticated satellites and antennas with which to work them. Targets for their activities include LEO AMSATs and those with highly elliptical orbits, a category into which Phase 3D falls, as well as the Earth's own natural satellite the Moon. Elliptical orbit and Earth-Moon-Earth (EME or *moonbounce*) transmissions take considerable equipment and expense and it's here that the hobby of working the AMSATs has earned its reputation as a money drain. But, the amateur radio hobby is all about doing more with less, and many hams have taken the challenge to work the AMSATs as cheaply as possible.

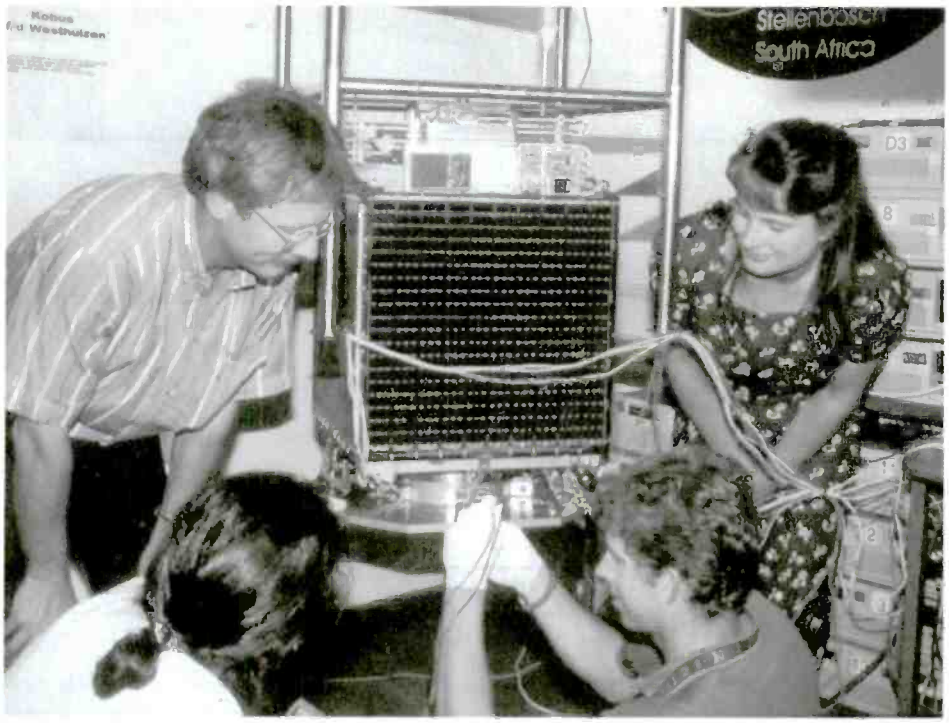
This spirit is what drives AMSAT's project teams. As current AMSAT President Keith Baker KB1SF says, "Many of our experimenters do what they do precisely because it isn't a commercial venture! They are free to tinker and experiment to their heart's content without always having to justify their activities against some Board of Director's 'bottom line'..." He adds, "...These forces are powerful motivators that attract many of the best and brightest in the space business to our doorstep."

The QSL card from SunSat

And, these experimenters are not just North Americans. Satellites designed and built by teams from Russia, England, Germany, Japan, Israel, Australia and others have all made their mark in space. Not only does AMSAT show how sophisticated satellite technology can be built and launched by volunteers, but it's also a demonstration of international cooperation among people whose political agendas are checked at the door.

Aside from carving out new monetary frontiers, amateur satellite hobbyists have also sought to move the technology bar ever higher. Not content to operate in painfully slow voice and CW modes, AMSAT operators have pushed into the realm of highspeed data and digital transmissions which can send greater amounts of information in a relatively short time. That's particularly useful because the amount of time available during LEO satellite pass over your location is likely to be less than 10 minutes.

Now, if you're thinking that these satellites are anything like their commercially developed siblings, you're completely off. Typical commercial satellites such as those used to transmit satellite TV are classified as "standard satellites" and weigh in at 2,200 pounds or more. Phase 3 D, which at 7-ft across and 3-ft high is AMSAT's biggest satellite to date, is actually considered a "small sat." Most AMSATs are considered "micro sats" weighing just 20 pounds and are typically a 9-inch cube! What's next? Believe ir or not, "nanosats" and "picosats!"



SunSat was designed and built at the University of Stellenbosch near Capetown (courtesy http://sunsat.ee.sun.ac.za)

Operating Rewards

As with all ham radio and shortwave listening (SWL) activities there's plenty of opportunity to plaster the walls with evidence of your operating achievement, and the AMSATs are no different. Aside from collecting QSL cards from the various actual on-air contacts, there are at least a dozen awards for operators to shoot for. The easiest is the "Satellite Communicators' Club." Similar to HF's Rag Chewer's Club, the SCD is for making one satellite contact. On the other extreme is the "W4AMI Satellite Operator Achievement Award" for making 1,000 two-way contacts with any station on any satellite. Check out the AMSAT website for details of these and other awards. Additionally, there is the Cosmos-RS Award offered by the Radio Sport Federation of Russia which is open to SWLs as well as hams. Details on this award are found at **www.amsatnet.com/cosmos.html**.

Among the most sought after contacts for amateur satellite operators are the *Mir* space station and the U.S. Space Shuttle. Both have amateur radio stations on board and are sporadically active (see chart). Since *Mir* has been occupied for long stretches of time by international crews including Americans, the R0MIR call sign has seen a lot of activity. Anyone bothering to tune a scanner to the *Mir* 2 meter frequency during the crises several years ago won't forget the frantic activity heard on that channel. Indeed, U.S. astronaut Shannon Lucid stated that during her tenure on *Mir*, the amateur radio packet station made daily contacts with her family possible and the whole experience so much better.

The Shuttle, with its less frequent missions of shorter duration, is a much harder contact to make. Astronaut Ron Parise, WA4SIR, speaking at a *Monitoring Times* convention several years ago, played a tape for those present of American hams calling on the Shuttle frequency as it streaked across the U.S. The ensuing mayhem, blaring out the tape recorder's speaker, of hams calling the shuttle had to be heard to be believed. If you've ever actually contacted the Shuttle by voice, consider yourself very lucky.

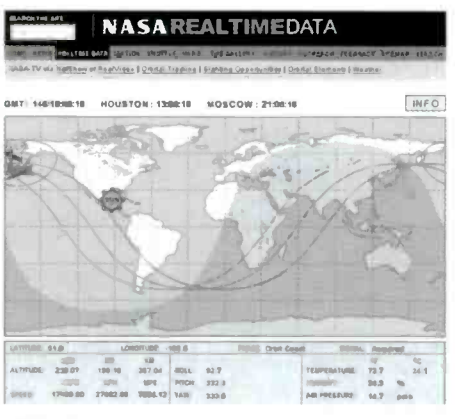
The next location for human space action will be on the International Space Station (ISS). Throughout the rest of this year, if anything goes according to schedule, several Shuttle missions will be made to bring supplies, building materials and amateur radio gear to the ISS. It's hoped that the larger ISS will also allow astronaut/hams to install more than just VHF/UHF equipment. An HF station may not be out of the question!

So, just how do you know when the Shuttle, *Mir* or any other satellite is near your location? Most AMSAT operators use one of many commercially available tracking programs designed to keep up with all available spacecraft. But, before you decide on one you may want to ask others what they use. For an idea of how these programs work, check out the one by NASA at **http://spaceflight.nasa.gov/realdata/index.html**. This site requires a computer running at 166 MHz or better. All tracking programs are based on constantly updated Keplerian Element sets which are the computations which predict the satellite path. These sets must be updated regularly, which is why it's a good idea to start at the NASA site where they do all the leg work for you.

Listener's Guide to the AMSATs

Satellite	AMSAT	Downlink Frequency	Mode	Designation (MHz)
Radio Sport	RS-13	29.460-29.500	CW/SSB	
Radio Sport	RS-15	29.354-29.394	CW/SSB*	
OSCAR 10	AO-10	145.975-145.825	CW/USB	
AMRAD	AO-27	145.850	FM	
UOSAT	UO-14	435.070	FM	
SUNSAT	SO-35	145.825	FM	
JAS-1b	FO-20	435.800-435-900	CW/USB	
JAS-2	FO-29	435.800-435.900	CW/USB	
KITSAT	KO-25	436.500	FM	
UOSAT	UO-22	435.120	FM	
OSCAR 11	AO-11	145.825	FM 1200 baud AFSK	
LUSAT	LO-19	437.125	CW	
PACSAT	AO-16	437.025	SSB RC-BPSK 1200 baud PSK	
TMSAT-1	TO-31	436-925	9600 baud FSK	
UOSAT-12	UO-12	437.0-025-437.400	9600 baud FSK	
ITAMSAT	IO-26	435.822	SSB	

With Russia's *Mir* space station back in operation (see page 70) monitor 145.985 (FM) voice simplex and SSTV (Robot 36 Mode). There's no current U.S. Space Shuttle activity, but, when there is check out 145.550 MHz for FM voice and packet.
*Unofficial SSB meeting frequency 29.380 MHz



One of NASA's satellite tracking programs available on their website.

Looking Backwards & Forward

In just 40 years AMSAT has grown from a few hams with the ways and means to work the amateur satellites to tens of thousands of hams with modest means enjoying more than just traditional HF activity. This march of technology is due in no small part to the persistent efforts of those volunteer space engineers and scientists who have continued to pursue their passion for space and amateur radio.

Indeed, AMSAT can probably claim credit for some of the current high tech action in the commercial space sector. As AMSAT's Baker notes, "... there is no doubt that teams of International AMSAT volunteers have, quite literally, invented whole new communications technologies, and in some cases, have laid the exploratory groundwork so that others can launch entirely new commercial telecommunication industries in the process. A classic example of this is the store-and-forward packet communications satellite messaging technology that was at least perfected, if not 'invented' by AMSAT's volunteers."

Baker points out that "...ongoing partnerships with various educational satellite projects at a number of colleges and universities ...assure that there will be a continuing supply of these satellites always in the pipeline. This approach...releases our more experienced international experimenters to concentrate their advanced knowledge and efforts on the more exotic stuff...amateur satellites destined for Lunar orbit, or possibly onward and outward to Mars, for example."

Noting the struggle at the WARC 2000 conference in Turkey this spring, Baker warns, "...nothing in amateur radio happens without our continued access to frequencies. I'd like to think that the contributions made by AMSAT groups, acting in partnership around the world and advancing the state of the radio art over the years, has helped us justify our continued access to those frequencies at international telecommunications meetings that decide such things ... AMSAT's work has become a superb example of how hams are being good stewards of our frequency spectrum...spectrum that we often simply take for granted as being 'ours' forever."

AMSAT

Part of the international team that recently assembled at the Phase 3D Integration Laboratory in Orlando, Florida. The team included participants from seven countries.

AMSAT HF Networks

Net Designation	Day	Time	Frequency
AMSAT International	Sunday	1900 (UTC)	14.282 MHz
AMSAT International	Sunday	1900 (UTC)	21.280 MHz*
AMSAT International	Sunday	2300 (UTC)	18.155 MHz*
AMSAT-NA East Coast	Tuesday	2100 (Local)	3.840 MHz
AMSAT-NA Mid-American	Tuesday	2100 (Local)	3.840 MHz
AMSAT-NA West Coast	Tuesday	2100 (Local)	3.840 MHz

*active only during favorable winter propagation.

A list of local AMSAT nets on 2 meter repeaters can be found at **www.amsat.org/amsat/activity.html**

Informed Sources

Where To Go for More AMSAT Info

An amazing amount of information on amateur satellite activity is readily available. Here are just a few of the more interesting places to start your AMSAT quest. Remember, you don't have to be a ham to enjoy listening to all the modes on the various AMSATs. In fact, it's easier to get started in this hobby by listening first. Not only is it cheaper, but you'll get a good working background in operating procedure without having to make the usual "newbie" mistakes.

I recommend subscribing via E-mail to two excellent sources of amateur satellite information: Dan James' *AMSAT News Service* (ANS) a weekly publication, and John Magliacane's *SpaceNews*, a bi-weekly publication. The ANS typically runs more than 10 printed pages and *SpaceNews* usually 3 pages. Both cover the latest news and information concerning AMSATs including *Mir* and Shuttle updates. While some information overlaps, I find I can't do without either. You may subscribe to these and a host of other publications at **www.amsat.org**.

To get started in amateur satellite operating there's no better place than a 42 page article entitled "How To Work the EZ Sats" by Gary Rogers, WA4YMZ, which is available on the AMSAT website at **www.amsat.org/amsat/features/ymzintro.html**. The easy-to-read text gives a rundown on the satellites Rogers recommends as the easiest way to get a start in this part of the hobby. I recommend downloading a copy, printing it out and keeping it at your listening post. You'll find yourself referring to it over and over as you dig deeper into the AMSAT universe.

There's one really great way to keep track of all of the international space action and that's at **www.spacedaily.com**. While this is mostly a site for commercial space activity, it's up to date, accurate and has an excellent archive of previous articles as well as extensive links to other space related sites. It's a great educational tool for learning more about satellites and space.

The Amateur Radio Relay Leagues's monthly magazine, *QST*, routinely publishes extensive features and cover stories on the AMSATs. The April 2000 issue has a well-written piece by Steve Ford, WB8IMY, entitled "An Amateur Satellite Primer." This six-page intro to the AMSATS is filled with great tips on working CW, FM and Packet satellites. It happens that this particular issue of *QST* also has an article on the far more advanced reception of high-resolution digital imaging. "Step Up to the 38,400 Bps Digital Satellites" by Stacey Mills, W4SM, is not for the beginner, but does give one an idea of where things in this part of the amateur radio hobby are headed.

The Houston AMSAT Net, Bruce Paige KK5DO net controller, is a weekly get-together of some of the most informed and active AMSAT enthusiasts to be found anywhere. You can hear the Houston AMSAT Net in real time on the web at **www.amsatnet.com/**. "Tune in" at 9 pm Eastern, 8 Central. Hams in your region of the country get together every week to talk satellites and you can tune in to listen (see "AMSAT HF Networks" chart).

Those interested in the history of amateur satellites will find a genuine treasure trove at the ASMSAT website in the section called "Sounds from the First Satellites." Here Roy Welch, W0SL, has collected actual audio recordings of some of the first satellites ever heard. These sound files were recorded by Welch in the late 50s and early 60s and include Sputnik 1, OSCAR 1, Explorer 1 and an Earth-Moon-Earth transmission from 1965. Listen to these recordings at **www.amsat.org/amsat/features/sounds/firstsat.html**.

And, finally, here's an opportunity to be able to actually transmit on the AMSATs. Study guides for the entry level amateur radio license are available at most Radio Shack stores or through the American Radio Relay League at **www.arrl.org**. The information is basic, not too hard, and paves the way toward new and exiting horizons in your radio hobby.

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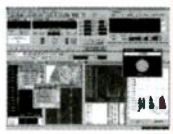

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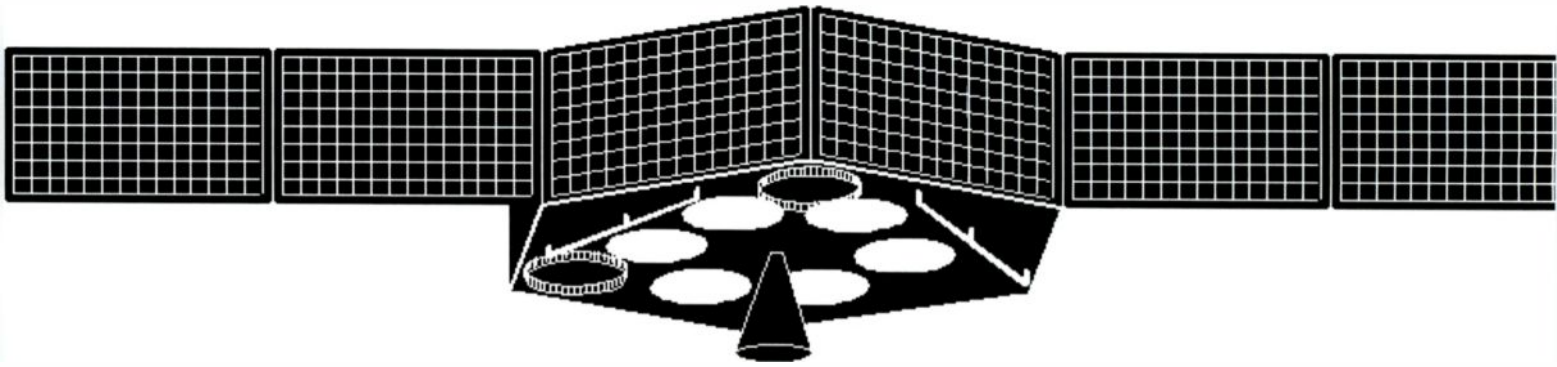


Phase 3D: Amateur Radio's Next Generation Satellite

By John A. Magliacane, KD2BD
kd2bd@amsat.org

When Sputnik 1 was launched into orbit on October 4, 1957, the space age was born and the fields of science, engineering, and electronic communications were forever changed. From very early on, amateur radio operators wasted no time in getting involved in emerging space technologies. In fact, communication satellites have been a part of the Amateur Radio Service for nearly 39 years.

This month, amateur radio's next generation spacecraft, the Phase 3D satellite, is scheduled to be placed into orbit. This satellite represents the culmination of decades of research and development by countless individuals from many nations who together have designed, built, and launched dozens of communication satellites dedicated to amateur radio communications and scientific research.

To better understand the significance of the Phase 3D satellite, let's take a look at how the amateur space program got started, how it has progressed over the years, and what it is about this latest satellite that makes it so important to the world of wireless communications.

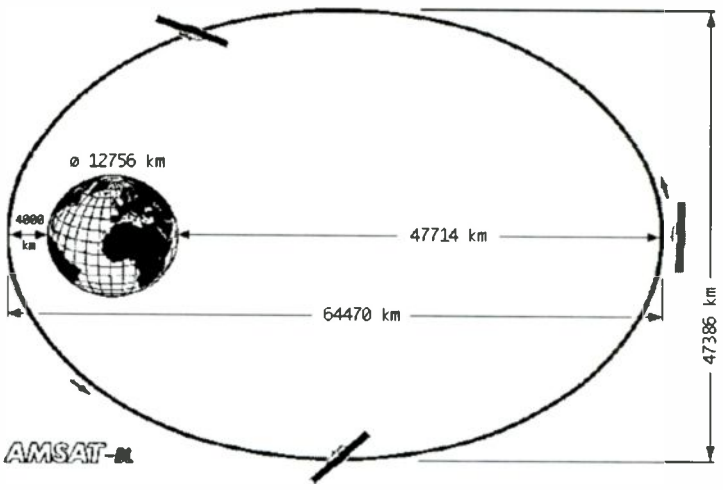


Figure 1: Phase 3D's high altitude elliptical orbit will carry the spacecraft to over 47,000 km above the Earth's orbit. (Photo via AMSAT-NA's Web Site)

It Started With $26 Worth of Parts

The amateur space program got its start back on December 12, 1961, when OSCAR-1, the world's first non-governmental satellite, was launched into earth orbit. This tiny spacecraft was built by a group of amateur radio operators working on their own behalf using just $26 worth of surplus parts.

OSCAR-1 was carried to an orbital altitude of 430 kilometers along with the much larger Discoverer 36 spacecraft by an Agena-Thor rocket launched from Vandenberg Air Force Base in California. OSCAR-1's only payload was a 140 milliwatt CW Morse telegraphy beacon transmitter powered by three 18-volt mercury batteries connected in a parallel arrangement. The beacon transmitted the letters "HI" in Morse code.

"HI" is internationally recognized friendly salutation greeting used by amateur radio operators. It was chosen as an identifier because it was relatively easy to generate using basic logic circuits, and because it possessed a low duty cycle, which was an important consideration for the design of a satellite operating under expendable battery power.

OSCAR-1's beacon transmitter operated on a carrier frequency of 144.983 MHz in the lower portion of the 2-meter band. The speed of the telegraphy was controlled by an internal temperature sensor on board the spacecraft. This novel form of telemetry permitted OSCAR satellite designers, as well as others who received the beacon transmissions from the spacecraft, their first glimpse at the actual "living conditions" on-board a tiny spacecraft in low earth orbit. OSCAR-1 continued to operate for 21 days until its internal battery power finally exhausted. The spacecraft later decayed in the earth's atmosphere on January 31, 1962.

Despite its short life, OSCAR-1's success, coupled with overwhelming support from over 570 amateur radio operators in 28 countries around the world who logged transmissions made by the tiny satellite, gave spacecraft designers all the ambition they needed to move on toward designing and building larger and more capable satellites carrying amateur radio communications equipment.

The Many Phases of Amateur Spacecraft

OSCAR-1, along with later amateur radio spacecraft such as OSCAR-2, OSCAR-5, and Russian ISKRA 2 and 3 satellites, were considered Phase 1 satellites. Phase 1 satellites are characterized as being short-lived experimental spacecraft that operate from a low-earth orbit.

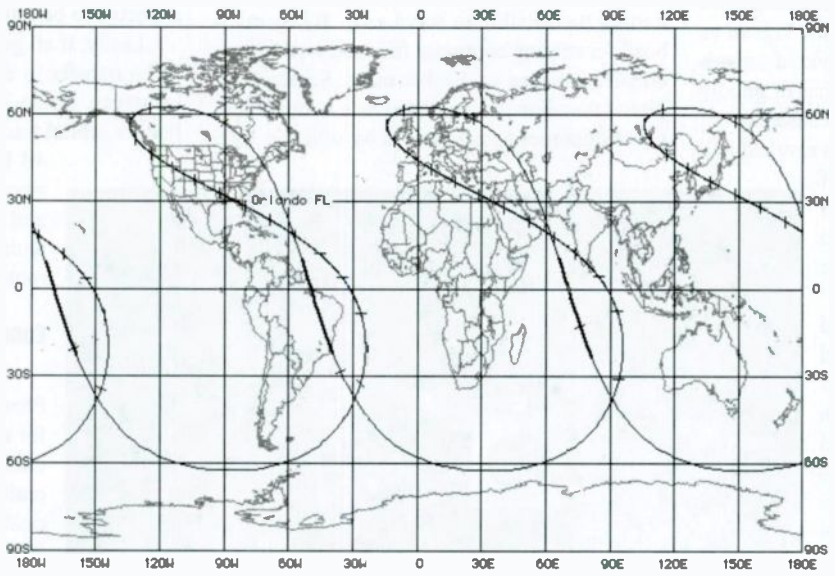
Advancing satellite technology gave rise to more sophisticated Phase 2 satellites that were characterized as being long-lived, developmental, operational spacecraft operating from low-earth orbits. Phase 2 satellites were designed for general amateur radio communications use, and even to this day represent the largest number of orbiting satellites carrying amateur radio transponders. By 1983, it was estimated that between 10,000 and 20,000 radio amateurs worldwide had communicated through a Phase 2 spacecraft.

Through years of use, OSCAR satellites clearly proved themselves as being considerably

more dependable than relying on favorable solar terrestrial conditions and the Earth's ionosphere for long-distance communications on shortwave radio frequencies. It soon became apparent, however, that if intercontinental communication distances were going to be covered reliably via satellite, then the orbital altitude of future satellites would have to be raised over that used by Phase 2 spacecraft.

Simply raising the altitude of a communications satellite alone would not improve the situation completely. In fact, a higher altitude would introduce problems not seen in a low-earth orbiting spacecraft. While a higher orbit would certainly increase the operational range or "footprint" of the spacecraft, it would also subject the satellite's electronics to much higher levels of ionizing radiation if the altitude approached that of the Earth's Van Allen radiation belts.

And, while the lower orbital velocity of the satellite would keep it in range of groundstations for longer periods of time, it would also keep it out of range for longer periods of time as well. A geostationary satellite, while attractive at first glance, would only serve slightly less than half the Earth, thereby limiting its use as a world-wide communications resource.



Typical Phase 3-D ground track for two days (3 orbits)

Figure 2: Phase 3D's groundtrack will repeat every 48 hours. (Photo via AMSAT-NA's Web Site)

Eccentricity to the Rescue

As it turns out, some strong advantages can be realized by placing a communications satellite in a highly elliptical orbit, rather than one that is nominally circular. In fact, things get really interesting if the orbit's eccentricity is set between 0.6 and 0.7, the inclination is 63.4 degrees, and the orbital period is between 8 and 12 hours.

An orbit having these characteristics is known as a Molniya orbit, and is named after the Russian Molniya satellites that in the past were used for the Moscow/Washington Hotline. Such spacecraft serving this duty maintained an 8 to 9 hour mutual visibility window between Moscow and Washington, D.C., per orbit. With two orbits occurring per day, one such satellite provided about 12 hours of coverage between the two cities. A three-satellite Molniya constellation provided 24 hour per day communications coverage between both capitals.

A satellite in an elliptical orbit is beneficial to communications because a satellite in such an orbit spends most of its time at distances approaching or exceeding those of geostationary satellites, but also quickly "sling-shots" around the Earth on a much closer approach, and then swings out again to far distances serve another region of the planet for long periods of time. In this manner, great communication distances can be served by the satellite, and no region of the Earth will necessarily be left without service.

When the satellite is at its farthest distance from Earth in its orbit (apogee), it moves very slowly in its orbit. This greatly minimizes the effects of Doppler shift, and makes communication on higher frequencies more practical as a result. The slow apparent motion of the satellite also makes tracking very simple. In fact, highly directional antennas can be essentially "parked" in place for hours at a time while communicating through a communications satellite in elliptical orbit at apogee, without having to frequently adjust the azimuth or elevation pointing angles of the antenna array.

Of course, there are some drawbacks to having a communications satellite in elliptical orbit. Simple map-based tracking methods that enjoyed popularity prior to the availability of affordable personal computers become complicated when trying to predict passes of satellites in elliptical orbit. The good news is that modern computer-based tracking methods handle elliptical orbits splendidly.

Another problem is that it takes stronger radio signals to span the much greater distance needed to communicate with a satellite at high altitudes. This problem is solved by using higher power transponders and high-gain antennas on the spacecraft to compensate for the greater distances the radio signals must travel when the satellite is at apogee.

Finally, a satellite cannot simply be "dropped" directly into a high altitude elliptical orbit. It must first be deployed by a launch vehicle, and temporarily placed into a low-altitude circular transfer orbit. It then must use its own thrusters to modify this orbit into one that is highly elliptical. Having thrusters powered by explosive chemicals onboard a satellite complicates the design of the spacecraft tremendously. It also takes great engineering on the part of the spacecraft designers and controllers to successfully thrust the satellite into a high altitude elliptical orbit when the time is right.

The Phase 3A Satellite

The first amateur radio communication satellite designed to operate from a high altitude elliptical orbit was the Phase 3A spacecraft. Phase 3A was designed and built in the late 1970s, and launched from Kourou, French Guiana, by an Ariane rocket on May 23, 1980. Its intent was to serve as a reliable, long distance communications relay.

Unfortunately, a problem with the Ariane launch vehicle shortly after liftoff caused the rocket and its payloads to plunge into the Atlantic Ocean. As a result of the loss of the Phase 3A spacecraft, May 23, 1980, became known as "Black Friday." The accident was a tremendous setback for the European Space Agency as well as for AMSAT.

Phase 3B

Despite the tragedy, AMSAT licked its wounds and quickly began work on a successor, the Phase 3B spacecraft. Phase 3B successfully made it into orbit on June 16, 1983, but difficulties were encountered with its orbital placement. The Ariane rocket's third stage bumped the Phase 3B satellite twice shortly after separation from the launch vehicle.

The collision partially damaged Phase 3B's 2meter antenna, and modified the orientation and spin of the spacecraft to the point of subjecting it to temperatures far below those for which it was designed. This caused problems with the operation of the spacecraft's thrusters. Two kick motor firings were needed to reach the planned orbit; however, only the first firing was successful. As a result, Phase 3B ended up in an orbit entirely different than the one intended.

Despite these problems, the Phase 3B satellite was commissioned and became available for general use as AMSAT-OSCAR-10 satellite. Still providing communications service to the world,

it is the oldest and the largest operating amateur satellite in orbit.

AMSAT-OSCAR-10 suffered an on-board computer malfunction in December 1986 that made it impossible for groundstations to perform seasonal attitude adjustments on-board the spacecraft. While it was feared that the spacecraft would be quickly lost as a result of this malfunction, careful use by groundstations has extended its life to the present day. Despite some minor inconveniences, OSCAR-10 continues to remain an excellent communications resource.

Phase 3C

A third Phase 3 spacecraft was launched on June 15, 1988. This satellite became known as AMSAT-OSCAR-13, and it provided superb performance, but for far less time than originally anticipated. Orbital perturbations caused by the moon and other combining factors resulted in a sudden and premature decay of OSCAR-13's orbit. The satellite fell silent on November 24, 1996, and decayed in the Earth's atmosphere 11 days later.

In hindsight, it was discovered that if OSCAR-13 was launched only one hour earlier, or two weeks later, or if the second thruster burn had been deferred for several months, the orbital parameters would have been changed a sufficient amount to avoid the orbital perturbations that resulted in the premature demise of OSCAR-13.

Phase 3D

The first three Phase 3 spacecraft were designed with radio communications as their first priority, and this is also true of the Phase 3D satellite as well. Many of the lessons learned throughout the entire 39 years history of the amateur space program are reflected in the design of Phase 3D. Phase 3D isn't simply a replacement for the earlier Phase 3 satellites. It goes far beyond that.

While earlier satellites carried one or two communication transponders, Phase 3D carries a number of uplink receivers whose outputs are connected to a matrix. The matrix, in turn, is connected to a number of downlink transmitters. The combination of the receiver and transmitter forms a linear transponder that is capable of relaying single-sideband, CW, RTTY, and other forms of linear communications.

While this is nothing new, the matrix allows an unprecedented variety of uplink/downlink combinations. Phase 3D carries receivers for portions of the 15-meter, 2-meter, 70-cm, 23-cm, 13-cm, and 6-cm bands. Powerful downlinks will be available in the 10-meter, 2-meter, 70-cm, 13-cm, 3-cm, and 1.5-cm bands. See Ed Krome's companion article for details on the actual frequencies used and the equipment needed to communicate with Phase 3D on these bands.

Of particular interest to general radio enthusiasts is the 10-meter downlink on 29.330 MHz. This downlink is actually an AM voice beacon transmitter capable of relaying news and information about the operation and status of the satellite to groundstations. The downlink strength and the modulation method of this beacon has been chosen specifically to be easily copied on low-cost receiver and antenna combinations.

A number of digital store-and-forward transponders are included on Phase 3D as well, permitting the satellite to serve as a "flying mailbox" for sharing computer files and exchanging e-mail messages with other users. Some of the digital transponders will take data communication techniques to new levels by utilizing high speeds and new modulation methods. By acting as a test-bed for innovative modulation methods, Phase 3D is expected to encourage research and development in the field of high-speed communication technologies.

Figure 3: The SCOPE camera on Phase 3D will image the Earth, Moon, and nearby planets. (Photo via AMSAT-NA's Web Site)

More Than Just Amateur Radio

Another exciting feature of the Phase 3D spacecraft will be a payload it is carrying known as the Spacecraft Camera experiment for Observation of Planets and the Earth, or "SCOPE." SCOPE is a microprocessor-based high resolution digital camera designed to provide images of the Earth, Moon, and nearby planets. In essence, the SCOPE camera will allow Phase 3D to serve as a small "Hubble Space Telescope," and even permit general Phase 3D satellite users some control over how the camera is used. Images taken by the SCOPE camera will be available via a packet radio downlink.

Phase 3D will also carry global positioning satellite (GPS) receivers for several purposes. First, GPS navigation will be used to determine the position and motion of the satellite in its orbit around the Earth. Second, the Phase 3D satellite will conduct experiments to analyze and eventually map the radiation pattern of the GPS satellite constellation. While GPS satellites are generally used to determine global positions on the Earth's surface hundreds of miles below the altitude of the GPS satellites themselves, Phase 3D will listen into GPS signals from high above the orbits of the satellites themselves. Since this has never been done before, and since the radiation pattern of the GPS satellite constellation from outside their orbits is unknown even to GPS satellite owners, some very interesting data is expected to be returned from this experiment.

Lastly, if all goes as planned at launch, and if the transfer to elliptical orbit is nominal and on target, Phase 3D's final orbit will be such that its orbital track will repeat regularly every 48 hours. This regularity will greatly simplify antenna tracking, and make scheduling contacts with friends a half a world a way, routine and predictable.

Conclusion

As the early Phase 1 and Phase 2 satellites paved the road for advanced communication satellites such as the Phase 3 spacecraft, so will the Phase 3D spacecraft serve as a gateway to more advanced projects, both on and off the satellite. Phase 3D is expected to deliver reliable, long distance communication unlike those ever seen before in the Amateur Radio Service.

Throughout the history of the space program, we have seen governments and large corporations build and launch spacecraft, only to find amateurs working to duplicate those efforts in a more efficient manner. The best is yet to come.

About the Author:

John A. Magliacane, KD2BD, has strong interests in RF communication systems, hardware design, software development, and networking solutions using the Linux operating system. He holds both amateur and commercial FCC radio licenses, and has earned college degrees in Electronics Engineering Technology, Computer Science, and Physics. He's editor of *SpaceNews* and was a columnist for *Satellite Times* during the four years of its existence.

Hearing Phase 3D: A Primer on Satellite Groundstations

By Ed Krome K9EK
k9ek@amsat.org

By the time this is published, AMSAT Phase IIID should be just about ready to head for the heavens. This incredible bird, almost 10 years in the making, will usher in a whole new chapter in the 39-year ham radio satellite saga. If you haven't read John Magliacane's companion article, it is must reading.

With all this enthusiasm, the obvious question is how can I participate? Sounds difficult and expensive; for experts only. Well, like a lot of things, the place to start is at the beginning. Understanding the basics of what it takes and how to do it will take some of the trepidation out of the whole thing. But the magic will remain!

Even for licensed ham radio operators, the place to start enjoying satellites is by listening to them. With P3D, this should be relatively painless. Many hams and SWLs already have either the appropriate equipment or need to add only minimal, inexpensive gear.

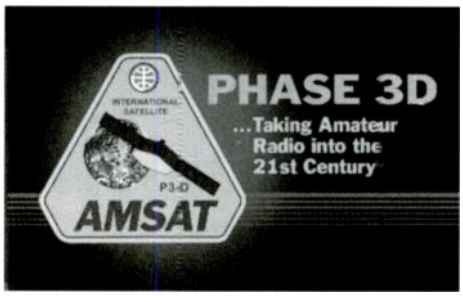
Receiving the transmissions from a satellite takes three basic things 1) knowing where and when to look for it 2) having the antennas to pull the signals out of the ether and 3) the receivers to hear it.

Finding the signal

First, where and when to look for the satellite. The first ham satellites had beacon "downlinks" on the 2-meter band, and were in low, circular orbits, referred to as "LEO's" (Low Earth Orbit). Well-equipped ham stations could hear their weak CW (Morse code) voices with simple antennas. This was before the days of tracking programs. After you heard the satellite a few times, you could determine the "period" (time for one complete orbit), and make a fair guess when you might hear it again.

A few years further down the road, a transparent overlay graphical tracking device called the "OSCAR Locator" was developed. Once the OSCAR Locator user had reference times of equator crossings for a given satellite, he could predict where and when the satellite would again appear over the horizon, and where it would head. Once you got the hang of it, it worked quite well. The reference equator crossings were either printed or transmitted on nets over the ham bands.

Then Dr. Tom Clark W3IWI and others changed all of that. The advent of early personal computers, Apple, Commodore 64, VIC 20 and TI-99/4A, provided the platforms for accurate and reliable orbital prediction. With these programs, the satellite enthusiast could accurately



predict when the satellite would become "available" (over the horizon where the antennas could "see" it) and know exactly where to point directional antennas. Pointing is specified by "azimuth," which is a fancy way of saying degrees clockwise from true North and "elevation," where 0 degrees elevation is straight out flat at the horizon and 90 degrees is straight up overhead.

These satellite orbital prediction programs have evolved into amazing pieces of technology, almost art. Graphics are incredible. Even if you never use them to track a satellite, they are fascinating works, and highly instructive. These IBM and Mac tracking programs, available from AMSAT for a nominal donation, are still the most elegant and satisfactory method of satellite tracking. It is even possible to tie one's antennas into the computer, so that the antennas automatically follow the satellite. One of AMSAT's major sources of income is from the sales of these programs.

While a tracking program is highly recommended, it is likely that initial orbital information will be published on the Web. But P3D will simplify casual tracking even further. The orbit of P3D differs from that of the early LEOs in that it is a "high elliptical" orbit. This elliptical path will be about 65,000 kilometers (40,625 miles) long by 47,000 kilometers (29,375 miles) wide. At "perigee" (closest approach to Earth), the satellite will pass within 4000 kilometers (2500 miles) of the ground. "Apogee" (furthest point from Earth) will be about 48,000 kilometers (30,000 miles) away. The desired orbit will have a "period" (the time for one complete orbit) of 16 hours. This will mean that every 48 hours, the Earth and P3D will be in sync; the satellite will reappear at the same time and place in the sky every other day! So, once you find it the first time (from the Web or some other source, such as listening in on an AMSAT Net), you know where to find it again.

How can this be, you ask? Remember that the Earth rotates every 24 hours. If it takes P3D 16 hours to do one complete orbit, the Earth will have rotated 240 degrees during that same time. 16 hours later, 240 degrees more. After three orbits of the satellite (48 hours), the Earth will have made two complete rotations itself. And, to the observer on the ground, the satellite will reappear at the same place it was seen 48 hours before.

Antennas

Once we know where and when to expect the satellite, it is necessary to have some means of catching the satellite's signals. P3D itself is

bristling with antennas for all satellite-allocated ham bands between 21 MHz and 24 GHz. Most of these antennas are directional arrays located on one "end" of the satellite. On the other "end" are omni-directional antennas for three bands, 2-meters, 70-centimeters and 23-centimeters. Both operating schedules and position in orbit determine which antennas are in use. When the satellite is close to Earth, the omni's will probably be in use. Through most of the orbit, the directionals will be pointed toward the Earth. A remarkably sophisticated stabilizing and control arrangement has been built into P3D that can keep the directional antennas pointed straight at the Earth through the entire orbit!

The most important part of satellite reception is the thing that grabs the signal out of the ether, the antenna. It doesn't matter how good your receiver is if the antenna doesn't capture something for it to work on. P3D has strong transmitters and large, directional antennas. But ultimate quality of reception on the ground is still a matter of the size of the groundstation antenna and how efficiently the signal is routed to the receiver.

Listening antennas can range from as simple as a ground plane or vertical monitoring antenna to a sophisticated tracking array. When the bird is close to the Earth, its signals will be very strong. That's good for the listener, in that it is likely that simple omni-directional antennas will provide satisfactory listening through at least a portion of the orbit. All the listener has to do is be there! The chart on page 22 details predicted performance with various antennas. Note that this is not to imply that armchair copy will be available with simple antennas throughout the entire P3D orbit. The signals from the bird's powerful transmitters and large directional antennas are still subject to huge "path loss" at these distances. But the simple antennas will at least allow the casual observer to sample QSOs (radio contacts) and telemetry from P3D before moving on to bigger and better antennas.

Many hams already have directional antennas for 2-meters, since 2-meters is the most popular ham band. An antenna designed for 2-meter FM should work just fine for receiving P3D. What? Aren't 2-meter FM signals polarized differently from 2-meter SSB/CW signals? After all, we rotate FM antennas so the elements are vertical. Well, to the satellite, it doesn't matter at all. All of the satellite's antennas are "right-hand circularly polarized," which is to say the waves from them rotate. This is done because terrestrial polarization is referenced to the Earth, and becomes meaningless in space. When we receive a circularly polarized signal on a linearly polarized antenna, the penalty is a barely-audible 3dB of loss of signal strength. For the ultimate reception, we use circularly polarized groundstation antennas, but, as proven on AO10 and AO13, they are not strictly necessary.

Ah, but if I have a directional antenna, pointed at the horizon, how do I receive a satellite that is up above the horizon? The answer is, just do it! Antennas, even highly directional ones, have a beamwidth. They capture signals over some angle, with the strength of signals captured decreasing as the angle increases. So, antennas that point at the horizon are entirely usable when the satellite is from just visible at the horizon to some distance above the horizon. Just follow the path of the satellite in the rotational, or azimuth direction. Experience with other high elliptical orbit satellites has shown that sometimes the vertical angle which provides a useful signal is surprisingly large. The same applies to transmitting. Try it!

Receivers

The next piece of the satellite listening puzzle is the actual receiver itself. The groundrules are simple. It has to be a radio that tunes the desired frequency and is capable of receiving the desired modes. FM voice will not be permitted for general use on P3D, since the 100% duty cycle of FM hogs power from the rest of the satellite. Voice communications are single side band (SSB).

The Icom IC-821H dual band transceiver

If you are interested in the digital modes, you will love P3D. Many modern receivers are already adapted for digital, with a separate receiver output connector that bypasses some of the internal filtering and limiting functions. P3D has a LOT of digital modes, including two hardwired 9600-baud modes and at least eight "agile" (programmable from the ground) modems. Beacon telemetry will be 400 baud BPSK and 10 WPM CW and probably others. There will even be experiments at up to 153 kilobaud! Additionally, there are several cameras on P3D, as well as GPS experiments. As they say, stay tuned.

The final frequency list on page 22 shows where each type of activity will be located in each band. Note that each "downlink" band has a beacon frequency, which will transmit telemetry. You will most likely find CW communications in the lower frequency half of the analog passband and SSB in the upper half.

Radios capable of hearing the satellite come in many varieties, from simple to sophisticated. Start easy, there is less to go haywire. The 2-meter band is a good starting point. Remember that you must be a licensed amateur radio operator to transmit signals to a satellite. But everyone is welcome to listen.

While cheap FM-only scanners won't do the job, high grade scanners that are capable of receiving SSB and CW will. Many of the popular 2-meter transceivers are "all mode," capable of SSB and CW as well as FM. You will hear people telling you that to receive 2-meter satellite signals, you need a preamplifier. A preamplifier is a low-noise amplifier that is normally mounted directly at the antenna. Coaxial cable has loss and cable loss looks like noise to a receiver, so preamps do little good unless mounted directly at the antenna. Unless you have a *really* long and lossy run of cable from your antenna back to your radio, don't worry about the preamp. Just use what you have. On higher frequencies, an antenna-mounted preamp is generally required.

If you are in the market for a radio, the possibilities are really broad. Earlier in the satellite game, the most commonly used radios were single-band multi-mode transceivers, one for each band. Remember that while a satellite seems like a flying repeater, it is different. Terrestrial repeaters receive and retransmit in the same band. They keep the in and out signals separated through the use of large filters. There's no room on a spacecraft for large filters, so satellites never receive and transmit in the same band. They are referred to as "transponders," where they receive ("uplink") in one band and re-transmit ("downlink") in another.

P3D's communications matrix allows almost any combination of uplink and downlink. So, for a ham to communicate through any satellite, he must have separate radios for separate up and downlink bands. Satellite communications are "full duplex," meaning that you transmit and receive at the same time. Two separate radios make this easy and offer great versatility. Separate radios are still a good choice, though they do get rather expensive if more bands are desired.

Radio manufacturers have a solution that is just about perfect for the casual satellite operator. These are the multi-mode, multi-band, all-

in-one boxes from Yaesu, Icom and Kenwood that have proven tremendously popular. The first of these was the Yaesu FT-726R (1983). It was essentially a full duplex, multi-mode 10 MHz radio that had slots for various plug-in modules. The standard setup had modules for 2-meters and 70-centimeters. There was one extra slot that could be used for 6-meters (not for satellites) or 23-centimeters. This rig was superseded by the FT-736R, still considered a standard for satellite communication, though no longer manufactured. Since these rigs were designed specifically for satellite communication, they did it well. The used gear market has all kinds of other possibilities, including the Kenwood TS-790 and Icom IC-970.

The latest all-in-one rigs offer impressive specs and performance.

The Yaesu FT-847 is an all-mode, HF + satellite transceiver that includes crossband full duplex operation capability on 2 meters and 70 centimeters. It has 50 watts output power on 144 and 430 MHz. It is set up for 9600 baud digital operation as well as voice/CW. This replaces the FT-736R previously mentioned, with many added features.

Icom's latest offering is the IC-821H, a 2 meter/440 MHz Dual Bander Base Station. This all-mode transceiver features 160 memories, one-touch Doppler shift adjustment and 9600-baud digital Plug and Play operation. Transmitters produce up to 45 watts output.

In addition, there are a number of wide-range, multi-mode receivers that should be well suited to eavesdropping on satellite communications. Such popular wide-range, all-mode receivers as the Icom R-8500, Icom PCR-1000 PC receiver and various AOR (AR3000, AR5000, AR7000) receivers should be quite satisfactory.

For those who are interested in digital modes only, transceivers such as the Kenwood THD7 and TMD700 are designed for 9600-baud satellite operation and are in wide use on the present digital LEOs.

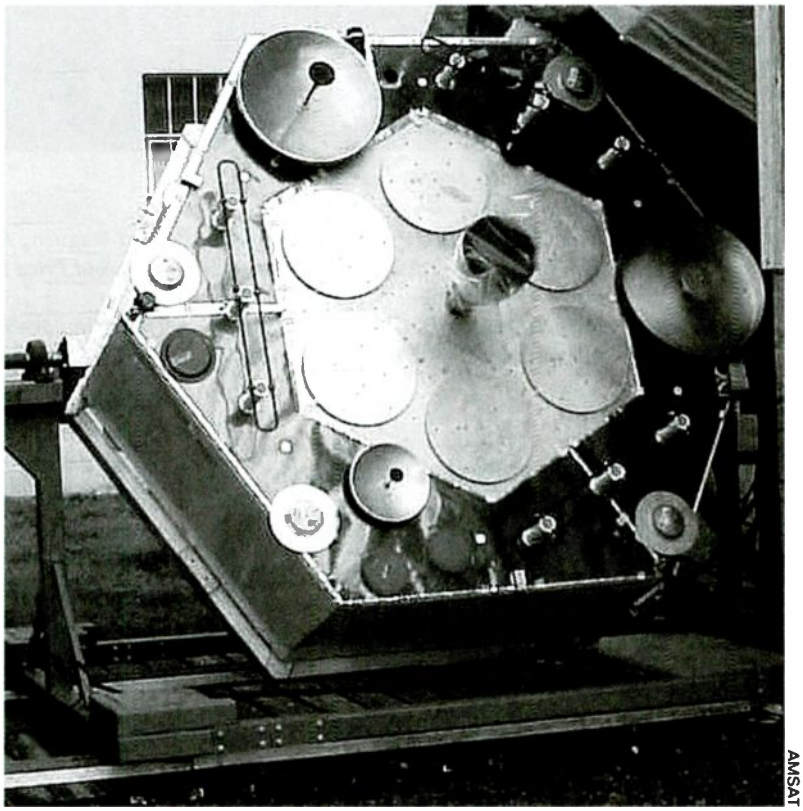
Yet another method of satellite operation is through the use of an existing radio and the addition of a "converter" (receive only) or "transverter" (which combines both receiver and transmit converters in one box) to it. These devices convert one frequency range to another, in front of the radio. For example, common 2-meter converters and transverters use the 10-meter HF band as the intermediate frequency (IF). They use frequency conversion schemes that make 144 to 146 MHz receivable at 28 to 30 MHz. So, you just ignore the megahertz part of the 10-meter radio dial and read your dial as though you were using a radio specifically designed for 2-meters. The 28-30 MHz IF is common for 2-meter and 70-centimeter converters. Higher frequency converters frequently use 2-meters as an IF.

Can you plug a higher frequency converter, say a 23-cm-to-2-meter converter, into a 2-meter-to-10-meter converter, then listen to 1269 MHz QSOs on a 10-meter radio? Of course; it works just fine. Just gets a little more complicated. My ancient Drake R4B HF radio has listened to 10 GHz QSOs in exactly this fashion. As the frequencies get up into the microwave region, converters and transverters become the only choice.

For the casual listener who wants to "get his feet wet" listening to satellites, the use of converters is the least expensive solution. One can buy a 2-meter to 10-meter receive converter for as little as $50, hook it up to the antenna lead of an HF radio and listen to 2-meter satellite communications to his heart's content. This method is good for the casual listener, but gets more complicated as more bands are desired or in the movement to transmitting also. Remember full duplex? HF radios are never equipped to operate full duplex, so two separate radios, with separate transverters, are required. Although it gets complicated, this method is viable and is, in fact, preferred by many experienced satellite operators for its versatility.

There probably isn't any one "best" way of communicating through P3D. Like much of life, it depends on what you want to get out of it. If you will be satisfied with casual eavesdropping on QSOs and listening to beacons, a receive-only converter in front of an HF radio is the way to go. If you are a licensed ham interested in ragchewing, DXing and general satellite communications, try one of the multi-band satellite radios. If you have a suitable single-band radio and wish to expand, get another single-band radio for a different band. If you are just a whacked-out, died-in-the-wool experimenter (like me), transverters and a variety of HF and 2 meter radios will provide enormous versatility.

Whatever you decide, don't be afraid to get your feet wet. Satellite operators are a friendly lot and very willing to help new operators learn the ropes. And P3D will be spectacular! Try it, you will like it!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P3D is being rolled outside while powered up for a full system check. Except for solar panels P3D is in flight configuration and is checked as an integrated system.

Useful information and tracking programs:

AMSAT-NA
850 Sligo Avenue, Suite 600
Silver Spring, MD 20910-4703
(301) 589 6062
www.amsat.org
Tracking Software:
www.amsat.org/amsat/catalog/software.html

Converters and Transverters (may not be a complete list)

Down East Microwave Inc.
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Frenchtown, NJ 08825
(908) 996 3584
www.downeastmicrowave.com

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Icom: **www.icomamerica.com**
Kenwood: **www.kenwood.net**
AOR: **www.aorusa.com**

Official Transponder Frequency Bandplan for P3-D

After several iterations and as a result of intensive research and discussions with all involved transponder builders, the P3-D Project Manager Dr. Karl Meinzer, DJ4ZC gave his final OK to the P3-D Transponder frequencies.

They have been carefully selected to minimize mutual interferences with other satellite projects and are also coordinated with IARU bandplans by the P3-D Frequency Coordinator, Freddy de Guchteneire, ON6UG, with the help of Peter Guelzow, DB2OS and Werner Haas DJ5KQ.

Downloaded from http://www.amsat-dl.org/p3dqrg.html

P3-D Uplink Frequencies

UPLINK	Digital	Analog Passband
15 m	none	21.210 - 21.250 MHz
12m	none	24.920-24.960 MHz
2 m	145.800 - 145.840 MHz	145.840 - 145.990 MHz
70cm	435.300 - 435.550 MHz	435.550 - 435.800 MHz
23cm(1)	1269.000 - 1269.250 MHz	1269.250 - 1269.500 MHz
23cm(2)	1268.075 - 1268.325 MHz	1268.325 - 1268.575 MHz
13cm(1)	2400.100 - 2400.350 MHz	2400.350 - 2400.600 MHz
13cm(2)	2446.200 - 2446.450 MHz	2446.450 - 2446.700 MHz
6cm	5668.300 - 5668.550 MHz	5668.550 - 5668.800 MHz

P3-D Downlink Frequencies

DOWNLINK	Digital	Analog Passband
2m	145.955 - 145.990 MHz	145.805 - 145.955 MHz
70cm	435.900 - 436.200 MHz	435.475 - 435.725 MHz
13cm(1)	2400.650 - 2400.950 MHz	2400.225 - 2400.475 MHz
13cm(2)	2401.650 - 2401.950 MHz	2401.225 - 2401.475 MHz
3cm	10451.450 - 10451.750 MHz	10451.025-10451.275 MHz
1.5cm	24048.450 - 24048.750 MHz	24048.025-24048.275 MHz

P3-D Telemetry Beacons (IHU)

BEACON	General Beacon (GB)	Middle Beacon (MB)	Engineering Beacon (EB)
2 m	none	145.880 MHz	none
70cm	435.450 MHz	435.600 MHz	435.850 MHz
13cm(1)	2400.200 MHz	2400.350 MHz	2400.600 MHz
13cm(2)	2401.200 MHz	2401.350 MHz	2401.600 MHz
3cm	10451.000 MHz	10451.150 MHz	10451.400 MHz
1.5cm	24048.000 MHz	24048.150 MHz	24048.400 MHz

Remarks:

- All Receivers are inverting!
- Telemetry Beacons are for command purposes and are modulated in 400 Bit/s BPSK, AMSAT format.
- The MB can be switched between IHU-1 or IHU-2 telemetry.

AMSAT

Integration Team Photo

Back row left to right :
Matjaz Vidmar S53MV , Wilfried Gladisch , Horst Wagner , Lyle Johnson WA7GWD
Peter Guelzow DB20S , Chuck Green N0ADI , Harold Price NK6K , Bob Davis KF4KSS
Front row left to right :
Michael Fletcher OH2AUE , Miroslav Kasal OK2AQK , Werner Haas, DJ5KQ
Richard Leon KA1RHL , Freddy de Guchteneire ON6UG , Karl Meinzer DJ4ZC

Equipment for the Groundstation

Downloaded from http://www.amsat-dl.org/gndstn.html
By Frank Sperber, DL6DBN

Uplink:

Band	EIRPc	TX-power	Antenna
146 MHz	20 dBWi	10 W50 W	7 Element X-YagiCrossed Dipoles
435 MHz	21 dBWi	10 W40 W	10 Element X-YagiCrossed Dipoles over Reflector Plane
1270 MHz	23 dBWi	10 W	12 turn Helix
2400 MHz	27 dBWi	5 W	60 cm Parabolic Dish
5670 MHz	34 dBWi	10 W	60 cm Parabolic Dish

Downlink:

Band	GND-PEP/QSO	Antenna	S/N
146 MHz	-155 dBWi	7 Element X-Yagi Crossed Dipoles over Reflector Plane	23 dB16 dB
435 MHz	-157 dBWi	10 Element X-Yagi Crossed Dipoles over Reflector Plane	24 dB13 dB
2400 MHz	-167 dBWi	60 cm Parabolic Dish14 turn Helix	26 dB18 dB
10450 MHz	-184 dBWi	60 cm Parabolic Dish	24 dB
24 GHz	-197 dBWi	60 cm Parabolic Dish	13 dB

- The above is the best estimations from the AMSAT-DL (AMSAT-Germany) web site. Following are notes on the various types of antennas indicated and terms.
- "Crossed dipoles over a reflector plane" is a pair of center-fed dipoles, 90 degrees to each other, fed 90 degrees out of phase, to produce right hand circular polarization, suspended over a reflective sheet. A very simple circularly-polarized antenna with a predominantly vertical radiation pattern. Tracking not required.
- "X-Yagi" is a right-hand circularly polarized yagi antenna made with 2 sets of elements at right angles to each other. Also referred to as a "cross yagi". A "7-element X-yagi" has 2 sets of 7 elements in each set on a single boom. A relatively small, directional yagi. Must track the sotellite.

"60 cm parabolic dish" is a 24 inch diameter parabolic dish antenna with the appropriate feed for the band in use. Must track the sotellite.

- "GND-PEP/QSO" is the signal strength of the sotellite's signal on the ground.
- "EIRPc" is Effective Isotropic Radiated Power, circularly polarized, in decibels (dB) relative to 1 watt. This is effective transmitted power from a combination of actual transmitter watts and antenna gain, referenced to an "isotropic" (fictitious point source) radiator.

About the Author:

Ed Krome is a long time satellite enthusiast and AMSAT contributor, microwave experimenter and builder. A ham radio operater for 37 years, he operates almost all homebrew gear, and has had over 40 articles published in the amateur radio press. Professionally, Ed is a Mechanical Engineer/MBA with 9 patents.

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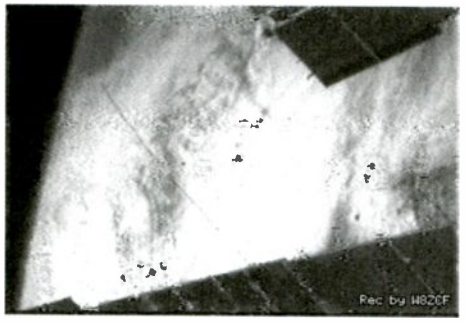
Amateur Radio Survives in *Mir*

by Farrell Winder, W8ZCF

Many hundreds of Amateur Radio operators on Earth were thrilled and delighted to experience the return of slow scan television (SSTV) images from the *Mir* Space Station on April 16, 2000. *Mir* was unoccupied beginning August 27, 1999, until April 6, 2000. While it was thought that *Mir* might be deorbited in 1999, today finds the Russian space station very much alive with a new crew and plans for continued operation for an unknown period.



Typical of a series of automatic pictures which shows portions of Mir's solar panels and the Earth with clouds below. Recorded by the author, Cincinnati, Ohio.

Many excellent pictures were received as *Mir* with the new crew orbited Earth. A few of these images are shown here. On April 16 the crew attached the camera to a window and showed a series of Earth pictures at precisely 2 minute intervals, activated by the SSTV Auto Controller.

The SSTV System performed flawlessly when activated by the crew, as was expected, but had undergone a dormant period aboard *Mir* of nearly 8 months. As reported by Chris van den Berg in his *Mir* News Report 477, the crew found the space ship in good standing, but noted "the fact that there was no dinner ready after their arrival. When in the past a new crew arrived, all was ready and that is very convenient."

Many messages flooded the Sarex and AMSAT internet bulletin boards as the crew activated the Amateur Radio equipment and began voice and video transmissions. It was great to have the recipients of *Mir* contacts share their excitement of initial QSOs (amateur radio contacts) for this latest *Mir* Mission 28. The earliest noted contacts came from "down under" in Australia.

There were also wav files of the actual voice contact made available. There was obvious real excitement in one of these. Apparently Alex, U8*Mir* had attempted to locate Maggie, VK3CFI via the *Mir* radio. Then apparently all Australia helped notify Maggie who was later successful in a documented excellent clear recording on a wav file. In one of the exchanges with Maggie, Alex discussed the beginning of his third stint on *Mir* and said, "For the first time, I arrived at the station which was unmanned "*hez lade*" (without people).

From what is learned at this writing, the crew remains very busy with scheduled experiments including preparation for an EVA (extra vehicular activity). At some later date a school schedule with a Q & A and SSTV is planned as time permits.

The* Mir *control room. (It is presumed* Mir *was on autopilot/computer control as none of the crew are visible). Also received by W8ZCF.

The crew is to be greatly thanked for taking time in their busy schedule to provide voice contact and the transmission of very exciting and informative pictures to us from outer space via the Russian *Mir* Space Station.

A new QSL card is being prepared by MAREX-RU and MAREX-NA. It is expected that this card will be available sometime in June 2000 to cover the requests of all those stations who have heard or have contacted the *Mir* Space Station during current or past missions. Details will follow in various media as to contacts for these QSL cards.

From *Mir* to the Space Station

For those who would like to know how the *Mir* Amateur Radio SSTV System came into existence, it was conceived by Dr. Don Miller, W9NTP, Hank Cantrell, W4HTB, and Farrell Winder, W8ZCF. Dr. Dave Larsen, N6CO and Miles Mann, WF1F, initiated and received approval for the system via Sergej Samburov, RV3DR. Miles arranged for the delivery of three of four systems to Russia and further journeyed to Russia to train the Cosmonauts in the operation of the equipment.

Tom, N3CXP, Allentown, Pennsylvania, received this picture of Flight Engineer Alex Kaleri, U8MIR.

Image received by Murray, VK2KGM in Wiley Park, Australia, shows Commander Sergei Zalyotin on the left and Flight Engineer Alexander Kaleri, U8MIR, on the right.

The *Mir* SSTV System consists of a Tasco Electronics TSC-70 Color Scanner & Docking Station with a 5-inch LCD screen. Integrated with this equipment is a Kenwood TM-V7A transceiver, a W4HTB Auto Controller and a PictureTel or Apple Computer Camera having NTSC output. It was possible to get this equipment aboard *Mir* only with the generous sponsorship of Kenwood, Tasco Electronics, Wyman

***These pictures were received by Gerald Klatzko ZS6BTD, Johannesburg, South Africa. Miles Mann, WF1F, who has been aboard a model of* Mir *describes them: Cosmonaut and Flight Engineer Alexander Kaleri is working in the* Mir *Core or Base Block Module of the Space Station. In one picture he is sitting and at another standing by a table which doubles as a work bench and oven for heating food. Above his head are two glowing light objects. The larger one is the MAREX-NA Tasco SSTV system. Above that is the Kenwood TM-VA Transceiver which is the radio being used to send pictures to Earth from* Mir.**

Research, PictureTel, Apple Computer and W4HTB Autocontroller Associates.

A new SSTV system utilizing a software approach, as opposed to the hardware system now aboard *Mir*, is being developed and completed by Silicon Pixels/CPIX consisting of Jim Barber, N7CXI, together with his associate Bill Montgomery, VE3EC. With the assistance of the original group, this system is being designed for possible use aboard the International Space station (ISS).

Mir Amateur Radio is currently operating on a frequency of 145.985 MHz FM. Everyone is encouraged to listen for the crew and copy pictures when the crew has some free time.

For more details of the Amateur Radio SSTV equipment see *Monitoring Times* June 1999 page 19. A picture of the miniature SSTV station that was sent to *Mir* by rocket is shown in this issue.

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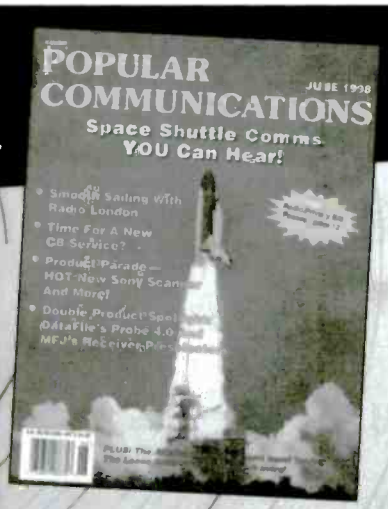

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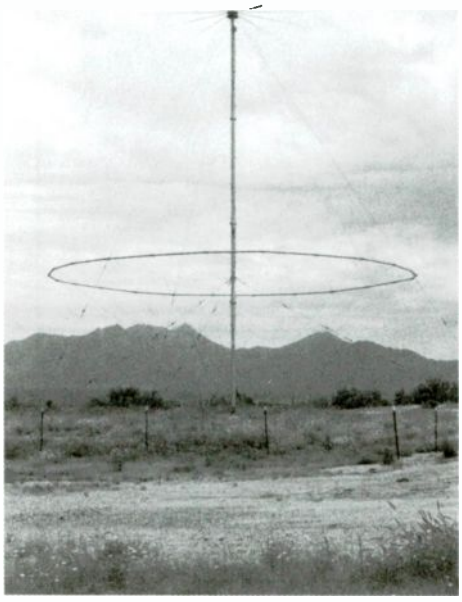
"There's rockets in the meadow . . ."
– Gordon Lightfoot

WAITING FOR THE GO CODE

Story and Photos by Chuck Penson
wa7zze@juno.com

When your job is sitting in an underground stronghold waiting for the order to launch a nuclear missile, having a reliable communications system is a big deal. A *very* big deal.

The Titan Missile Museum, located about 30 minutes south of Tucson, Arizona, is home to the last of what once was a collection of 54 Titan II intercontinental ballistic missile launch complexes scattered among three locations in the United States. These nuclear-tipped missiles, originally put on "alert" in 1963, played a vital role in national defense for more than two decades.



This is the HF discage antenna. It still functions and is often used by the local ham club for Field Day operations. Imagine connecting your receiver to this!

For the communications enthusiast, a visit to the museum is a little like heaven, because in addition to the control complex, the missile, the silo, and an impressive 760-ton silo door, the complex bristles with antennas. And even though the site's radios have been quiet since it was taken off alert status in 1982, if you use your imagination, you can still hear the com chatter in the control center.

The first thing you see when you approach the site is the huge high frequency (HF) discage antenna. A curious hybrid of a discone and a conical monopole, the antenna's two sections combine to provide continuous coverage from 3 to 30 MHz. Yet this impressive antenna only begins to hint at the complexity of the total communications system.

There were several radio systems employed at the launch complex, and as you might imagine each system has backups. Some even have backups for the backups. The two most often used systems were the *Radio Type Maintenance Network* (RTMN), used for talking around the site, and the *Intercomplex Radio Communications System* (IRCS), used to talk with the Wing Command Post, Alternate Command Posts, and other launch sites. There was also a low frequency (LF) receive-only data system, an HF single sideband (SSB) system, and an ultra-high frequency (UHF) voice system.

Let's take a quick look at how all of these systems were used at the Titan II missile launch complexes.

The RTMN

The Radio Type Maintenance Network was provided by Motorola and was mostly an off-the-shelf very-high frequency (VHF) repeater system. The RTMN used a small folded monopole antenna on the surface (which could be disabled when not in use), as well as a length of Radiax – a slotted coaxial cable that acts as an antenna. The Radiax winds its way through the entire underground complex all the way to the deepest levels of the silo – nearly 150 feet below the surface!

The telescoping HF antenna is kept in its own hardened silo. It can telescope to as high as 117 feet depending on the frequency in use.

Without these two antennas, radio communications from the control center to crews on the surface or elsewhere in the complex would be impossible, because the entire underground portion of the complex is radiation shielded with steel plates that radio waves cannot penetrate. The shielding protected the site from the electromagnetic pulse (EMP) generated by a nuclear explosion.

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A museum guide (for scale) stands near one of two IRCS backup antennas in the "stowed" position. These can be fully deployed in about 50 seconds. The foreground hatch is a service manhole.

IRCS

The Intercomplex Radio Communications System was the most vital system because it was the system that would have carried the order to launch the missile. This system was designed for maximum survivability and employed multiple backups to make sure the order got through – no matter what. In fact, the entire system had another entire backup system, but more on that later.

The heart of the IRCS was a frequency-diversity VHF/UHF radio system made by General Electric. Frequency diversity is the technique of sending the same intelligence on two different frequencies and then combining the receiver outputs to yield an optimum signal. Frequency diversity is used to compensate for signal fading, multipath effects, and (in the case of the launch complexes) the vagaries of a post nuclear environment.

The author (for scale) with the UHF antenna.

The IRCS operated simultaneously on nine frequencies between 140 and 250 MHz. Each of the nine frequencies was divided up with several subcarriers. Various subcarriers carried voice, data, selective calling tones, Primary Alert System (PAS) signals, and a couple of system status tones. The PAS was the channel over which the launch order would come. Other channels and frequencies were used to carry encrypted data as part of a large scale digital data "command and control" system. The IRCS also employed a mountain top repeater. The most remarkable feature of the IRCS was that it could reconfigure itself, automatically rerouting signals had trouble developed in one or more portions of the system.

The antenna for the IRCS is a long cylindrical frequency diversity antenna perched atop a short tower. This antenna was regarded as "soft" – unable to survive an attack. If this primary antenna was destroyed, a "pop-up" antenna could be deployed from its own small "hardened" underground silo and could be operational in less than a minute. So vital was the IRCS that the backup antenna was itself backed up by another identical pop-up unit.

A length of Radiax winds its way through the underground complex all the way to the bottom of the silo. Without the Radiax, communications from the control center to crews elsewhere underground would be impossible because of the extensive shielding.

LF / HF / UHF

The LF / HF / UHF systems functioned primarily as backups for the IRCS and this is where that big discage antenna comes in.

HF single sideband (SSB) communications were maintained with the Strategic Air Command (SAC) headquarters and other Air Force installations on a wide variety of frequencies between 3 and 30 MHz (dozens of which are still in use today). The site was equipped with a 100-watt transceiver made by General Dynamics. The big discage antenna worked well but was comparatively frail and would have been swept away in a nuclear blast. To ensure that HF communications could be maintained, the discage was backed up by a telescoping antenna similar to those used for the IRCS. From its underground silo this antenna could be raised or lowered between 7 to 117 feet depending on the frequency in use. Both the discage and its backup were made by Collins.

The VHF RTMN antenna is mounted on a pole near the access portal. In the background is the main IRCS frequency diversity antenna.

Communication with the famous Looking Glass airborne command post was provided by a UHF system. The launch complexes could talk to Looking Glass and other aircraft on one of 19 preset frequencies between 225 and 400 MHz. The antenna for this system, also made by Collins, is housed in a hardened cone-shaped enclosure and sits at ground level. Technical manuals in the museum's archives describe this antenna as a "monopole radiator" in the shape of a "solid cylindrical probe weighing 200 pounds, insulated from a heavy antenna base weighing 1700 pounds."

"Sliffix"

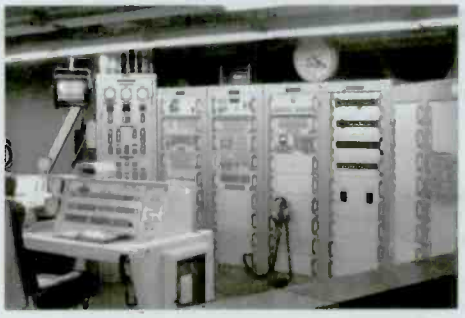
Last but not least is the Survivable Low Frequency Communications System (SLFCS, often shortened and pronounced as "sliffix" by the initiated). This was a receive-only system made by Westinghouse that operated from 14 to 60 kHz.

Hearing the Air Force in Action

Even though the Titan II missiles sites are now off the air, there is still plenty of Air Force HF com traffic to be heard. Dozens of frequencies in the Air Force's Global High Frequency System (GHFS) are in use day and night and make for some fascinating listening. The list below, compiled by Larry Van Horn, *MT* Assistant Editor, includes some of the more popular channels.

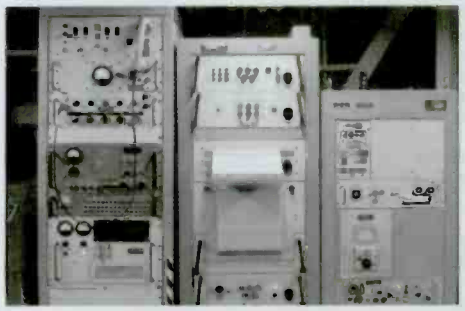
GHFS Primary Net Frequencies:
4724 6712 6739 6750 8992 11175 13200 15016

GHFS Discrete Frequencies
(* indicates an Automatic Link Establishment frequency)
3059* 3068* 3137* 4444 4542 4715 4721* 4745 4894 4982 5708* 5739 6715* 6721* 6728 6731 6785 7567 7632* 7805 7961 8965* 9016 9023 9025* 9057* 9320 10427 10462 10648 10881 10935 11052 11053 11055 11057 11058 11118 11129 11181 11217 11220 11226* 11229 11233 11244 11250* 11271 11445 11494 11634 12107 13204 13215* 13218 13242 13244 13440 13822 13900 13960 14445 14615 14635 15011 15038 15041 15043* 15091 15094 15097 15733 16273 17480 17973 18003* 18019 18027 18801 20631* 23217 23337* 27870*

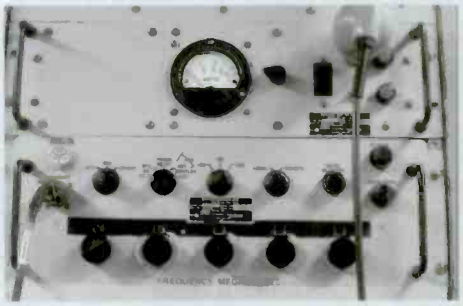


This is the Launch Control Center. The Commander's launch console is at lower left. Behind the console are a variety of systems used to monitor the status of the facility and the missile. All the communications gear is just out of view to the left.

The Deputy Commander's console controls all the radio systems and antennas.



The rack on the left contains the HF receiver-exciter, a 100 watt HF amplifier, and the UHF radio. The middle rack contains a teleprinter that is part of the IRCS system, and on the right is the SLFCS system.



Close-up of the General Dynamics HF receiver-exciter and a wattmeter. Note the frequency reads out in "megacycles."

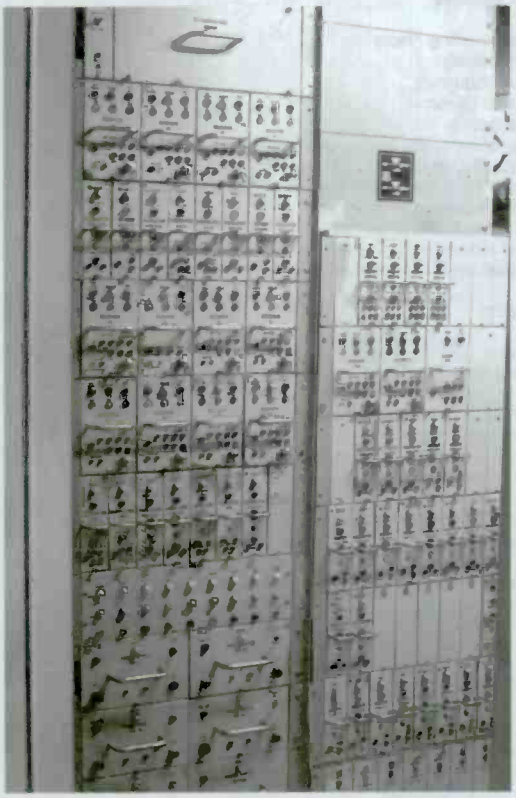
It was a teleprinter-based system, normally run between 5 and 50 baud. Transmitting data any faster at these frequencies would widen the bandwidth so much that the transmitter would go out of resonance.

For the same reason, transmitting voice messages at these frequencies was out of the question. The messages, which could take 20 minutes or more to send, came through on a miniature teleprinter and were viewed on an illuminated screen. The SLFCS antenna consists of a pair of large loops buried in the ground. This is similar to the systems used to communicate with submarines.

Located on the lower level of the control center is the IRCS equipment. In the foreground are two General Electric transmitters (one active and one standby). In the middle is the antenna coupling system with more than a dozen large cavity filters, and in the background are all the receivers, demodulators, selective call tone generators, and other diversity gear.

Conclusion

Keeping the peace is a difficult business. But at its core, keeping the peace means keeping the lines of communication open. The ability to communicate what is happening and where is of critical importance to any defense program. So important is "command and control" communications that it is the first thing targeted for attack in any conflict. Therefore, the communications systems developed for and deployed in the Titan II missile program were specific in purpose, redundant in operation, and survivable in design. The systems described here, combined with a number of other wireline systems, all worked together to promote clear, reliable, survivable communications to, from, and between all parties concerned before, during, and after a nuclear exchange.



A close-up of the IRCS receiver equipment.

An understanding of these systems reveals a great deal about how the Titan II program worked, how it served to accomplish its mission, how crews coped with keeping the system in a constant state of readiness, and what kinds of considerations were taken into account when the facilities were designed and built. The museum offers tremendous insight into the kinds of problems associated with business of keeping the peace.

No visit to Tucson would be complete without a stop at the Titan Missile Museum – especially for the radio enthusiast. You can contact the museum at 520-625-7736.

My sincere thanks to deputy director Becky Roberts and the entire staff of the Titan Missile Museum, without whose cooperation this article would not have been possible.

GLOSSARY

A Glossary of radio related terms used in *Monitoring Times*. (See www.grove-ent.com/mtglossary.html for a much more comprehensive list.)

THE RADIO SPECTRUM

ULF - Ultra Low Frequency (3-30 Hz)
ELF - Extremely Low Frequency (30-300 Hz)
VF - Voice Frequencies (300 Hz-3 kHz)
VLF - Very Low Frequency (3-30 kHz)
LF - Low Frequency (30-300 kHz)
MF - Medium Frequency (300 kHz-3 MHz)
HF - High Frequency (3-30 MHz)
VHF - Very High Frequency (30-300 MHz)
UHF - Ultra High Frequency (300 MHz-3 GHz)
SHF - Super High Frequency (3-30 GHz)
EHF - Extremely High Frequency (30 GHz and above)

// - Indicates a Parallel Frequency
μF - Microfarad
μH - MicroHenry
AC/ac - Alternating Current
AGC - Automatic Gain Control
AM - Amplitude Modulation
ARRL - American Radio Relay League
BCB - Broadcast Band (530-1705 kHz AM)
Bd - Baud
BFO - Beat Frequency Oscillator
BNC - Coax connector commonly used with VHF/UHF equipment
CB - Citizen Band
C-band - 3.7-4.2 GHz
Comm - Communications
CQ - General call to all stations
CTCSS - Continuous Tone Controlled Squelch System
CW - Continuous Wave (Morse code)
DAB - Digital Audio Broadcast
dB - Decibel; dBi- decibels over isotropic
DBS - Direct Broadcast Satellite
DC/dc - Direct Current
de - Morse code prosign meaning "from"
DSP - Digital Signal Processing
DTMF - Dual Tone Multi Frequency
DTRS - Digital Trunk Radio System
DX - Distant Station Reception
DXer - A person who engages in the hobby of distant radio/television reception
DXing - The hobby of listening to distant radio or television signals
DXpeditions - DX Expeditions (trips to the boonies by radio listeners)
ECPA - Electronic Communications Privacy Act
ECSS - Exalted Carrier Selectable Sideband
E-skip - Sporadic E-layer ionospheric propagation
FCC - Federal Communications Commission
FD - Fire Department
FM - Frequency Modulation
Freq - Frequency
FRS - Family Radio Service
GHFS - Global High Frequency System
GHz - Gigahertz
GMDSS - Global Maritime Distress and Safety System
GMRS - General Mobile Radio Service
GMT - Greenwich Mean Time (replaced in most applications by UTC)
GPS - Global Positioning Satellites
GSM - Global System for Mobiles (900 MHz)
HT - Handi Talkie/Handheld Transceiver
Hz - Hertz
ID - Identification
IF - Intermediate Frequency
IRC - International Reply Coupon
ISB - Independent Sideband
kHz - Kilohertz
km - Kilometer
Ku-band - 11.7-12.2 GHz (plus 12.2-12.7 GHz in North America)
kW - Kilowatt
LCD - Liquid Crystal Display
LED - Light Emitting Diode
LNA - Low Noise Amplifier
LNB - Low Noise Block Downconverter
LNBF - Low Noise Block Downconverter Feedhorns
LSB - Lower Sideband
LT - Local time
LW - Longwave (150-300 kHz)
mb/MB - meter band/Megabyte
MDT - Mobile Data Terminal
MF - Medium Frequency
MHz - Megahertz
ms - milliseconds
MT - Monitoring Times
MUF - Maximum Usable Frequency
mW - Milliwatt
MW - Medium Wave (typically 530-1710 kHz)
MW - Megawatts
NCS - National Communications System/Net Control Station
NDB - Non-Directional Beacon
NFM - Narrowband Frequency Modulation
NiCd - Nickel Cadmium Battery
NiMH - Nickel Metal Hydride battery
No Joy - Station did not answer call
NWR-SAME - National Weather Radio Specific Area Message Encoding
Ops - Operations
Packet - Amateur radio error correcting mode
PC - Personal Computer/Printed Circuit
PCS - Personal Communication System/Satellite
PD - Police Department/Primary Data
PFC - Prepared Form Card
PL - Private Line
Q - Performance rating regarding selectivity or bandwidth
QRM - Interference from another station
QRN - Interference from natural or man-made sources
QRP - Low power operation
QSL - A card or letter confirming reception of a radio station
QSO - Communications between two or more stations
QTH - Location
RDF - Radio Direction Finding
RF - Radio Frequency
Rptr - Repeater
RTTY - Radioteletype
SASE - Self Addressed Stamped Envelope
S-band - Microwave frequencies above UHF
SCA - Subsidiary Carrier Authorization (now known as SCS)
SCPC - Single Channel Per Carrier
SCS - Subsidiary Carrier Service
SELCAL - Selective Calling
Sesqui - A "Hauserism" meaning one and one-half
SINAD - Signal to noise and distortion ratio
SINPO - A code system used by radio hobbyists to indicate how well a station was received: S=Strength, I=Interference, N=Noise, P=Propagation, O=Overall (sometimes shortened to SIO)
SITOR-A(B) - Simplex teleprinting over radio system, mode A (B)
S-Meter - Signal Strength Meter
SMR - Specialized Mobile Radio
S/N Ratio - Signal-to-Noise Ratio
SSB - Single Sideband
SSN - Sunspot Number
SW - Shortwave (high frequency - HF)
SWBC - Shortwave Broadcast
SWL - Shortwave Listener
SWR - Standing Wave Ratio
Tac - Tactical
Tent - Tentative
TIS - Traveler Information Service
TVRO - TV Receive Only
Tx - Transmit
UHF - Ultra High Frequency
UKoGBaNI - United Kingdom of Great Britain and Northern Ireland
ULS - Universal License System
Unid - Unidentified
USB - Upper Sideband
UT - Universal Time
UTC - Universal Time Coordinated
Vac/VAC - Volts Alternating Current
Vdc/VDC - Volts Direct Current
VFO - Variable Frequency Oscillator
VOLMET - Aviation Weather Broadcasts (on HF)
VOX - Voice Operated Relay
VSWR - Voltage Standing Wave Ratio
WAM - Wideband Amplitude Modulation
WEFAX - Weather Facsimile
WFM - Wideband Frequency Modulation
wpm - Words Per Minute
WWV - National Bureau of Standards Time Station, Ft. Collins, CO
WWVH - National Bureau of Standards Time Station in Hawaii
Wx - Weather
WXSAT - Weather Satellite
X-band - Expanded AM broadcast band (1610-1700 kHz)
Zulu - Military time zone (same as UTC)

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A Great Tale, Beginning to End

Let me start out by stating that *I am not that old!* Okay, I've passed the mid-point of my fortieth decade on this ball of rock. I've also been involved in the radio hobby for over half of those years. I guess you could say that I am now a beginner at being an Old Timer in the radio monitoring hobby.

As most of you have figured out by now, part of my job around here at *MT* is to give beginners all the good reasons why the radio hobby is so much fun. Well, this month let's take this story through to its logical conclusion. Once upon a time, Old Uncle Skip was himself a beginner to the radio hobby. I went from those early days on through to my current lofty status as radio monitoring sage (or curmudgeon, depending on my current mood).

The excitement I want to bring to you this month is the fact that, if you spend enough time in this hobby, you get to meet some really neat people and do some genuinely fun and memorable things. These events over the passing years become great stories. Like the one Old Uncle Skip is about to tell. So settle down by the glow of those receiver dials and I'll tell you the kind of story you'll get to tell once you've been in this hobby awhile.

❖ The Story Begins

1976 was quite a year for me. I graduated from college, a rather important step in one's life, and I became an Amateur Radio operator, also a very important decision on my part given how much it has meant to me for so long. I had my nice new callsign WN2GHA (This was back in the days when there were still Novices and even Novice callsigns).

Now I wasn't one of those steely-eyed engineering students from places like Drexel University. Nope, I was more of your standard bleary-eyed Liberal Arts major with a degree spread over a couple of schools. Anyway, at this particular point in my life, the sum total of my electronics background was a couple of semesters of high school electronics "shop" class where the venerable Col. "Blinky" Austell taught us the resistor code and then set us about the task of sorting out the shop's resistor drawers. He knew better than to let us anywhere near hot pointy objects like soldering irons and such.

But here I was, a bonafide licensed ham and I needed to get on the air. I was also somebody with a large college debt and, as yet, not much to show in the way of disposable income. I figured that the thing to do was to build something. After all, those guys from the West Jersey Radio Amateurs who taught my class said they built things all the time. How hard could it be?

Well along came the May 1976 issue of *QST* and Doug DeMaw's now classic design, the Tuna Tin 2. This looked like a winner: A handful of components, most of which could be found at the local Radio Shack. I scrounged a few dollars left from several maiden aunts' graduation gifts and got everything together. I even ordered a couple of 40 meter crystals from Jan's Crystals. I had been listening to the Novice activity on my Realistic DX-160 for a long while and I wanted to get into the show.

So to make a long story a bit shorter, I had the initial homebrewing experience that many folks encounter when they first decide to get involved in making their own radio gear. I built the rig and it just would not work! What I did next is the bit of experience I want to impart to you, so you don't make the same mistake I did. I put the Tuna Tin 2 on a shelf and went on with my life. A bit later I picked up some non-descript used commercial rig at a hamfest and played radio that way for far too long. What I should have done was got on the phone to a couple of those Elmers from WJRA and doped the problem out. In the long run I would have grown a lot faster in my amateur experience.

Tom McCuen, AA2VX

Ed Hare W1RFI with Uncle Skip N2EI at the controls of W1FB/3

❖ Older, but Wiser?

Now, over twenty years later, I have come a long way in my life and my amateur radio career. I have sat in the shacks of a lot of great hams and learned a lot. I operated QRO full power through the standard awards cycle and clawed my way up to Extra class "the old fashioned way."

Finally, I "got my mind right" and began to operate low power or QRP. Playing ham radio at 5 watts or less is a great new challenge for someone who has "been there and done that" with most aspects of the radio hobby. So, at this stage of the game I could not overlook the Tuna Tin 2 revival movement that came about after Doug W1FB going "Silent Key."

An interesting side note to all of this was that, for the last few years of Doug's life, we were colleagues here on the editorial staff of *Monitoring Times* magazine. By this time I had also read just about every word that Doug had written on the subject of radio and I felt the least I could do was finally build the rig he is best known for and this time get things right. In this way I could honor his memory and prove to myself that I had come full circle to the things that made me want to be a ham in the first place.

I decided the best way to go was to get the New Jersey QRP Club's Tuna Tin 2 kit. In keeping with the beginner's nature of this column I'm going to dwell a bit on this kit and its building because I think it would make a great first project for anyone interested in getting started in HF amateur radio under the FCC's new licensing guidelines. It only costs $10 (plus $2 S+H). It even includes the crystal for 7040 kHz the 40 meter QRP calling frequency. You can get more information on how to get one of these kits by checking out the club website at **www.njqrp.org** or by writing to George Heron, N2APB, New Jersey QRP Club, 2419

Feather Mae Ct., Forest Hill, MD 21050.

Now right off the bat this was a neat deal! Way back in 1976 I paid a lot more than ten bucks to pull my project together. Who says the price of everything has gone up? All the NJQRP kit needs in addition to what they provide is three RCA jacks, an SPDT switch and, of course, an empty tuna can for a chassis. The kit even includes a marked printed circuit board. A far cry from the perf-board kludge I created back at the start of the Carter presidency.

The printed circuit board supplied with the TT2 kit is clearly laid out with beginners in mind. All of the solder leads are of generous size compared to many modern boards and this makes it a great first project for someone who is still getting a handle on how to wield a soldering iron. The parts layout is clearly marked on the board and the step by step directions are easy to follow.

I have talked to quite a number of folks who have assembled this kit over the last several months and they all seem to say the same thing – some variation of "The hardest thing I had to do was eat the tuna out of the can!" Actually some folks had some problems cutting their cans down effectively. Since we eat a lot of tuna in my house and we also have two cats who show no signs of starvation, my recycling bin provided me with a number of cans to experiment with.

All good stories should have a happy ending. This one does as well. In fact it has several.

❖ Coming Full Circle

I was able to get my Tuna Tin 2 together in one evening. Admittedly though, by the time I was done, 40 meters had closed out for the night. (All that can cutting, you know.) But the following evening, using my Small Wonder Labs SW-40+ as the receiver, I fired up the Tuna Tin 2 in grand style as a participant in the 1999 NorCal Zombie Shuffle, making six contacts in rapid succession before a QRO RTTY station decided that his need of the frequency surpassed those of my 350 mW QRP signal. It had taken me 23 years, but I was finally there. It was all I could do to keep from signing WN2GHA instead of N2EI.

But there is more to this story. Doug's original Tuna Tin 2 was recently restored through the efforts of Bruce Muscolino W6TOY and Ed Hare W1RFI. This is a great story in itself. It turns out that Doug's original TT2 went missing from the American Radio Relay League Headquarters where Doug worked for so many years. It turned up in a box under a table at a ham radio flea market a number of years later. Bruce got the honor of restoring it and Ed has had the pleasure of putting the original Tuna Tin 2 back on the air in a series of special events. I've had the pleasure of contacting this station a number of times.

But that's not all! Recently, through the efforts of the DeMaw family, Doug's callsign W1FB has become the club callsign of the Connecticut QRP Club. On February 26, 2000, Doug's call was returned to the air for the first time since his passing by his son Dave DeMaw N8HLE working a contact with his mother Jean DeMaw W1CKK. Many radio hobbyists monitored that contact with many fond memories of Doug and all he has done for the radio hobby.

Now you would think this would be enough. But remember...I've said that this hobby offers some great opportunities for exciting stuff. Ed Hare has been taking the original Tuna Tin 2 transmitter "On the Road," operating it from various locations around the country. On March 24 of this year, Ed brought Doug's venerable rig to Glen Mills, PA, as part of the Atlanticon 2000 QRP radio get together. It was at this local that Old Uncle Skip had the distinct privilege to sit at the master's original Tuna Tin 2 and operate using the callsign W1FB/3. I tell you folks, it just doesn't get any better than this!

If you stay with this hobby, in less time than you think, I am confident that you'll have stories to tell that will rival this one But no matter, I know that somewhere, Doug DeMaw W1FB is smiling down on all of us.

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Ask Bob

Bob Grove, W8JHD
bgrove@grove-ent.com

Q. I like to listen to Internet radio programs; problem is, I'm stuck having to be in the same room as my computer. Where can I get a device that can be plugged into an external speaker jack that will transmit a low power radio signal so I can use a portable radio to listen to the internet program anywhere in my house? (Randy DePoppe, e-mail)

A. Radio Shack sells several 900 MHz "wireless headphones" which allow you to roam 100 or more feet from the monitoring device while listening to a base scanner, stereo system, computer audio feed – anything with a headphone or speaker jack. If you don't like using headphones, you can probably tune in the analog signal on a scanner between 902-928 MHz.

Additionally, a product called NetPlay Radio (model FMP3) allows you to broadcast the audio output of your PC throughout the house or even your yard on the FM band. I see no reason why it wouldn't work on the external speaker/earphone jack of a scanner, shortwave radio, or anything else. $189.95 from NetPlay Radio, PMB 511, 5859 Kanan Rd., Agoura Hills, CA 91301-1652; ph. (818) 773-2234.

Also, check **www.sonicbox.com** for Sonicbox – a device under development which will rebroadcast to your existing FM radio (see Feb 2000 *What's New*). Ramsey Electronics' low power FM transmitter kits can perform a similar function (716-924-4560, or **www.ramseyelectronics.com**) from any audio source (see April *MT*, p.103).

The MT Reference Guide

There's lots more on the MT web page at www.grove-ent.com/hmpgmt.html than just Table of Contents, Indexes, and how to subscribe! Check out these regular and new additions:

- NEW! Completely updated and comprehensive listing of NASA and related frequencies for shuttle launches.
- NEW! Listener's Lawbook: what's legal in your state?
- NEW! Comprehensive listing of major league baseball networks.
- HUGE glossary of terms and acronyms.
- Spectrum Guides and Frequency Assignments
- Links to staff members and websites
- MT CHAT Board: read or post questions and comments

Q. As I was about to make a clothing purchase, I noticed a tiny printed circuit stitched inside. I'm sure this was part of the shoplifting alarm system. How do these operate? R.H. McMinn, Whittier, CA)

A. One of the most common techniques involves a small diode which develops harmonics when a source of radio frequency energy strikes it. If the diode is still present in the article, when it passes through the sensors at the doorway, a receiver detects the harmonic frequency energy and activates an alarm.

Q. I need a two-way splitter to divide the antenna into two receivers covering the shortwave frequency range. TV splitters are typically rated from 40-860 MHz; are there other splitters for the lower frequencies? (David Pannell, West Sussex, England)

A. Don't sell short those TV splitters; I've used them repeatedly for the frequency range 3-1000 MHz. The reason they are specified as 40-860 MHz is that this is the frequency range of cable and VHF/UHF TV signals.

And even if there is some loss at the lower frequencies, the limiting factor in reception below 30 MHz is atmospheric noise, not receiver sensitivity and received signal strength, so if low signal strengths reduce the S-meter reading, all you have to do is turn up the volume control!

To test the thesis, simply listen to a very weak signal with the antenna connected directly to the receiver, and then through the splitter; if you can still hear the signal above the noise, you're home free.

Q. I am attempting to align a single-conversion receiver. If I receive WWV on both 15000 kHz and its image frequency of 15910 kHz, how do I know it is aligned correctly? (Babe, Glen Ellyn, IL)

A. In a single conversion circuit, all of the image rejection must be done by the radio frequency (RF) stage. This is because the oscillator injects its frequency into the mixer without any band-edge restrictions, so it is up to the front end (RF amp) to provide the frequency filtering.

If the receiver does not have a tunable RF stage, and is "broad as a barn," then hearing the intended signal frequency and its image is very likely.

The proper alignment procedure is to first align the IF output (455 kHz) to maximum output when a weak 455 kHz signal is introduced at the input of the first IF stage; then make sure the oscillator is injecting 15,455 kHz (in this instance); when the dial reads that frequency; then peak the RF stage(s) to 15000 kHz when that signal frequency is introduced at the antenna.

If the image is still strong, you need a preselector (or a new radio) – that's what they're for!

Q. When I hear CB communications in the 27.285-27.555 MHz range, I frequently hear references to "divisions," along with phonetic listings like, "Division Romeo Quebec 040," etc. What do these mean? (James Ashe, Weymouth, MA)

A. Since the legal CB band is divided into 10 kHz increments from 26.965 to 27.405 MHz, any "CB" transmissions made outside of that range are in violation of international law. Nonetheless, this virtually unregulated portion of the spectrum has very active clubs and associations who issue their own callsigns and districting coordinates.

What you are hearing are most likely grid squares, identifying approximate locations of intercommunicators. These charting systems are not officially recognized.

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 bgrove@grove-ent.com. (Please include your name and address.) The current "Ask Bob" is now online at our WWW site: www.grove-ent.com

Bright Ideas

Gary Webbenhurst
ab7ni@arrl.net

Easy database: For you SWL fans, here is a tip by David Guretzki from his monitoring station in Canada. Using Microsoft Access, he created a database for his logs. The logging table stretches across a couple of screens in the following order: Frequency, Date, UTC Start, UTC End, Station ID, Mode (e.g., AM, USB, etc.), Type (e.g., SW Broadcast, MW broadcast, UTE, etc.), SINPO, Program Details, QSL Sent? QSL Date, QSL Type (letter, email, fax, etc.), QSL Received, Receiver Type, Antenna Type, Website (URL address for station, if available), and Comments.

For some categories like UTC Start or SINPO, Access can be programmed to ensure uniformity of entry: for example, the SINPO category can be set up so it cannot be greater than 55555. Other categories include a "pull down list" (e.g., Mode = AM, LSB, USB, NLSB, NUSB, CW, etc.) Still other categories *must* have a value entered using a uniform format (e.g., the frequency value must appear for the record to be saved and the format is always as #####.#) The QSL sent or QSL received is simply a "check mark" or "Yes/No." The station URL can be stored under the "Website" category and be instantly accessed by your browser.

Of course, the whole database can be queried (e.g., How many QSL cards received between two dates? or How many frequencies logged on a certain Band?) Reports can be set up to automatically creat a reception report and the information is accessible and easily used in Word or other MS products. Eventually, he also plans to have "audio clips," recorded in MP3 or WAV format, directly linked to entries as an "Object." This would be great, especially for utilities.

Store MT: Another reader idea comes from E.H. Lindley in Biddeford, Maine. He wisely saves his back issues of *MT*. Rather than using a three ring binder, he uses inexpensive (he says $3) "accordion" files. They come with 12 slots for documents up to 10x12-inches in size. The compartments can then be labeled for each month. A great tip! (The cheapest I could find was $7.95 at Office Max.)

The Professional Look: Mr. Lindley's letter gave me yet another idea. His letter was on his personal "letterhead." The top line was in a large font and read "From the shack of" followed by his name, address, phone, etc. While I had seen others use this approach, I had never bothered to create one for myself. So I did, using large fonts, colors and a small radio graphic.

I had long ago made my own business cards using the Ink Jet Business Cards (Avery #8377.) I coordinated the colors and the design theme with a presentation folder from the local office products store. The end result is a very professional looking set of materials, whether I'm making a radio-related business contact or just giving my card to a fellow scanner enthusiast.

Laminating: I rarely watch TV except for the news. However, I did buy a plastic tag laminator for $19.95 (plus S&H) from one of those home shopping networks. It has been very handy, and not just for doing luggage tags. With several different radios, and scanners, I often forget how to perform certain functions on a particular radio. So I typed up a small cheat sheet of instructions for each radio, and then encapsulated it in plastic, about the size of a business card. All of these go into my "Grab & Go" fanny pack of radio accessories.

The lamination process works great. My little cheatsheets have survived many hardships. I also made a cheatsheet for the autopatch instructions for the local ham repeaters. You can also make custom frequencies lists. I even laminated my business cards. From name badges to photos, it worked great. Naturally, I laminated a copy of my FCC amateur radio license.

Ham Q&As: The FCC recently overhauled the requirements and class structure for amateur radio. They have made it even easier to get the No-Code Technician class license. Now it requires just one written exam, not two. The pool of all the possible multiple-choice questions is available in the public domain and can be downloaded from the ARRL website at **www.arrl.org/arrlvec/pools.html**.

Each question has four possible answers. Well, in the spirit of the popular game show, I asked the computer to take away the three incorrect answers, leaving *only* the correct answer. So you read the question, the correct answer, and move to the next question. No sense in reading all the wrong answers. The test is Pass/Fail. How can you not pass when you have all the questions and answers to study?

If you would like this edited pool of questions, email me and I'll send it to you via email as an attachment as a Word 97 document. If you need it in some other format please specify. When you feel ready to take the test, visit this website, **www.arrl.org/arrlvec/examsearch.phtml** to learn about future test sessions in your state.

If you wish to study from the book, make sure you purchase a new book with questions that are in effect from April 15, 2000, through June 30, 2003. C'mon, get your ham license. I dare ya. I double dare ya!

Park freqs: I love to go camping. I also like to monitor the new local frequency for the park rangers. So how do you find out their frequency? Remember all those reference books you bought? They have finally justified their expenditure. Campgrounds can be run by the USFS, National Park Service, Corp of Engineers, state, county or local government. Don't overlook utility districts (e.g. PG&E) or water districts.

More catalogs: There is still plenty of fire season ahead. There are many useful equipment catalogs for wildland firefighters. You can request your catalog by contacting the following:

Forestry Suppliers, Inc. 1-800-360-7788
www.forestry-suppliers.com
National Fire Fighter Corp. 1-800-423-8347
www.nationalfirefighter.com
The Supply Cache Inc. 1-800-839-0821
www.firecache.com

Why bother with catalogs? They have some really neat radio chest packs, pocket windmeters, and you gotta have the Thermo-Cool™ headbands and/or neck wraps.

They also make for interesting reading. Knowledge is power. When monitoring forest fires, I like to feel that I can identify with the terms and equipment used. Do you know what a Pulaski is used for? How about a fire swatter? (I could not figure out the urgent call for fly (fire) swatters.) Speaking of forest fires, check out this website: **www.fs.fed.us/fire/aviation/areas.html**.

Dumpster diving: While I was living in California, the CHP held an open house at their training academy in West Sacramento. I was most interested in the building where the CHP runs a production line as they equip and outfit their own cars. Their fleet has several thousand vehicles. They also strip the old cars of all their emergency equipment and throw most of it away.

I asked what they did with it and they said it was in the dumpster behind the building. I asked if I could have any of it and they said, yes and no. The dumpsters are normally behind locked gates, but since this was a special day, they said I could take a couple of items.

I went dumpster diving for the first and only time in my life. Grabbed a handful of 155 MHz quarter wave mobile antennas, coax cables and even a set of blue and yellow wig wags. They went to my shack! Now don't rush down to the CHP academy looking for the dumpster. It is not available to the public. But, you can look in your yellow pages under Emergency Vehicle Installation. Most large metro areas have private companies that do the same kind of work.

Naturally, I was also interested in the radios they were installing. If you have a frequency finder this could be paradise...

Thanks to David Guretzki and E. H. Lindley for their tips. If you have a tip, suggestion, comment, or question, please contact me. See you next month: We're out of space, but not bright ideas.

Richard Barnett
ScanMaster@aol.com

Itinerant Matters

All serious scanner people are, by nature, serious fans of itinerant and low-power frequencies. These are the frequencies generally used at amusement parks, fairs, malls, sporting events, concerts, and the like. Radios carrying the familiar "blue-dot" and similarly color-coded channels can be found on sale at familiar stores such as Wal-Mart.

Manufactured and sold by Motorola and a host of other two-way manufacturers, these radios are as ubiquitous as ever. Businesses, large and small, use the portable equipment for in-house operations, and families – tired of the CB-like congestion of Family Radio Service (FRS) units – are snapping up the radios as well. (Note that some of these frequencies can be used for base operation as well as mobile and portable.)

While operation of itinerant channels requires a license, unfortunately not everyone files the proper paperwork. Thus, while you'll find some fascinating licensees in the IB or IG general business sections of the FCC database, there's even more out there that hasn't been licensed that you'll only find through monitoring.

The most common of these itinerant channels are 151.625, 154.570 and 154.600. The most common UHF channels are 464.500, 464.550, 469.500 and 469.550. There are others in VHF, and of course UHF splinter frequencies, such as 464.2625 and the other 12.5 kHz channels between 461 and 470 MHz, are fantastically popular.

The new Uniden-Bearcat 780XLT includes a "Special Service Search" feature that covers just about all the VHF low-band, VHF high-band, UHF and even 800 MHz low power, wireless microphone and itinerant frequencies. We love this feature in that it provides a rapid, multi-band search of almost every possible frequency used in a low-power or temporary situation. (The Bearcat 780 has a total of 10 Service Search ranges.)

We were notified recently of a new line of VHF itinerant portables on sale at one of the major warehouse clubs. We have not had a chance to verify the frequencies, but they're worth checking out: Here is the reported channel plan for the new HT:

Channel 1 151.625 Red Dot
Channel 2 151.955 Purple Dot
Channel 3 154.570 Blue Dot
Channel 4 154.600 Green Dot
Channel 5 151.700
Channel 6 151.760
Channel 7 151.820
Channel 8 151.880
Channel 9 151.940

You'll notice that these frequencies are positioned directly between two common business-band channels. For example, 151.8200 is between 151.8050 and 151.8350. The FCC is wedging more channels in the spectrum and this is the first example where we've seen these particular frequencies used.

❖ ECPA Challenge Denied

As Congress once again considers the same old anti-scanner legislation (the old, amended H.R. 2369 with slight modifications), it has been reported that the first challenge to the 1986 Electronics Communications Privacy Act has been denied by a federal judge. As reported on the web page **www.nylj.com/stories/00/05/050200a1.htm**, the case against a New York City policeman who allegedly used the "Message Tracker" software to eavesdrop on alphanumeric paging messages sent by the police department will proceed. A similar case was pressed a couple of years back against a buff/news monitoring service in New Jersey.

❖ Boston APCO Convention Monitoring

Completing the article we started last month, below is a report on monitoring in Boston during the August national convention of APCO, the Association of Public Safety Communications Officials, or during any time of the year in Boston. See the June issue for Boston Police, Fire and EMS information. The following information is Copyright 2000, Scanner Master Corp.

Boston City Services Trunked Network (Mot. Type 1)

851.5875, 852.1875, 856.7625, 857.7625, 858.7625, 859.7625, 860.7625, 856.9375, 857.9375, 858.9375, 859.9375, 860.9375

Best Uniden/Bearcat TrunkTracker Fleet Map: Try Default Map 15
Alternate: b0-S0, b1-S4, b2-S4, b3-S10, b4-S10, b5-S4, b6-S12

City Trunked System Fleets & Subfleets
Fleet 100 Traffic and Parking

100-1	Public Safety Emerg.
100-2	Operations
100-3	Parking Enforcement
100-4	Traffic Enforcement
100-5	Tow and Hold
100-6	Transportation Admin
100-7	Transportation Invest.
100-8	Reserved
100-9	Reserved
100-10	Boston Fire Dept.

Fleet 200 DPW/Park Rangers

200-1	Public Safety Emerg.
200-2	Central Office
200-3	Highway Dept
200-4	Snow Removal
200-5	Sanitation
200-6	Street Lighting
200-7	Engineering
200-8	Construction
200-9	Reserved
200-10	Reserved

Harry Baughn

200-11 Unknown
200-12 Reserved
200-13 Park Rangers

Fleet 301 Public Facilities
301-1 Public Safety Emerg.
301-2 Dispatch
301-3 Warrant Listing (F2)
301-4 Technicians (F3)
301-5 City Hall Sec./Adm (F4)
301-6 Regrouping (F5)
301-7 Reserved

Fleet 303 Parks & Recreation
303-1 Public Safety Emerg.
303-2 Park Maintenance
303-3 Emerg. Supervisors
303-4 Park Programs
303-5 Administrative
303-6 Supervisors (F9)
303-7 Regrouping

Fleet 400 Elder Vcns/LI Hosp
400-1 Public Safety Emerg.
400-2 Shuttle Buses
400-3 Supervisors
400-4 Reserved
400-5 Reserved
400-6 Long Island Hosp Security (Primary)
400-7 Long Island Hosp Security (Secondary)

Fleet 401 Penal (Southbay Corr.)
401-1 Public Safety Emerg.
401-2 Transportation
401-3 Security
401-4 Administration
401-5 Maintenance
401-6 Tactical
401-7 Penal 6

Fleet 402 Inspectional Services
402-1 Public Safety Emerg.
402-2 Animal Control
402-3 Building Inspectors
402-4 Health Inspectors
402-5 Electrical Inspectors
402-6 Code Enforcement
402-7 Administrative

Attractions

151.280	R Arthur Fiedler Memorial	(159.285) 151.4
484.0125	Aquarium Security	(156.975 Boat Docking)
461.9125	Aquarium	(& 463.2875/154.570 Parking)
461.400	Christian Science Center	(& 463.750, 462.850)
464.375	Fanueil Hall Security	
471.9375	Franklin Park Security	136.5
464.575	Isabella Stewart Gardner Museum	(& 464.775)
151.745	Museum of Fine Arts	(& 151.835, 154.600)
462.650	Museum of Science operations	118.8
464.575	Museum of Science	
461.100	Symphony Hall	

Boston Area Campus Police

Boston College	472.1375	127.3
Boston University	472.1625*	131.8
Emerson College	463.875	103.5
Harvard University	471.0625	131.8
M.I.T. 472.5375	131.8	
Northeastern University	464.975	127.3
Northeastern Student Patrol	464.125	127.3
Suffolk University	463.650	127.3
Tufts University	463.325	192.8
University of Mass. Boston	463.850	141.3

* B.U. also operates a 900 MHz trunked system.

Boston Hotels

Back Bay Hilton	463.550
Boston Harbor Hotel	463.225
Bostonian Hotel	484.5625
Collonade Hotel	154.570
Copley Plaza	464.575 (Also: 464.350, 463.925, 464.025, 154.570)
57 Motor Hotel	151.745
Four Seasons	464.675
Holiday Inn	151.745
Hotel Meridion	464.475
Hotel Meridian	464.925
Hyatt Harborside	461.350
Logan Airport Hilton	463.800 (Also: 154.515, 154.540)
Marriott Copley Place	464.350
Marriott (various locations)	464.825 (Also: 463.800, 464.2875, 464.450)
Park Plaza	151.865
Park Plaza	151.745
Ritz Carlton	464.775
Sheraton	461.225 (Also: 154.570, 462.000, 464.725, 464.750)
Suisse Chalet	464.925
Swissotel	462.150 (Also: 462.125, 463.425)
Westin	462.125
Westin	463.350

Metro Boston Communities

Arlington Police	471.1625	131.8
Arlington Fire	460.600	82.5
Belmont Police	471.4125	131.8
Belmont Fire	154.130	100.0
Braintree Police	471.5375	131.8
Braintree Fire	483.5125	131.8
Brookline Police	471.0125	131.8
Brookline Fire	483.4375	131.8
Canton Police	471.6625	131.8
Canton Fire	453.525	D-051
Cambridge Police –Channel 1	470.3125	131.8
Cambridge Police –Channel 2	471.3125	131.8
Cambridge Fire (& trunking sys)	154.355	146.2
Chelsea Police	470.8875	131.8
Chelsea Fire	154.325	114.8
Concord Police	482.3375	146.2
Concord Fire	483.5375	D-054
Dedham Police	470.9625	131.8
Dedham Fire	153.950	131.8
Everett Police	470.8125	131.8
Everett Fire	154.310	186.2
Lexington Police	471.1875	131.8
Lexington Fire	154.340	131.8
Lynn Police	472.4125	131.8
Lynn Fire	154.415	131.8
Malden Police	470.7625	131.8
Malden Fire	154.250	179.9
Medford Police	470.5875	131.8
Medford Fire	153.890	131.8
Milton Police	470.4625	131.8
Milton Fire	483.5125	131.8
Needham Police	470.3625	131.8
Needham Fire	153.950	192.8
Newton Police –Channel 1	470.8375	131.8
Newton Police –Channel 2	470.3875	131.8
Newton Fire	483.4625	131.8
Quincy Police	453.225	192.8
Quincy Police	453.250	192.8
Quincy Fire	483.5375	131.8
Randolph Police	471.4375	131.8
Randolph Fire	483.6625	103.5
Revere Police	470.8625	131.8
Revere Fire	154.175	123.0
Salem Police	471.6375	131.8
Salem Fire	483.4625	146.2
Somerville Police	470.5375	131.8
Somerville Fire	483.3875	131.8
Waltham Police	470.5125	131.8
Waltham Fire	154.400	123.0
Watertown Police	470.7125	131.8
Watertown Fire	483.7125	131.8
Wellesley Police	471.4875	131.8
Wellesley Fire	482.575	D-065
Weymouth Police	470.9375	131.8
Weymouth Fire	154.235	136.5
Winthrop Police	471.7375	131.8
Winthrop Fire	483.6375	131.8

MASSACHUSETTS STATE/FEDERAL AGENCIES

Massachusetts State Police

Troop A/H System Motorola Trunking System (Boston/ Metro West/North Shore)
856.7125, 857.7125, 858.7125, 859.7125, 860.7125
856.7375, 857.7375, 858.7375, 859.7375, 860.7375
856.9625, 857.9625, 858.9625, 859.9625, 860.9625
856.9875, 857.9875, 858.9875, 859.9875, 860.9875
(future use: 857-860.2125, 859-860.2375, 859-860.4625)

Uniden/Bearcat TrunkTracker Scanner Fleet Map:
b0-S4, b1-S0, b2-S12, b3-S12, B4 through 7-all S0

Trunking Talkgroups

State Police Troops A&H:

33168	Troop A Tac 1A (North-A1, A2, A6)
33200	Troop A Tac 2A (South-A3, A4, A5)
33232	Troop A Tac 3A (Special Events, Car to Car)
33264	Troop H Tac 4A (North-H1, H4, H5, H6)
33296	Troop H Tac 5A (South-H2, H3, H7)
33328	Troop A Tac 6A (A&H Emergency)
33360	Troop H Tac 7A (Special Events, Car to Car)
33392	Troop A Tac 8A (Troop F, Logan Airport)
33424	Troop A Tac 9A
33456	Troop A Tac 10A
33488	Troop A Tac 11A
33552	Radio Technicians
33776	Troop C Operations (Central Massachusetts)
36336	Regional Public Safety Tactical
36368	Regional Public Safety Tactical

Type 1 Subfleet

000-1	MWRA	Water-1 (Primary)
000-2	MWRA	Water-2 (Tactical)
000-3	MWRA	Water-3 (Emergency)
000-4	MWRA	Sewer-1 (Primary)
000-5	MWRA	Sewer-2 (Tactical)
000-6	MWRA	Sewer-3 (Secondary)
000-7	MWRA	Admin-1 (Vehicle Maint)
000-8	MWRA	Admin-2 (Fore River Staging Area)
000-9	MWRA	Private
000-10	MWRA	Emergency tie to MSP
000-11	MWRA	Deer Island (Interagency Emerg)
000-12	MWRA	Deer Island Project (Const)
000-13	MWRA	Car to Car (Safety Secondary)
000-14	MWRA	Deer Island Project (Special Ops)
000-15	MWRA	Security (Wakenhut Security)
200-1	MDC Ch.1	CEN 1-Central Svcs Charles River, Esplanade area, Memorial Drive
200-2	MDC Ch.2	CEN 2-Central Services
200-3	MDC Ch.3	RESERV-Reservations, Parks
200-4	MDC Ch.4	ZOO 1-Franklin Park Zoo
200-5	MDC Ch.5	ENGN-Parks Engineering
200-6	MDC Ch.6	CEN 3-Central Svcs North
200-7	MDC Ch.7	SP Ops.-MDC Rangers/State House
200-8	MDC Ch.8	Recreation (Rinks, Pools, Beaches)

Type II Statewide Talkgroups
8272 Plymouth County Sheriff

8528	BAPERN 1
8560	BAPERN 2
8592	Big Dig IOC 1 Operations
8624	Big Dig IOC 2 Operations
8656	Big Dig IOC 3 Operations
8688	Big Dig IOC 4 Operations
8720	Big Dig IOC 5 Operations
8752	Big Dig IOC 6 Operations
8784	Big Dig IOC 7 Operations
8816	Big Dig IOC 8 Operations
9072	Exec Office of Public Safety EOPS
9136	SFM-1 (State Fire Marshal)
9168	SFM-2 (State Fire Marshal)
9200	Mass Emerg Mgt Agency old MEMA
9264	Norfolk County Sheriff
9328	Bristol County Sheriff
9424	Exec Office of Public Safety EOPS
9744	Massport Tie (Logan Airport Emerg.)
9776	Radio Technicians
9904	Southeast Expressway HOV lane ops
23552	State House
35312	Radio Technicians
35344	Radio Technicians (statewide)
38928	Mass Emerg Mgt Agency (New)
39152	Mass Env Police Ch 1 (Statewide)
39184	Mass Env Police Ch 2 (Statewide)
40176	Mass Env Mgmnt. Administration
10608	Convention Center Authority

Additional State Police Frequencies

159.030	State Police Turnpike Patrol	varies
866.0125	NPSPAC Calling	156.7
866.5125	NPSPAC Tactical	156.7
867.0125	NPSPAC Tactical	156.7
867.5125	NPSPAC Tactical	156.7
868.0125	NPSPAC Tactical	156.7
868.9375	State Police Tactical	
868.950	State Police Tactical	
868.9625	State Police Tactical	
868.975	State Police Tactical	
868.9875	State Police Tactical	

Radio Codes

1	Emergency	10	Stolen status request
2	Phone the station	11	License status request
3	Phone	12	Message request
4	Out of service	13	Radio check
5	Bock in service	14	Moke & wants-person
6	Location	15	Emergency request for assistonce
7	Return to stotion		
8	Stopping suspicious vehicle	16	Investigotion
		17	Clear from assignment
9	Registration request	18	Request to clear

Troop Call Signs

TROOP "A" -Station A- Danvers Headquarters

A-1	Andover	A-5	Revere
A-2	West Newbury	A-6	Peabody
A-3	Concord	A-9	MSP Radio Repoir
A-4	Medford		

TROOP "H" - Greater Boston/North (Former Metro)

H-1	State House, Boston	H-5	Boston, Brighton
H-2	Framingham	H-6	Boston, Old Colony
H-3	Foxboro	H-7	Boston, Milton
H-4	Boston, Downtown		

Environmental Management (DEM)

151.205	-F1-	Statewide Administration 71.9
151.145R	-F2-	Plymouth repeater
151.145R	-F3-	Sharon repeater
151.145R	-F4-	Andover repeater
151.415	-F12-	Fireground Simplex CSQ
151.235	-F13-	Fire Towers - Dis 5,6,7,8,12,14 71.9
151.310	-F14-	Fire Towers - Dis 1,2,3,4,9,10,11 71.9
151.370	-F15-	State Parks & Recreation 71.9

United States Coast Guard

156.450	-ch. #09-	Boston Harbor Hailing
156.600	-ch. #12-	Port Navigation
156.650	-ch. #13-	Navigational
156.800	-ch. #16-	Distress/Calling
157.100	-ch. #22-	Working/Main Operations/ NOTAMS
157.150	-ch. #23-	Boston Occosional Use/ NH/ME
157.075	-ch. #81-	Boston/Gloucester/ Merrimack/Hull

Miscellaneous Military/Federal Frequencies

142.350R	Mass Notional Guard – high band rptr 110.9
168.325R	US Army Corps Eng. -Central MA CSQ
148.150R	Civil Air Patrol -East, Central, W Ma 100.0
148.125R	Civil Air Patrol 100.0

REGIONAL POLICE NETWORKS

BAPERN

The Boston Area Police Emergency Radio Network is a mammoth multi-county regional police radio network. PL is generally 131.8.

470.7875	BAPERN ch. #3 -Intercity/Tactical Ops.
470.5625	BAPERN ch. #4 -Investigations/ Intercity

Bapern Channel #2 District Frequencies

470.4875	North District "BAPn" in the Community Section
470.7375	West District "BAPw" in the Community Section
470.9125	South District "BAPs" in the Community Section

REGIONAL FIRE NETWORKS

Fire District Mutual Aid Systems

Dist	Frequency	Control	County
2	154.295B/33.90M	Hanson	Plymouth
SE	154.295	Randolph	Southeost
4	33.50/33.54	Stoughton	Norfolk
5	154.070/153.83M	Beverly	South Essex
13	483.2875	Newton	Metrofire
14	33.980/483.7125	Natick	South Middlesex
15	154.070	Haverhill	North Essex

District #13 - "Metrofire"

Metrofire is the fire mutual aid association comprised of Boston, communities in the metropolitan area and Massport. Many of the communities transmit on either 154.220, which is retransmitted on UHF, or directly on 483.2875. Newton is the control for the system, with Boston as its backup. An incident command unit located in Waltham is available for major fire and HazMat incidents.

483.2875R	Base to base mutual aid operations (131.8)
154.220	Simulcasted on 483.2875
483.3125R	"Fire Red" Fireground communications
483.2625	"Fire Blue" HazMat incident channel
868.0125	National Tactical Channel/HazMat Channel

Fire Notification/Buff Networks

463.550	Citywide Boston	167.9
463.550M	Citywide Boston	167.9
461.575	Citywide Boston (south)	167.9
461.375	Citywide Boston (north)	203.5
461.775	Citywide Boston (Lowrence area)	103.5
464.275	Citywide Boston (Newscomm)	91.5
463.550M	Citywide Boston (Dispatch)	91.5
464.100	Citywide Cape Cod	85.4
461.600	City News/Chelsea Notification	162.2
462.725	Metro Radio System "1" Primary	167.9
462.725M	Metro Radio System "2"	167.9
462.650M	Metro Rodio System "3"	167.9
463.850	Metro Rodio System "4"	151.4
463.850M	Metro Radio System "5"	151.4

TRANSPORTATION

Boston-Logan International Airport (Massport)

128.800	Tower
119.100	Tower
134.050	Gate Control
121.900	Ground Control
120.600	Approach Control -South
118.250	Approach Control -North
127.200	Approach Control -West
133.000	Deporture Control
121.650	Clearance Delivery/Pre-Taxi Clearonce
121.750	Tower to Helicopters
123.075	Helicopters
135.000	ATIS
122.950	UNICOM
854.9625	Massport -Fire Dept. emergency channel

Massport Trunked Radio System

Trunk Fleet Map: b0-S12, b1 through 5 all S0, b6-S4, b7-S0
856.4375, 857.4375, 858.4375, 859.4375, 860.4375, 855.8125, 856.8125, 857.8125, 858.8125, 859.8125, 860.8125, 858.2625, 859.2625, 860.2625

Key Massport Talkgroups

000-1	Emergency
000-2	Emergency 2
000-3	Call in
000-4	Massport Tac 1
000-5	State Police Troop F
000-6	Massport Tac 2
000-7	Reserved
000-8	Fire Operations
000-9	Fireground
000-10	Operations
600-10	Taxis
600-11	Buses
600-13	Parking

Boston-Logan Ground Crews

460.650	Continental Airlines (131.8)
460.775	American Airlines (D-263)
460.825	Delta Airlines (103.5)
460.875	Northwest Airlines (192.8)
460.675	Trans World Airlines (192.8)
460.700	US Air (131.8)
460.725	United Airlines (203.5)
Trunked	ARINC (856-860.8875)

Boston-Logan Private Air Radio (plane to company)

129.400	Airinc. (Northeast)
129.225	American Airlines
130.400	Continentol Airlines
130.525	Continental Airlines
131.850	Delto Airlines
131.900	Delta Airlines
131.450	Northwest Airlines
131.700	Northwest Airlines
130.100	US Air (also: 936.250; 936.6375; 937.1375)
129.300	United Airlines

MBTA (Metropolitan Boston Transit Authority)

470.6875	Blue Line Operations	162.2
470.6375	Green Line Operations	162.2
470.6125	Orange Line Operations	162.2
470.4125	Red Line Operations	162.2
470.6625	MBTA Police ch. #1	131.8
483.5625	MBTA Police ch. #2	131.8
472.5875	North Buses/Trackless Trolleys	162.2
472.6875	South Buses	162.2
31.140R	"Tronsportation"/Repoir/Supervisors	162.2
44.460	Maintenance/Engineering/Power	162.2

MBTA Commuter Rail

161.490	Ch. #1 - System Emergency - TRAINS (alert)
160.590	Ch. #1 - System Emergency -DISPATCHER
160.320	Ch. #2 - General Operations - NORTH DISP.
160.800	Ch. #3 - General Operations - WEST/SOUTH
161.070	Ch. #4 - Yard Operations
160.875	Yards North of Boston
160.920	Yards South of Boston/Amtrak tie

Scanner Logs

SCANNING REPORT

Larry Van Horn
larry@grove-ent.com

Avery County, North Carolina

Public safety frequencies below courtesy of Jim, K4HHN. Thanks for checking in with us, Jim.

Avery County Sheriffs channel	155.625/155.070 (KVV663)
Avery County Fire channel	154.445/154.010 (KNGE474)
Avery County EMS channels	155.280/155.295 smplx (WZT 899)
NC statewide mutual aid	154.875 (KVV663)
Nationwide law enforc. mutual aid	155.475

Mexico VHF Low-Band

This fine list of Mexican VHF low-band assignments comes courtesy of Ian Julian, ZL1TBM, and the popular and very informative vhf skip newsgroup at **www.onelist.com**. This list of Mexican nationwide 30-50 MHz users originated from the Mexican COFETEL, equivalent of the U.S. Federal Communications Commission.

31.000	Secretario de Salubridad Y Asistencia
34.980	Autobuses Anahuac, S.A. de C.V.
37.500	Constuctiones Y Maquinaria Guerrero S.A. de C.V.
40.200	Universidad Autonoma de Chapingo
40.280	Petroleos Mexicanos
40.330	Petroleos Mexicanos
40.400	Petroleos Mexicanos
40.430	Petroleos Mexicanos
40.450	Petroleos Mexicanos
40.650/44.650	Comision Federal de Electricidad
40.790	Petroleos Mexicanos
42.280/44.380	Petroleos Mexicanos
43.260	Ideal S.A.
44.080	Petroleos Mexicanos
44.130	Petroleos Mexicanos
44.150	Petroleos Mexicanos
44.200	Petroleos Mexicanos
44.230	Petroleos Mexicanos
44.280	Petroleos Mexicanos
44.300	Petroleos Mexicanos
44.330	Petroleos Mexicanos
44.350	Petroleos Mexicanos
44.380	Petroleos Mexicanos
44.480	Petroleos Mexicanos
44.500	Petroleos Mexicanos
44.530	Petroleos Mexicanos
44.550	Petroleos Mexicanos
44.650/40.650	Comision Federal de Electricidad
44.880	Petroleos Mexicanos
45.150	Petroleos Mexicanos
45.180	Petroleos Mexicanos
45.230/47.150	Petroleos Mexicanos
45.620	Instituto Nacional de Estadistica Geografia E Informatica
45.950	Petroleos Mexicanos
46.300	Petroleos Mexicanos
46.450	Petroleos Mexicanos
46.500	Petroleos Mexicanos
46.550	Petroleos Mexicanos
46.700	Petroleos Mexicanos
46.750	Petroleos Mexicanos
46.800	Petroleos Mexicanos
46.900/47.400	Petroleos Mexicanos
47.000	Petroleos Mexicanos
47.150/45.230	Petroleos Mexicanos
47.400/46.900	Petroleos Mexicanos
47.580	Petroleos Mexicanos
47.600	Petroleos Mexicanos
47.630	Petroleos Mexicanos
47.630/49.350	Petroleos Mexicanos
48.280	Petroleos Mexicanos
48.490	Petroleos Mexicanos
48.580	Petroleos Mexicanos
48.900	Petroleos Mexicanos
48.900/45.450	Petroleos Mexicanos
48.900/45.950	Petroleos Mexicanos
49.100	Petroleos Mexicanos
49.150	Petroleos Mexicanos
49.180	Petroleos Mexicanos
49.200	Petroleos Mexicanos
49.230	Petroleos Mexicanos
49.280	Petroleos Mexicanos
49.350	Petroleos Mexicanos
49.350/47.630	Petroleos Mexicanos
49.400	Petroleos Mexicanos
49.430	Petroleos Mexicanos
49.500	Petroleos Mexicanos
49.550	Petroleos Mexicanos
49.600	Petroleos Mexicanos
49.650	Petroleos Mexicanos

More Italian Skip Logs

Ciccio is back this month with some more long distance logs from Italy. All times UTC and frequencies are in MHz.

29.810 Argentine Army unidentified location in Argentina. Link to Antarctica bases. Duplex circuit. YL/SS phone patch at 1225.

31.500 Unidentified U.S. Army Range Control."8 from Range..." probably talking about gun firing. Quite distorted audio and deep fades at 1350. (I show nothing stateside Ciccio, this could be an overseas military range-LVH)

33.160 Unidentified in-house pagers at 1245.

33.250 Unidentified POCSAG protocol pager at 1249.

33.260 KCR 733 Epec Communications Corporation, Terrebonne Parish, Houma, Louisiana. Female clearing traffic with unidentified at 1436. First time I have heard Louisiana in the VHF low band.

33.420 Unidentified in-house pagers probably from Canada at 1346? I have nothing listed in my Canadian government frequency list. (I have nothing in my files for this frequency either Ciccio-LVH)

33.475 CMXN 35 Ministerio de Agricultura Cuba. Unknown location with Spanish speaking male calling CMXN 353 and receiving probable daily fuel consumption at 1242. Later CMXN 37 working another unidentified with same kind of data and heard CMXN 3 Control also calling CMXN 301.

33.700 KCD 271 Fire Station, Harwich, MA, units availability announcement at 1256.
KCC 944 Fire Station, Torrington, CT, rollcall to a total of 9 "towers" at 1318.
KSM 207 Fire Station, Worcester, MA, rollcall to all fire stations in the county, for radio check and some requests on units availability at 1410.
KCB 781 Barnstable County Fire, Barnstable, MA, rollcall to all fire stations in the county for radio check and some requests for units availability at 1420. I can hear this one often during his morning duty rollcall always with fair to very good signals.

33.840 WNCR 900 Connecticut State Fire in Southbury, CT, radio checks with various mobile units at 1310.

33.880 WZJ 565 Mount Rainier Valunteer Fire Dept. Inc. Mount Rainier, MD, with a CW ID at 1742.

35.360 KJO 364 Bristol Construction Co. Inc. Bristol, CT, (tentative) male dispatcher asking "...is there anybody in Manchester" at 1455.

35.380 KNKB 566 St. Croix Telephone Company, Stillwater, MN, with CW ID and POCSAG/Voice messages at 1753. Nice signal up to S7. This is a first time log of Minnesota on VHF low-band. (I show this is Frontier Communications, St. Croix Inc, and has locations under this call in both Minnesota and Wisconsin-LVH)

35.460 KNKB 419 Pro-Com Inc. pager in Ohio (10 transmitter list in the state on this frequency). CW ID and POCSAG messages at 1737.

35.640 KNB 49953 Unidentified medical in-house pager heard at 1501. (Not a correct US callsign Ciccio-LVH) .... 7234 Unidentified medical in-house pager heard at 1458. (Closest match I have is WNZS724 from the Westwood Dermatology Group in New Jersey-LVH)

35.680 WNL 1247 Unidentified medical in-house pager heard at 1336.
KSK 983 Unidentified medical in-house pager heard at 1348. (Nothing close in my notes for either one of these-LVH)

40.9885 Arabic speaking male heard on a cordless phone on this frequency at 0800.

Amateur Radio Space Shuttle Audio/Video Transmissions

And finally, my new shuttle ham retransmissions list.

HF Broadcast
WA3NAN-NASA Goddard ARC
3860 (LSB) 7185 (LSB) 14295 (USB) 21395 (USB) 28650 (USB)
WA3NAN Shuttle Retransmission FAQ: **http://garc.gsfc.nasa.gov/www/retransmission/shuttle_faq.html**

VHF/UHF Broadcast

444.200	Birmingham, AL (WO4W)
1241.25	Mt. Wilson, CA (K6KMN)
147.150	Pasadena, CA (WR6JPL/R-Jet Propulsion Lab)
145.160	Cheyenne Mountain, CO (Colorado Repeater Assoc) **www.rmsd.com/hamradio/cra/**
147.225	Conifer Mountain, CO (Colorado Repeater Assoc) **www.rmsd.com/hamradio/cra/**
224.980	Conifer Mountain, CO (Colorado Repeater Assoc) **www.rmsd.com/hamradio/cra/**
145.460	Lee Hill, CO (Colorado Repeater Assoc) **www.rmsd.com/hamradio/cra/**
145.230	Ounedin, FL (K4LK-TBATS) **http://home.tampabay.rr.com/k4lk/**
51.840	East Clearwater/Largo, FL (K4LK-TBATS) **http://home.tampabay.rr.com/k4lk/**
442.075	East Clearwater, FL (K4LK-TBATS) **http://home.tampabay.rr.com/k4lk/**
146.940	Merritt Island, FL (K4GCC)
443.950	Port Richey, FL (K4LK-TBATS) **http://home.tampabay.rr.com/k4lk/**
147.285	St. Petersburg, FL (K4LK-TBATS) **http://home.tampabay.rr.com/k4lk/**
444.700	St. Petersburg, FL (K4LK-TBATS) **http://home.tampabay.rr.com/k4lk/**
442.550	Sarasota, FL (K4LK-TBATS) **http://home.tampabay.rr.com/k4lk/**
146.655	Sweat Mountain, GA (BSRG) **www.bsrg.org/**
147.345	Sweat Mountain, GA (BSRG) **www.bsrg.org/**
224.120	Sweat Mountain, GA (BSRG link to 146.655 repeater) **www.bsrg.org/**
427.250	Sweat Mountain, GA (N4NEQ BSRG ATV repeater) **www.bsrg.org/**
147.450	Greenbelt, MD (WA3NAN-NASA Goddard ARC Simplex) **http://garc.gsfc.nasa.gov/www/garc-home-page.html**
145.530	Clowson, MI (N8UDK-Simplex)
439.250	Lincroft, NJ (N2SMT/R-Brookdale ARC ATV) **http://165.230.224.140/~mogliaco/otv.html**
145.670	Cleveland, OH (NA8SA-NASA Glenn ARC Simplex) **www.grc.nasa.gov/WWW/Clubs/NA8SA/**
426.250	Dayton, OH (DARA ATV) **www.radio-amateurs.com/**
1258.30	Dayton, OH (DARA ATV) **www.radio-amateurs.com/**
146.445	Greenville, PA (KE3JP) **www.svol.net/~ke3jp**
445.000	Arlington, TX (WB5EPI-Simplex)
147.560	Beaumont, TX (KE5O-Simplex)
147.544	College Station, TX (WSAC-Simplex)
147.560	Canrae, TX (WB5ITT-Simplex)
53.110	Houston, TX (WA5SIX)
146.640	Houston, TX (W5RRR)
145.250	Mesquite, TX (KC5NQ)
145.310	Temple, TX (N5ZXJ)
421.250	Waco, TX (KC5OYN WATS ATV via W5TAH) **www.wacoatv.org/**
144.340	Norfolk, VA (KO4FR/WA1TSS)
427.250	Norfolk, VA (KO4FR/WA1TSS ATV)
431.750	Norfolk, VA (KO4FR/WA1TSS)

Information on amateur radio aboard the International Space Station can be found at **http://garc.gsfc.nasa.gov/~ariss/ariss.html**. Current information on amateur radio activity aboard the Russian MIR space station is presented at **www.arrl.org/sarex/mir.html**.

Space Shuttle Amateur Radio Experiment (SAREX) information is available at **www.arrl.org/sarex/sarexfaq.html**. If your ham voice or ATV repeater/simplex operation carries shuttle mission audio please contact us. Email Larry-N5FPW at **larry@grove-ent.com**.

Up-to-date versions of this list can be found on the Grove Enterprises website in our detailed *Monitoring NASA and Space Shuttle* report at the following URL: **www.grove-ent.com/nasa.html**.

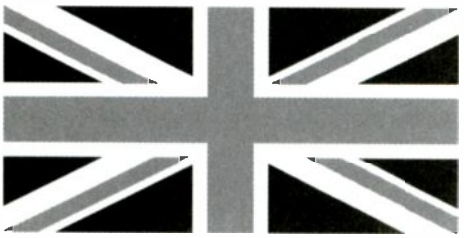
Till next month, good hunting all and send those logs to the email address above.

Hugh Stegman, NV6H
utilityworld@ominous-valve.com
www.ominous-valve.com/uteworld.html

The Sun Sets On Portishead Radio

We're getting used to dramatic station closures in the maritime coastal service. One owner after another is noting the decline in traffic and pulling the plugs, usually amid great ceremony and nostalgia, leaving these once-crowded bands ever quieter. Even so, nothing had really prepared the radio world for the disappearance of Britain's Portishead Radio, a huge network of maritime and aeronautical stations dating back almost to Marconi.

On April 30, 2000, the utility station lists for Europe suddenly got a whole lot shorter. That was the day British Telecommunications (BT), the



giant phone and Internet conglomerate, discontinued all of its high frequency (HF) and very high frequency (VHF) services. Gone was pretty much everything except a few mediumwave services such as NAVTEX (Navigational Telex, an automated bulletin system). These, though, were slated to go away at the end of June.

All of this left BT, and Britain in general, more or less out of the maritime coastal radio business. It was the end of an industry, and of an era.

In the North Atlantic, Portishead was synonymous with high seas radio. Stations and facilities came and went, adding remote sites all over British coasts, but the proud name remained. Portishead played a major role in World War II, in the subsequent "Area Scheme" that followed, and in the commercial era that followed that. Such famous ocean liners as the *Queen Mary* and *Queen Elizabeth 2* maintained contact all the way across the Atlantic. In Portishead's heyday, it employed hundreds of operators, and moved millions of words of traffic. However, this traffic declined enormously when maritime service migrated to satellites in the 1990s.

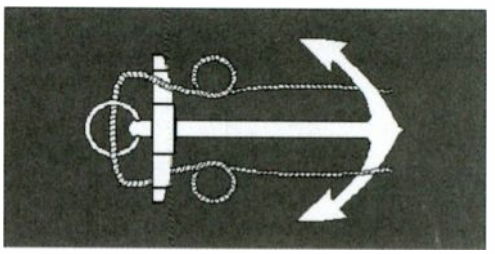
As with all of these "sudden" closures, then, Britain's bombshell had actually been years in coming. As we've seen with AT&T and other big phone companies, BT simply could not justify its money-losing coastal radio division in today's deregulated, cutthroat markets.

In October of 1998, BT warned its customers to start making other arrangements. Originally, the shutdown was scheduled for mid-1999. As we've seen in other countries, though, certain regulatory hurdles had to be cleared. Hearings were held and comments were taken.

According to these comments, the big losers were yacht clubs, fishing fleets, a global relief agency, and some aeronautical customers. Many of the smaller vessels exempt from the satellite requirements of the Global Maritime Distress and Safety System (GMDSS) ended up purchasing the equipment anyway.

Essential safety services, some required on GMDSS compulsory ships, have been shifted to the British Maritime and Coastguard Agency (MCA). MCA will broadcast mediumwave and VHF marine safety information (MSI). It will also handle MEDICO, a voice radio medical service, and NAVTEX.

British maritime HF, however, is dead. On April 29, ironically International Marconi Day, the radio world marked this event. Amateurs in many countries, though not in the United States, were given temporary permission to work GKB crossband, using Morse code. Hams transmitted in the amateur bands, but they listened to Portishead's high-powered stations on the regular maritime frequencies.



On April 30, Portishead's voice stations broadcast the old-time, telephone "circuit adjustment" loops, which had not been heard in many years. Finally, at 1200 Coordinated Universal Time, a last series of messages went out in all modes. Here's the one in Morse, as sent by hand key:

"CQ CQ CQ *[hello all stations]* DE GKB2/4/5/6. This is the last broadcast from Portishead Radio. For 81 years we have served the maritime community. We say thank you to all those who have supported and used our station. We pay tribute to Marconi who made it all possible. His first transmissions across water were made from nearby here and so started the radio era. We are proud to have been part of that era. As this historic time in the commercial messaging world comes to a close the Manager and Radio Officers wish you farewell from Portishead Radio/GKB AR *[end of message]* VA *[end of work; the final sign off]*"

Goodbye, old friend, and good job!

❖ Yet More ALE

As the old goes out, the new comes in. Last month we explained how to decipher the network commands passed by the latest generation of computer-controlled radios using Automatic Link Establishment. As we've often noted, personal computer users with the Windows operating system can run a rather remarkable program, PC-ALE, that lets them see these. I told how to convert the computer-geek output of the commands into plain old English, thereby obtaining some useful information.

Well, the technology is moving too fast even for me. Charles Brain, G4GUO, has been hard at work programming, and he has his new version "G" of PC-ALE out much sooner than I expected. It does a nice job of displaying these commands for you, already decoded. Just enable "Command Trace," a new option, on the configuration screen. It looks like Charles got ahead of me on this one.

However, the procedure given last month still works, and it's still the only way to do it on any of the older PC-ALE versions. Have a nice time with this stuff, as we bleep our way, bravely, into the Third Millennium.

Utility Logs

Hugh Stegman

Abbreviations used in this column

AFB	Air Force Base
AM	Amplitude Modulation
ARQ	Automatic Repeat Request teleprinting system
AWACS	Airborne Warning And Control System
CAMSPAC	Communication Area Master Station, Pacific
CANFORCE	Canadian Forces
CIA	US Central Intelligence Agency
COQ-8	8-tone multi-frequency teleprinting system
CW	Morse code telegraphy ("Continuous Wave")
EAM	Emergency Action Message
FAX	Radio Facsimile (120/576 mode unless otherwise stated)
FEC	Forward Error Correction teleprinting system
FEMA	Federal Emergency Management Agency
GANTSEC	Greater Antilles Section
ISS	International Space Station
LDOC	Long Distance Operational Control
M/V	Motor Vessel
MARS	Military Affiliate Radio System
MFA	Ministry of Foreign Affairs
MI6	British Military Intelligence, group 6
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
Ops	Operations
PR	Puerto Rico
RSA	Republic of South Africa
RTTY	Radio Teletype
SELCAL	Selective Calling
SHARES	Shared Resources
SIS	Secret Intelligence Service (Like British "MI6")
UK	United Kingdom
Unid	Unidentified
US	United States
USCG	US Coast Guard
USS	United States Ship
UTC	Universal Coordinated Time
VOLMET	Aviation weather observations

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.

60.0 MSF-Standard time signal station, Rugby, UK, in CW at 0650. (Ary Boender-Netherlands)

75.0 HBG-Observatoire Neuchatel, Switzerland, with CW standard time signals at 1540. (Boender-Netherlands)

77.5 DCF77-Standard time signal station, Mainflingen, Germany, in CW at 0700. (Boender-Netherlands)

147.3 DDH47-Hamburg Meteorological, Germany, with plain text RTTY weather at 2200. (Boender-Netherlands)

2203.0 MGJ-British Royal Navy, Faslane, with RTTY channel bulletins at 2319. (Boender-Netherlands)

2357.5 OUA32-Danish navy, Stevns, with CW marker at 2215. (Boender-Netherlands)

2626.0 Unid-Mossad, Israel (Enigma code E10), AM phonetic female "numbers" voice, in progress at 2314. (Boender-Netherlands)

2872.0 Shanwick-Shannon/Prestwick Aeradios, UK, working an Alitalia flight at 2310. (Boender-Netherlands)

3195.0 "R"-Russian CW channel marker (MX), Izhevsk, at 2056. (Boender-Netherlands) *These weird markers have changed again. They're intermittent, they move around a lot, they often come in clusters, and RTTY appears frequently. -Hugh*

3285.0 M5RT-Czech Republic military, Milovice, with coded CW message in 5-letter groups, at 2346. (Boender-Netherlands)

3291.0 "P"-Russian CW channel marker (Enigma MX), Kaliningrad, at 2200. (Boender-Netherlands)

3322.0 "R"-Russian CW channel marker (MX), Izhevsk, at 2056. (Boender-Netherlands)

3338.0 "L"-Russian CW channel marker (MX), St Petersburg, at 2231. (Boender-Netherlands)

3699.5 "P"-Russian CW channel marker (MX), Kaliningrad, at 2251. (Boender-Netherlands)

3876.0 DPQT-Czech Republic military, Prague, with coded CW message in 5-letter groups, at 2126. (Boender-Netherlands)

4073.0 Unid-Russian military pseudo-time signal station (M18), repeatedly sending "0237" (time in UTC plus 4), at 2237. (Boender-Netherlands)

4325.0 "R"-Russian CW channel marker (MX), Izhevsk, at 2056. (Boender-Netherlands)

4395.5 NVKL-Slovak military, Zilnia, with a CW marker or loop at 2103. (Boender-Netherlands)

4447.0 YABE-Unid Russian military, calling HR4S, GL1J, TROC, W44S, ZKDC, many others, in CW at 2130. (Boender-Netherlands)

4463.0 FTJ-Israeli intelligence (E10), with phonetic callup in AM at 2000. (Boender-Netherlands)

4557.8 "P"-Russian CW channel marker (MX), Kaliningrad, at 2055. (Boender-Netherlands)

4557.9 "S"-Russian CW channel marker (MX), Arkhangelsk, at 2055. (Boender-Netherlands)

4646.0 "V"-Russian CW channel marker (MX), Khiva, at 2253. (Boender-Netherlands)

4706.0 REA4-Russian Air Force, with coded CW message in 5-letter groups, at 2000. (Boender-Netherlands)

4731.0 MKL-British Royal Air Force, Kinloss, with CW Terminal Aerodrome Forecasts at 2200. (Boender-Netherlands)

4742.0 Architect-Royal Air Force command, UK, working aircraft Ascot 300? (Missed last digit), using SELCAL LM-DG, at 0258. (Ron Perron-MD)

4802.5 Unid- Russian Air Defense "time stamp station" (M21), with data in the usual, 14-character, CW format, lots of question marks and UTC+4 times, at 2245. (Boender-Netherlands)

4878.0 "VV"-Russian CW channel marker (MX), Khiva, not parallel to 4646, sending the letter V twice, at 2244. (Boender-Netherlands)

4880.0 ULX2- Israeli intelligence(E10), with phonetic callup only, in AM at 2200. ULX-Mossad, Israel (E10), with English phonetic callup and 5-letter "numbers" message, at 2230. (Boender-Netherlands)

5153.8 "P"-Russian CW channel marker (MX), Kaliningrad, at 2054. (Boender-Netherlands)

5154.0 "C"-Russian CW channel marker (MX), Moscow, at 2055. (Boender-Netherlands)

5236.0 AGA6NE-US Air Force MARS, Las Vegas, NV, in SHARES exercise 00-1, telling an unknown station that he had traffic for FEMA from KBW48, a Department of Energy mobile command post, at 1605. (Hugh Stegman-CA)

5446.5 FDC-French Air Force, Metz, with CW marker at 2010. (Boender-Netherlands)

5705.0 Steam Car-US military, in comm check with Legislate on frequency Z145, after moving from 9016 kHz, quickly moved to Z190 (10294), at 0501. (Haverlah-TX)

6227.0 Tropic Night-Private coastal station, probably southern US, taking daily reports from several "Tropic" boats in the Caribbean, at 0900. (Todd Helberg-OH)

6697.0 Birds Nest-US Military, with same EAM at 0106, 0137, and 0207. (Jeff Haverlah-TX)

6745.0 MIW2-Mossad, Israel(E10a), repeating this phonetic callup at 2142. (Dean Burgess-MA)

6815.6 Coast Guard Lima-5-Whiskey-USCG, giving position relative to checkpoint "Yankee" to GANTSEC (Greater Antilles Section, PR), at 0306. (Perron-MD)

6959.0 Lincolnshire Poacher (E3)-British MI6/SIS "numbers," female voice, groups of 5, probably on Cyprus, in progress at 2139. (Burgess-MA)

7038.8 "P"-Russian CW channel marker (MX), Kaliningrad, at 2053. (Boender-Netherlands)

7038.9 "S"-Russian CW channel marker (MX), Arkhangelsk, at 2053. (Boender-Netherlands

7039.0 "C"-Russian CW channel marker (MX), Moscow, at 2053. (Boender-Netherlands)

7506.1 ZSJ-South African Navy, Silvermine, with series of six FAX weather charts, parallel on 13536.1 and 18236.1, at 1120. (Bob Hall-RSA)

8247.0 CCM-Chilean Navy, Magellanes, with 4- and 5-letter RTTY code groups for EWDZ, UTWZ, and others, at 0715. (Hall-RSA)

8298.3 VTP13/14-Indian Navy, Vishnapatam, with 4-letter RTTY code groups, then test loop, at 1602. (Hall-RSA)

Utility Logs (continued)

8494.8 "P"-Russian CW channel marker (MX), Kaliningrad, at 2052. (Boender-Netherlands)

8495.0 "F"-Russian CW channel marker (MX), Vladivostok, at 2047. "C"-Russian CW channel marker (MX), Moscow, at 2052. (Boender-Netherlands)

8605.0 UIW-Kaliningrad Radio, Russia, with RTTY messages to vessels at 2210. (Boender-Netherlands)

8739.0 Cyprus Radio-Maritime radiotelephone service identifier loop with male voice, at 2158. (Burgess-MA)

8861.0 Dakar-Air route control, Senegal, working Alitalia 1986 at 0349. (Ron Perron-MD)

8957.0 Shannon VOLMET, Ireland, with aviation weather for European airports at 2210. (Burgess-MA)

8971.0 Wafer 71A-US Navy, calling Fiddle, Jacksonville NAS, no joy, at 0015. (Perron-MD)

8992.0 Aussie 451-Royal Australian Air Force, patching via US Air Force Hickam Global, HI, for weather and arrival arrangements at that base, said he was a 707 with 1 Distinguished Visitor, 16 crew, and 82 passengers, at 0556. (Stegman-CA) Aussie 45-Royal Australian Air Force, also patching Hickam base ops via Hickam Global, different day at 0720. (Haverlah-TX)

9010.0 Architect-Royal Air Force, UK, with aviation weather at 0035, 0135, 0235, and 0335. (Al Wires-GA)

9016.0 Steam Car-US military, working Legislate, went to Z145 (5705), at 0459. (Haverlah-TX)

9222.0 CIA "Counting Station"-Spanish female "numbers" (V5), pretty much daily at 2100. (Jay Steimel-AR) *This is one of Cynthia's oldest schedules. Check for parallel on 6502. -Hugh*

9330.0 Cuban "Atencion" (V2), with AM Spanish female "numbers" in progress at 0641. (Steimel-AR)

10204.0 Steam Car-US military, working Legislate in a net on frequency Z190 after moving there from 9016 and 5705, at 0502. Hold Axe-US military, with very long EAM, parallel on 8992 and 11244, at 1503. (Haverlah-TX)

10355.0 4XZ-Israeli Navy, Haifa (M22), with CW marker at 2259. (Boender-Netherlands)

10780.0 Cape Radio-US Air Force, Cape Canaveral, FL, sending Navy ship USS *Underwood* to 6937 kHz, at 1803. (Steimel-AR). Cape Radio, sending *Underwood* to 6937 for US Coast Guard Cutter *Drummond*, at 1839. (Allan Stern-FL)

10871.8 "P"-Russian CW channel marker (MX), Kaliningrad, at 1554. (Boender-Netherlands)

10871.9 "S"-Russian CW channel marker (MX), Arkhangelsk, at 2050. (Boender-Netherlands

10872.0 "F"-Russian CW channel marker (MX), Vladivostok, at 2047. "C"-Russian CW channel marker (MX), Moscow, at 2050. (Boender-Netherlands)

11175.0 Teal 22-US Air Force Reserve WC-130, Keesler AFB, MS, in patch via Andrews to Miami Monitor, National Hurricane Center/Tropical Prediction Center, FL, with weather observations at 0014. Navy JV 170-US Navy, in patch via Croughton to duty office at Jacksonville NAS, FL, reporting inbound from Costa Rica, at 0021. (Perron-MD) Open Skies 12T-International verification flight with a patch via Thule to Smasher, at 0824. (Haverlah-TX)

11232.0 CANFORCE 3025-Canadian Forces, in patch via Trenton Military reporting departure enroute there, at 1558. Dragnet Whiskey-US Air Force AWACS, with Sentry 64, similar, in patch via Canadian Forces Trenton Military to "Current Operations" for tasking, at 1800. (Perron-MD)

11244.0 Lost Day-US military, given Lump Sum's working frequencies Z225 (13907) and Z175 (9016) by Press Car, at 1741. (Haverlah-TX)

11247.0 Royal Air Force, Upavon, UK, with weather at 2320. (Boender-Netherlands)

11306.0 Flight Support-Lima, Peru, LDOC, working American Airlines 2101, and Virgin 602 with position for unknown station, at 0341. (Perron-MD)

12730.0 NMC-US Coast Guard CAMSPAC Point Reyes, with good quality FAX weather chart, 120/576, at 1550. (Hall-RSA)

13242.0 Moderator-US military, calling Camera Man, "on Z211," no joy at 0051. (Haverlah-TX) *211 is usually 12070, 215 is usually 13242, but sometimes Jeff hears this net use them switched. ?! -Hugh*

13257.0 Trenton Military-Canadian Forces, in SELCAL check with unheard aircraft CANFORCE 1503, enroute to Thule, at 1814. (Perron-MD)

13257.9 "S"-Russian CW channel marker (MX), Arkhangelsk, at 2055. (Boender-Netherlands

13258.0 "F"-Russian CW channel marker (MX), Vladivostok, at 2047. "C"-Russian CW channel marker (MX), Moscow, at 2055. (Boender-Netherlands)

13527.8 "P"-Russian CW channel marker (MX), Kaliningrad, at 1554. (Boender-Netherlands)

13529.7 KAWN-US Air Force Digital Weather Switch/Aviation Weather Network, on a relay transmitter with RTTY weather at 0745. (Hall-RSA) KAWN, with long RTTY transmissions of weather observations, synopses, and warnings for eastern US and North Atlantic, no parallel frequencies found, at 0645 and 2051. (Stegman-CA)

13650.0 Cuban "Atencion" (V2), with AM Spanish female "numbers," also on 6825, in progress at 0935. (Steimel-AR)

13907.0 Lost Day-US military, checking in on frequency Z225 with Lump Sum, as sent there by Press Car, who he also called later, at 1747. (Haverlah-TX)

13956.5 V5C-French MFA, Tunis, with coded FEC message in 5-letter groups, at 1610. (Hall-RSA)

14367.0 BAF8-Beijing Meteorological, China, with a clear FAX weather chart at 0935. (Hall-RSA)

14396.5 DLA303-US Defense Logistics Agency, Bremerton, WA, taking many SHARES check-ins for exercise 00-1, at1639. (Stegman-CA)

15016.0 Andrews-US Air Force, Andrews AFB, MD, with a 133-character EAM at 1914. (Haverlah-TX)

16113.0 Unid-Possibly Swiss MFA, Bern, with long message using 5-letter code groups in fast ARQ, at 1650, and next day at 1700. (Hall-RSA)

16131.7 "wsgzkpk"-Egyptian Embassy, Kinshasa, Zaire, with ARQ 5-letter groups to Cairo, at 1635. (Hall-RSA)

16278.5 M/V *Thorndale*, no callsign heard, with an ARQ ship's report to the parent company in UK, at 1659. (Hall-RSA)

16331.8 "P"-Russian CW channel marker (MX), Kaliningrad, at 1556. (Boender-Netherlands)

16331.9 "S"-Russian CW channel marker (MX), Arkhangelsk, at 1556. (Boender-Netherlands

16332.0 "C"-Russian CW channel marker (MX), Moscow, at 1556. (Boender-Netherlands)

16833.5 UIW-Kaliningrad Radio, Russia, with RTTY navigation warnings, in Russian at 1630. (Hall-RSA)

16903.0 UIW-Kaliningrad Radio, Russia, with very strong RTTY news broadcast, in Russian at 1550. (Hall-RSA)

16915.0 RFVIE-French Navy, Le Port, testing in RTTY, also on 12690.7 at 1556. (Hall-RSA)

17215.7 LOR-Argentina Navy, Puerto Belgrano, with RTTY message in 5-letter code groups, at 1610. (Hall-RSA)

17441.5 5YE-Nairobi Meteo, Kenya, with RTTY weather at 1523. Switched to FAX weather charts at 1526. (Hall-RSA)

18027.0 Nominate-US military, with EAM broadcast, simulcast on 13155 and 11244 kHz, distinctive clattering on audio, at 2204. (Haverlah-TX)

18183.4 Unid-Probably Algiers, Algeria, with news in French for all stations, in Coq-8 at 1605. (Hall-RSA)

18269.0 HBD20-Swiss MFA, Bern, with a long ARQ message in 5-letter groups at 1710. (Hall-RSA)

19530.0 Unid-Station sending a "The quick brown fox..." RTTY test loop, 850/75, around the clock, loudest into California in the afternoon, first discovered at 1954. (Stegman-CA)

20047.9 "S"-Russian CW channel marker (MX), Arkhangelsk, at 1556. (Boender-Netherlands

20048.0 "C"-Russian CW channel marker (MX), Moscow, at 1554. (Boender-Netherlands)

21395.0 WA3NAN-Amateur club at NASA Goddard Space Flight Center, MD, also on 14295, retransmitting shuttle audio for scrubbed Atlantis/Spacehab/ISS launch, at 1955. (Steimel-AR)

22858.0 RFHI-French Navy, Noumea, with ARQ traffic at 0814. (Hall-RSA)

22912.7 RFFIND-French Navy, with 5-letter groups in ARQ to RFHINVS (French naval vessel *Nivoise*), at 0605. (Hall-RSA)

24370.0 RFGW-French MFA, Paris, with FEC embassy circular in 5-letter code groups at 1520. (Hall-RSA)

26241.7 RFHINVS-French Navy vessel *Nivose*, with coded ARQ message in 5-letter groups to RFFISYC (Marine Sycom, Paris), at 1004. (Hall-RSA)

Mike Chace
mike.chace@mindspring.com

Stan Scalsky
sscalsk@mail.ameritel.net

Got Sync?

It might seem strange to devote a whole column to signals that can't be decoded (yet), but the digital systems featured this month are some of the most common sounds on HF radio. So much so, it's practically impossible to traverse any segment of the HF bands without coming across at least one example.

All these signals also have something else in common besides being undecodeable – they are usually logged by monitors as "X sounds like RTTY but no sync" – hence the title for this month's column. However, these systems can at least be identified. Once recognized, the proper way to handle these systems is, in the words of Day Watson of WUN, "log it and move on."

BEE (aka 36-50, T600)

The first of our systems is the ever-present Russian Navy synchronous bitstream system. BEE idles at 36 baud (bd) with reversals (i.e., a constant stream of 1010101010...) and sends traffic at 50 bd, although a "double speed" version with traffic at 100 bd has also been logged. It is very common to hear a station idling for a few minutes before, after and in between messages. As the system switches into traffic at the higher speed, there is a synchronizing pattern which a high-end decoders' autocorrelation analysis tools will show has a period of 70. Tone shifts are usually 200 Hz or 250 Hz, and rarely 85, 170 or 500 Hz.

BEEs live at port facilities of the Russian fleet and on their ships. It is likely that they function as a low-grade encrypted communications tool carrying short messages, weather and other broadcast information. BEEs are frequently found sending the same traffic on two or more frequencies simultaneously at hourly intervals, further strengthening the probability that this is a broadcast system. Listeners might like to try 14411 kHz (often paralleled with 11468 and 16234 kHz) which carries a short broadcast message each hour on the hour. Also, many patient listeners have noticed that BEE transmissions are frequently preceded or followed by Morse traffic on the same frequency, when common Russian Navy callsigns (eg "RDL", "RIW") have been used.

Recently logged BEE frequencies include:

4582 7816 8000 10251 10535 11048 11468 11598 13032 14404 14411 14664 15648 15768 16207 16316 17480 18107 18576 20268

75 bd NATO CRATT

(Crypto Aided RAdio TeleType) or KG84: Some keen-eyed users of Hoka gear have probably noticed that when tuned to a 75, 100 or 150 bd signal the "auto classify" screen ominously announces "If not Baudot then forget it," and hence we arrive at another recognizable but undecodeable signal. Like the Egyptian Diplomatic Service's preference for just about any frequency, NATO's KG84 encrypted transmissions are everywhere. The usual flavors are 75, 100 or 150 bd, but you can occasionally log 50, 110, 200 and 300 bd varieties. Tone shift is nearly always 850 Hz, although anything from 75 bd to 1000 Hz is possible.

How do we identify KG84? Well, as usual, some patience is required, but after a long period of encrypted traffic, the system will idle on reversals, and similar to BEE, a short synchronizing phase of 256 bits with autocorrelation of 64 appears before the next encrypted message. You can detect this by setting the appropriate shift and speed and using your decoder's Baudot module, where the synchronization displays as 16 RYs followed a little later by the text "VMGTCNJBH." As we have mentioned in previous columns, KG84 channels are rapidly being replaced by MIL-188-110A and STANAG4285 PSK modems. My logbook shows many examples where 75 bd/850Hz KG84 signals are now occupied by the familiar "white noise" of these modems.

The Russians have a similar synchronous bitstream system which is often found with 75 bd and 250 Hz shift but which prints the text VMGTCNREX when synchronizing.

Recently logged KG84 frequencies:

3090 3103 5340 6717 7593 8493 9085 10428 10827 11213 11406 12120 12162 13257 13486 13952 16267 19350 20099

81-81

Last on our list of commoners is a former Russian Military system now also in use with a number of ex-Eastern Bloc countries. This signal is usually heard in 81 bd, with 500 Hz shift, one or two characters, 12 bits, and mostly usually encrypted. Some monitors have in the past noted operator chatter in the clear using Baudot with the Cyrillic M2 alphabet.

81-81 is mainly a two-channel system but there is also a 40.5 bd signal that carries just a single channel. Very rarely heard is the 73 bd dual-channel version. The system idles in reversals with the same speed as when sending traffic. Apart from the usual 500 Hz shift, 125, 200, 250, 1000 and even 1500 Hz have been logged.

Recently logged 81-81 frequencies:

9100 10444 10492 10636 10782 11016 12184 12370 13381 13985 14445 14697 14780 14968 16007 16023 17487 18562 19056 20138

SuperDARN - A DD Mystery solved

You'll remember that in our May issue we featured a machine gun-like broadband signal that could be heard in the 10, 13 and 14 MHz range. We speculated that it was an OTHR (Over The Horizon Radar). Well, we were nearly right!

Tipped off by a recent post on WUN, a reader described a number of web-based tools that offer real-time propagation analysis. One, a network of radars in the US, Canada and Europe, called SuperDARN (Super Dual Auroral Radar Network) offers a whole host of colorful Java applets that show the state of the ionosphere over a certain part of the world. One of these applets shows the frequency in use. These frequencies, when checked with an HF receiver, carry the mysterious machine gun sound. See the Resources section for the web address – it's an intriguing website

Decoders Update

Checking **www.hoka.net** reveals that Hoka's top-of-the-range Code30 decoder now runs under Windows 95 and 98, having previously been DOS-only software. Users can contact Hoka or their agents for upgrade details. The latest version of software also adds the Russian MS5 12-tone vocoder, the PSK31 amateur radio mode, CROWD-36, HF DataLink (aka HF ACARS) and MIL-188-141A ALE to the list of supported systems.

The Wavecom website **(www.wavecom.ch)** also notes a number of software updates for their W41 and W40pc decoders. DGPS has recently been added to the list of supported modes.

Mac users should check Black Cat Systems **(www.blackcatsystems.com)** for MultiMode which also supports most of the commonly heard modes.

UMC Logbook

Digital Digest's monthly logbook is now online at UMC. Shortly after the end of each month, you'll find our previous month's logs from DD Towers. Just follow the "Latest Logbook" link at the UMC homepage.

Resources

-Full frequency listings for this month's featured modes can be found by following the "Databases" link at Utility Monitoring Central and selecting "Modes" at:
www.mindspring.com/~mike.chace/umc.html

-SuperDARN:	**http://superdarn.jhuapl.edu/index.html**
-BEE Audio:	**http://rover.wiesbaden.netsurf.de/~signals/WAV/BEE.HTML**
-81-81 Audio:	**http://rover.wiesbaden.netsurf.de/~signals/WAV/8181.HTML**
-KG84 Audio:	**http://rover.wiesbaden.netsurf.de/~signals/WAV/LINK14.HTML**

Glenn Hauser, P.O. Box 1684-MT, Enid, OK 73702
E-mail: wghauser@yahoo.com
Web: www.angelfire.com/ok/worldofradio

Behind *"Chiapas, The World Speaks"*

"Dear Mr. Hauser, In the April 2000 *MT* you wrote: 'Now known as Michael Leo Lively, Adams has a twisted sense of humor immediately evident on the webpage. Makes one wonder how seriously the Chiapas show should be taken (gh)' While my sense of humor surely takes many forms, among them 'twisted,' the editorialization is somewhat off base.

"I have yet to find a person fluent in Spanish who was not stunned by the program. It is DEADLY serious in its content, the Spanish talent is world class, and the production is state of the art. The *Chiapas the World Speaks* programming was not designed for the context of my personal webpage. It was only posted there after I had left the Zapatista movement (in disgust) so that friends in the movement could download it.

"The suite of 10 programs was meant to be broadcast into Mexico by RFPI and clandestine/semi-clandestine stations I was 'backing' or had planned to back in Central America and Southern Mexico and the only source to be mentioned was NPC Information Associates. The program was one of many truth-based propaganda pieces designed [to] awaken the people of Mexico and the world to the human rights abuses perpetrated in Chiapas by the Mexican Government and mostly ignored or heavily 'spun' in the Government and Corporate Mexican Media.

"There were actually three 'suites' of programs ranging from responsible to radical that would have all appeared to come from totally different sources. We planned to use these different 'Masks,' (Sun Tzu would have called them 'Shapes') with programming ranging from over the top raving sarcasm (One program has a Mexican pop station style commercial for a PRI travel agency that enthusiastically promotes a 'Death Squad Indian Hunting Tour Package' Taxidermy included!), all the way to programming based on reasoned argument, guilt stimulation, etc., etc.

"None of the three formats would appear connected in the public eye or Mexican Government eye for tactical propaganda reasons. The series and two other suites of 10 or so programs already in the can, but unedited into programs, along with several communications projects were all cancelled due to lack of cooperation and/or downright hostility from the (in my opinion) turf protecting, often anti-gringo, bureaucracies that have attached themselves to the Zapatistas, particularly in the U.S.

"Also canceled was the distribution of 144 Baygen (Low Band) Windups which I sold back to the distributor at the loss of a 15% restocking fee. I'm obviously more persistent than smart because I wasted a year and a half and a wheel-barrow full of money before I blew the Zapatista's Cool-Aid Stand. These organizations and individuals are supposed to be the Zapatista's representatives and liaison outside of Mexico but seem to mostly serve as a defacto palace guard... (for their own palaces)

"I really didn't want to be a known entity in the project at all for security and propaganda flexibility reasons but during the pre-broadcast publicity phase Christopher Jones at *Wired Online* felt that people were interested in reading about the people involved in such a project and I relented. His article was called, *Chiapas' Well-Connected Rebels* and may be found at: **www.wired.com/news/technology/0,1282,17633,00.html** This was where the sharp-eyed and elephant-memoried Hans Johnson got his info.

"Since this clandestine (and it is a clandestine as I understand the term) has popped up, I'm probably going to do an article to submit to ***MT*** on all the NPCIA Zapatista radio projects to avoid more misinformation. I'm sure you can see from the above that while ill fated, these were some serious efforts" (Michael Leo Lively, a.k.a. Commandante Null MAF Rtd)

ARGENTINA 29810 USB: Good news for LA-DXers. Tired of staying awake all night long to get those elusive signals from faraway Latin American stations? Try for R. Rivadavia from Buenos Aires, which at 1200 can be heard quite well with its usual program of news and ads. I have never before heard them on such a high frequency. It certainly is one of these feeders like 8098, 15820, 20276, etc. (Harald Kuhl, Germany, via Wolfgang Büschel, *DX Listening Digest*) Like the other feeders, you never know which sideband will carry which station. Just traces of it here (gh, OK) 29810 LSB - Cadena Cien 1610-1800*, previously with Radio Mitre (Karel Honzík, the Czech Republic, *hard-core-dx*)

BOLIVIA New: 4716.8, Radio Yura, La Voz del Layo, Yura, Provincia Quijarro, Departamento de Potosí, at 1150 giving frequency as 4715, time check in UT-3, closing morning transmission to return at 2100 (Rogildo Fontenelle Aragão, Cochabamba, April 22, *DXLD*) Yura means in Quechua "shrub" (Takayuki Inoue Nozaki, Japan, *Relámpago DX*)

CANADA RCI started phasing in some new news sounders at the beginning of May (Ricky Leong, Quebec, *DXLD*) About time! The old ones were driving me nuts. BTW, a US-owned ad agency in Toronto has been contracted to develop a totally new image for CBC (English Television) per a *Globe & Mail* story via Mike Cooper. This could mean the end of the exploding pizza. Also, CBC 'Radio' 3 for youth will go ahead as a webcast only (gh)

R. Japan via Sackville, English at 0000 on 6145 put a spur on 6205 (Brian Alexander, PA, *DXLD*) That would be a mix with 6175 BBC relay. RCI already produces mixing product on 6205 from two other frequencies, 6015 and 6110 in the 0500 hour! (gh) see also VIETNAM

COLOMBIA 4895.0, Colombia Estéreo, 0056-0205 May 7, LA pop music with a few time checks. Patriotic promos for Colombian army. 0203 full canned ID, "Ésta es Colombia Estéreo 93.4, HJE, desde Bogotá, el centro capital de Colombia..." Very strong (Mark Mohrmann, VT, *DXLD*) Info on Colombia Estéreo is at **www.ejercito.mil.co/sistema/radio.htm** (Henrik Klemetz, Sweden, *DXLD*)

4895, Colombia Estéreo first heard May 6 2350-0430, quite strong here. Sargento Moreno told me on the phone the next day that they are testing a new transmitter for national coverage, and it will soon carry programming from the CREER (Cadena Radial del Ejército Colombiano) network. He was not certain of the transmitter location, but believes it is in the Base de Apoyo Aerotransportado de Melgar in Tolima Dept. Reports welcomed via fax 57 1 2407374 or you can try P-mail: Emisora Colombia Stéreo, Escuela de Cadetes José María Córdoba, Calle 80 No. 38-00, Santafé de Bogotá, Colombia. It is running 24h a day (Rafael Rodríguez, Bogotá, *DXLD*) But soon 4895 vacant again (gh)

Radio Macarena/Radio Auténtica, Villavicencio, reactivated on 5975! At 1245 and 1940 with gospel programs (Yimber Gaviria, Colombia, *DXLD*)

CONGO Huge signal from RTVC Brazzaville on 5985 with new English program 1900-1915, news, political commentary, interviews and great African music, otherwise in French 1815-2045, excellent S9+20 (Enzio Gehrig, Spain, *hard-core-dx*)

CUBA [non] I can hardly believe how little coverage Radio Martí has given to the Elián González story. This seems to be a matter of policy. And it's been a while since they've used that carefully worded formula: *"Radio Martí, programa de servicio para Cuba de la Voz de los Estados Unidos de América."* (Max Swanson, MN, *DXLD)*

Federally funded Radio Martí, which is supposed to provide objective reporting to Cuba, inexplicably waited four hours to broadcast the news that Elián González had been seized. "It was an editorial judgment made by Radio Martí," says Joe O'Connell, spokesman for the U.S. government's International Broadcasting Bureau (Howard Kurtz, *Washington Post* via Mike Cooper) Office of Cuba Broadcasting Director Herminio San Román is in hot water over the delay. VOA broadcast the news only ten minutes after the raid (*Crisis At Radio Martí* via *hard-core-dx*)

[non non] I find it amusing that RHC varies its USB 11705 output. At times it is subdued. When major story breaks (as Elián case) they pump it up 15 or 20 over! Poor RAE Argentina NAm service English at 0200-0300 weekdays on 11710 doesn't have a chance! (Bob Thomas, CT, *DXLD*)

ECUADOR HCJB has acquired some land for a

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; A-00=midyear season, March 26-October 29, 2000; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

possible new transmitter site, not necessarily the final choice, but very good and usable. It's desert, just dirt and sand, on a peninsula, about 20 minutes east of the town of Salinas. The land in the middle of a field has been marked off with HCJB signs, but not yet fenced. This is a 12-hour drive from Quito, versus the present 35-45 minutes to Pifo, so possibly an airstrip would be put in if the site is used. The new airport project, which would require HCJB to shut down Pifo, may be moving again, especially if the decision is taken out of the hands of the mayors of Quito and Guayaquil. The present mountain site has a high horizon, causing some problems in covering Brazil, and other coverage is patchy preventing some lower angles. On the coast, the horizon is flat all around, allowing better coverage. Pifo has the advantage of direct access to HCJB's hydro plant at Papallacta. New site would be more dependent on national grid, and power would be more expensive (Doug Weaver, HCJB Frequency Manager, and now also Acting Director of Engineering, on *DX Partyline)*

HCJB explored a new antenna farm field and purchased the real estate. On Mar 17th, Mr. Engineer Gonzales Calbaral reported to the managing board that a suitable new antenna field is on the Pacific coast near the peninsula Santa Elena 100 km west of Guayaquil (DFC via Dr. Hansjörg Biener *Medien aktuell* via Wolfgang Büschel, *DXLD*)

FINLAND A planned Finnish legal commercial SW station is due to start on July 1. For further information, have a look at Scandinavian Weekend Radio, **www.swradio.net** Let's see if they really can make it! 73 (Arto Mujunen, Finland, *DXLD*) Site says:

"SWR is Finland's first private owned shortwave radio station. Our first transmission is planned to start at 30th of June, 2000, 22:00 UTC. SWR is on the air at every month's first Saturday 24 hours (local time), starting at Friday 2200 UTC and ending Saturday 2159. SWR broadcasts in 25 meter band shortwave. Our frequencies are 11690 and 11720 kHz. Frequency used depends on interfering stations. Studios and transmitters located in Virrat, western Finland. Our reception area is confirmed after test transmissions held in June."

Sixteen different programmes have already been lined up in a listing on another page of the above site, including *History of Finnish Radio*, but mostly hard music (gh) This depends on their licence being granted in time; application was made at end of April (Frans Vossen, RVI *Radio World*)

The power behind the scenes is the Scandinavian Shortwave Radio Association, promoting and supporting non-commercial radio, independent of the Oy Finnish Broadcasting Company Ab, of home and foreign radio chains, and of other radio stations and advertisers. (via Mike Terry, BDXC-UK) I asked them about the power: 250 watts. Antenna is half wave dipole in 20 metres above ground (Ville-Veikko Haikaräinen, SWR, via Sergei Sossedkin, ODXA)

GERMANY Info about the Jülich site can be found at **www.telekom.de/dtag/lpl1/cda/level3_a/0,3680,10110,00.html** Of special interest is a detailed description of the antenna complex; note especially the set-up of the curtains in a star with the transmitter building in the centre (Kai Ludwig, Germany, *DXLD*) DW announced they will relaunch their web presence later this year and plan to invest available resources into DW-online (Harald Kuhl, Germany, *DXLD*)

GREECE [non] We have been checking VOG's new 15455 in the mornings just about every day. Here in the boresight of 75 degrees from Delano, it's the strongest signal on 19m and maybe on the entire shortwave range, except for the first half-hour or so from *1200.

This beam from Delano must have been designed with domestic coverage in mind, denied to IBB, but I suppose it is kosher as long as used only to relay foreign stations? Immediately became a preset on our car SW radio for the great music. Altho scheduled until 1800 it has actually been cutting off at 1700*. I wonder if this 75-degree azimuth from Delano is also engineered for a high vertical takeoff angle, enhancing domestic coverage and producing the super-strong signals here during the day on 15455, and from 1800 on 17705.

On Saturday I was very pleased to come across *Hellenes Around the World*, the weekly hourlong magazine in English with news, interviews and music, at 1603-1700*. This had been on Sats at 1900, but had been lost in the DST and frequency shuffle. The other English feature show of music, *It's All Greek to Me*, is on Sundays now around 1801/1805 to 1900 on 17705. VOG is of absolutely no help in publicizing its own English segments, so we have to do it for them – or rather, for you. We checked the website **http://ert.ntua.gr** and found the SW schedule out of date and no details of languages; tho you can get audio including foreign languages at certain times via webcast (gh)

Official schedule via Dionisios Angelogiannis shows
English segments of VOG, News u.o.s.:
0200-0210 M-F NAm 7450, 9420, 12110, 15630
0610-0620 M-F ME/Au/NAm 7475, 9375, 9420, 15630
0750-0800 S/S Au 9775
1110-1120 daily Eu 9420, 15630
1600-1700 Sat Eu/NAm *Hellenes Around the World* 9420, 15455, 15630
1800-1810 daily Eu 7475
1800-1900 Sun Eu/NAm *It's All Greek To Me* (music) 9420, 15630, 17705
2120-2220 Sun Au repeat of 1800 9425, 15650

Angelogiannis' letter says the good news is that VOG will soon install the first of three VOA-donated transmitters from the site in Portugal, all rated at 250 kW, perhaps in use by July. I believe that they will replace the present 100 kW presently being used in Avlis, near Athens.

BBC news in Greek is now relayed at 1730-1745 on 15630.

SW-Macedonia Radio Station (35 kW): 0600-2200 9935 Eu, 11595 ME; 1400-2300 7430 Eu. A separate untitled time column shows the first two frequencies running until -2300; perhaps this means Sat and Sun? (ERT via John Babbis, *DXLD*)

GUATEMALA R. Verdad, 4052.5, Chiquimula: received a very nice no-data color QSL card, full-data letter in English from Dr. Édgar Amilcar Madrid Morales, Manager; and (get this) a bright red felt covered pressboard in the shape of a house w/ raised lettering inscribed "Dios bendiga este hogar" (God Bless this house). It's about 6x9 inches with a picture hook. All this in 1 month for $1 (w/ receipt from station). The full name of the station is 'Estación Educativa Evangélica Radio Verdad'. They are using 800 watts into a bi-pole full wave oriented NE/SW. Sched is 1125-0120 UTC. Power goes out all of the time and they are not using a compressor so they are purposely overmodulating to compensate. What Glenn and I heard in reference to their call letters TGW-1 is actually SW-1 or 'Short Wave One'. When they get their call letters they will probably be TGAV. They have been reported in Argentina, Chile, Peru, Colombia, Cuba, DR and (apparently) I was the first from the USA. Address is: Apartado 5, Chiquimula, Guatemala. (Terry Palmersheim, KC7LDP/FO0PAM, *hard-core-dx*)

HUNGARY Sad news to those of us who've listened to Radio Budapest for years. Long-time announcer Charlie Coutts died April 6. He was 79. For those who may not recall him, he had the Scottish accent and was formerly head of the English service. There was an on-air tribute and excerpts from E-mail condolences from listeners, Sunday April 16. (Bob Thomas, CT, *DXLD*) a.k.a. Lászlo Pinter, I recall (gh)

KURDISTAN V. of the People of Kurdistan on 6995, new? at 0215-0240+. Tune-in to local martial music, talk in language, Koran. Local Mid-East music. Slightly wobbly carrier, fair to good; weaker on // 4061.5 (Brian Alexander, PA, *DXLD*)

Voice of the People of Kurdistan (Kurdish: *"aira dangi gelli kurdistana"*, Arabic: *"sawt sha'b kurdistan"*) is the official radio station of the Patriotic Union of Kurdistan (PUK) led by Jalal Talabani. It broadcasts from Sulaymaniyah in Iraqi Kurdistan. According to the radio's web site, it was established in 1979 under the name "Voice of the Iraqi Revolution" and adopted the current name in 1983. PUK web site: **www.puk.org** E-mail: puk@puk.org. Daily in Sorani Kurdish mixed with Arabic at 0215-0600, 1400-1900; in Sorani Kurdish at 1945-2045, all on 4060, 6995 (© BBC Monitoring May)

Voice of Iraqi Kurdistan (Kurdish: *era dangi kurdistana iraqiya*; Arabic: *sawt kurdistan al-iraq, sawt al-hizb al-dimuqrati al-kurdistani al-iraqi*) broadcasts in support of the Kurdistan Democratic Party (KDP) led by Mas'ud Barzani, from Salah al-Din in Iraqi Kurdistan. The KDP says the radio station was established in September 1963. A service to Europe was introduced on 27th April 1995. The KDP also operates Kurdistan Television, KTV. This schedule is based on monitoring observations. Frequencies and times of broadcasts are subject to change. Daily on 4085, 9495 0245-0300, 0400-0500, 1445-1630 in Sorani Kurdish; 0300-0300 and 1630-1730 Arabic. UK Address: KDP Press Office, PO Box 7725, London SW1V 3ZD, UK. E-mail: kdppress@aol.com Web Site: **www.kdp.pp.se/** (© BBC Monitoring)

KYRGYZSTAN Kyrgyz Radio, *2330 on 4010, English news and weather monitored at 2353-2358 (Andy Goodwin, British DX Club)

LIBYA [non?] The transistor circuit board which allowed investigators to trace the origin of the radio used in the Pan Am 103 bombing was sold to the Libyans by a company named Mebo, Ltd. of Zurich. Many may recall that Mebo was the company that owned the *Radio Northsea International* radioship back in the seventies. Mebo stands for Meister and Bollier, the two owners. On an NPR piece, I heard a brief interview with Edwin Bollier, who was one of the RNI owners. The subject was this circuit board that they sold in some quantity to both the Libyans and the East German Stasi secret police, that somehow ended up in the wreckage of Pan Am 103. Another interesting part of this association is that the *Mebo II*, RNI's ship, was sold to Colonel Qadaffi after it left the air in the mid-seventies (1975?) (Daniel Srebnick, *DXLD*)

MADEIRA Radiodifusão Portuguesa audible all day on 603 kHz, but also relayed at various times from 1600 past 1900 on 5550, strong with almost no fading; for Atlantic fishermen? (Jorma Mantyla, Fuerteventura, Canary Islands, *hard-core-dx*) Or pilots; that's an aero band (gh)

MEXICO Among the other Mexican SW stations: XEUJ, Radio Linares, from Mexico's newest industrial city. Lic. Sergio Jahaziel Becerra, Director General, informs us that they are carrying out negotiations and technical adjustments to improve the signal and increase coverage. Nevertheless, he does not give any tentative airdate. We suppose they will use the same frequency as before, 5980v. Good luck and we hope to have news soon. Those interested in writing to the station may do so at: XEUJ, Apdo. Postal 62, 67001 Linares, N.L.

XEYU, Radio UNAM; In spite of having some excellent installations and renovated equipment for MW and FM, its SW transmitter has not been updated and is now more than 50 years old (I believe). We have already commented on the trouble the technical personnel have to go through when some tube quits working, and replacing it causes work and above all monetary costs. Even so, a great effort is being made to get the signal on 9600 kHz, which to tell the truth is very difficult to hear outside Mexico. Months ago one could hear it, tho with a weak signal at midday, but now there is nothing but a carrier sometimes detected. I would like to invite everyone to write to Radio UNAM asking them to improve their SW equipment, insofar as possible: Radio UNAM, Adolfo Prieto #133, Col. Del Valle, 03100 México, D.F. (Iván López Alegría, *Aztlán* No. 34, March-April, Nayarit DX Club)

PAPUA NEW GUINEA 3345, R. Northern (non). A report heard on 4890 news was that the Radio Northern transmitter building has gone up in flames after an apparent electrical fault An investigation is underway as the land used for the transmitter building has been the subject of land payment claims since 1972. The transmitter may be relocated as part of the rebuilding process, though no indication was given as to when the station would be back on air (Richard Jary, Apr 17, *Cumbre DX*)

ROMANIA RRI's 0200 English broadcast to us keeps switching frequencies from one day to the next, 9510 or 9570, each with its own interference problems, //11940. Sometimes at 0200, 9570 and 11940 start up as late as 5-8 minutes. Alarm clock must be slow. RRI is maddening! Another day missing from 9570, 11940, but found them on 15105 (Bob Thomas, CT, *DXLD*) English at 2300-2359 on 11775 very good with // 15105 fair to good in Northeast Ohio. Presumed // 11830 fair on various recent days and 9690 barely audible here (Lee Silvi, Mentor, *DXLD*)

RUSSIA Radio Mayak has officially inaugurated its web-site at **www.radiomayak.ru/** . Formerly on numerous SW broadcasts, but currently streaming media delivers its broadcasts (music and information) to listeners all over the world.

Vladivostok: Radio Station Tikhiy Okean (Pacific Ocean) is on the verge of being shut down. Fëdor Brazhnikov from Irkutsk learned this during a phone call to the station. Tikhiy Okean has been targeting Russian seamen since April 13, 1963. Currently, staff consists of only two full-time journalists and one part-timer. They receive "a huge amount of letters and reports from all over the world" but are unable to respond. In the beginning of this season Tikhiy Okean was heard in Irkutsk from 0715 to 0800 on 12070. But it now seems to be absent from this or other SW frequencies (*Moscow DX Bulletin* via Sergei Sossedkin)

Radio Mix-Master from Yakutsk in the Far East of Russia: I have just phoned them using (4112) 42-03-02. Their schedule: 0700-0300 local time (or 2100-1700 UTC) on 102.5 MHz and 4940 kHz. This is a very long shortwave relay for local station here in Russia! Address: Radio Mix-Master, office 1, ul. Oktyabr'skaya 20/1, Yakutsk, 677027, Respublika Sakha, Russia. (Mikhail Timofeyev, St. Petersburg, *DXLD*) Was established under auspices of a local city government and its first broadcast went on the air on Dec. 31, 1999 (*Moscow DX Bulletin* via Sergei Sossedkin)

GTRK "Murman" (Murmansk) has been broadcasting on 5930 kHz for many years, with a very poor signal here in Europe. But now it can be heard twice a week with good reception with a relay of their "Radiostantsiya Atlantika" programme for seafarers, on Tuesday and Friday at 0810-0900 on 4429, 6510, 17266 kHz, all upper sideband mode (per Irkutsk DX Circle). **www.irkutsk.com/radio/russia.htm** A good-quality clip of this can be heard on the Interval Signals Archive at **www.intervalsignals.com** (Dave Kernick, *hard-core-dx*)

In his broadcast on May 10 a commentator of Echo of Moscow Radio Andrey Cherkizov said that Russia's current Minister of Press Affairs Mikhail Lesin is "obsessed with an 'idée fixe' to sell out the Radio House on Pyatnitskaya, 25, to affluent business structures and that he does not care about the future of radio stations and companies that are based there." Note that on May 10, for the first time in a 46-year history of Radio House, an inexpensive in-house restaurant and all cafes were closed down. There are persistent rumors that instead of an affordable restaurant [frequented by the journalists of the Voice of Russia] soon there will be a casino bar (!?) and that all broadcasters will be transferred to Ostankino [Radio and TV Center]. (via Pavel Mikhailov, *Moscow DX Bulletin* via Sergei Sossedkin)

SERBIA R. Yugoslavia, English at 0000 and 0430 to NAm moved from 9580 to 11870 (Chris Hambly, Victoria, *DXLD*)

SLOVAKIA R. Slovakia International: The entire team of English section announcers has been changed. The new team announces only their first names, and they are: Oxana, Martina, Jana, Silvia, Bill, Dushan (the first four ladies, then two men). I have been reporting regularly to RSI ever since they began broadcasting. Lately, I asked them for a list of their English announcers, so I could spell their names properly. Oxana is the head of the English section. The new team seems to be just as good as the old one. Still, I miss the old team (David Crystal, Israel, *DXLD*)

SOMALIA *Cumbre DX* has sent tubes and other spares to Radio Gaalcayo [sic]. The station has been on since 1993 and the spares were desperately needed to keep them on the air. Radio Gaalcayo can be heard daily at 1000-1200 and 1600-1700 on 7012. The parts should reach the station by early June. Cumbre DX is eager to partner with other organizations that are interested in helping small stations. A prime example would be Radio Miskut in Nicaragua. It seems that just a few spares will get both this station and country back on shortwave. If you are interested, you can reach me at *hansj@worldspy.net* (Hans Johnson, *DXLD*)

SPAIN Radio Exterior de España announced there will no longer be a newscast on weekend programs. On Saturdays, *Visitor's Book*, *American Chronicles*, and *Radio Waves*, a DX and music show with Justin Coe. Sundays, *Window on Spain*, *Spanish Composers* (a very fine program, by the way), and *Radio Club*, where Deanelle Baker answers letters and plays musical requests of (mostly) Spanish music. Some of the cutbacks could be due to an English announcing staff of only 4 with the departure of Christopher Birch (down from 7 few months ago). But they will get some help from Veronica, an English speaking colleague from the German Service. Too bad, but extending cultural and easy listening programs could be nice. Their news is comprehensive, with much on Latin America. And the Spanish language lesson (Tue-Sat about 0045, 0145, and 0545 UTC on 6055) is one of the best on the air at present. REE also has a new director, so there may be more shakeups (Roger Chambers, *swprograms*)

REE spurs from 9540 in the 0240-0315+ period, in Spanish, very distorted, FMing on approx. 8792, 8979, 9166, 9353; note separation of about 187 kHz between them (Brian Alexander, PA, *DXLD*)

UKRAINE 13590 1000 kW is back! I hear Radio Ukraine International nightly with a great signal in Ukrainian, and an hour of English from 0300 to 0400. I've heard an e-mail address announced for RUI: *VSRU@NRCU.GOV.UA* (Volodya Salmaniw, BC, 16 April, *DXLD*) 13590 could redisappear at any time due to power bill dispute; originally A-00 schedule did not include any English on 13590. Glad RUI came to their senses on that. Oh, oh, UT May 3 at 0330 check on 13590 all I heard was a strong Qur'an, then talk in Persian (gh) 13590 is registered at 0330-0530 to zones 29S,40NE from SIR=Sirjan, Iran, 500 kW, 338 degrees, IRIB TURKI service, per HFCC (Wolfgang Büschel, BC-DX) So Iran beamed close to uswards (gh)

On April 30, Radio Ukraine International closed down its powerful SW transmitter in Lvov used to relay RUI to the Americas and Australia. To somehow compensate this loss, RUI was planning to turn on several 100 kW transmitters in Kiev and Kharkov. I'm afraid that was the "last song" of Lvov's megawatter, and now it will share the sad lot of its "brothers" in Nikolaev transmitting center. (Aleksandr Yegorov, Kiev, *Moscow DX Bulletin* via Sergei Sossedkin)

U K BBC WS has a redesigned website **www.bbc.co.uk/worldservice** easier to navigate; a particular "Europe and World Service 2 Online" programme schedule, all times GMT, is now associated with one audio stream showing the whole week (gh)

Finally! You can listen to *Write On* [and *Waveguide*] via on-demand Real Audio. Try this: **www.bbc.co.uk/cgi-bin/worldservice/sheep.pl/worldservice/waveguide.ra** (Larry Nebron, *swprograms*)

Met a BBC reporter from Washington at Elián González' hearing in Atlanta. He says new BBC director Greg Dyke is a breath of fresh air and has been an improvement. He says one of his first acts was to end the much-criticized policy that requires the various radio outlets to pay to get discs from the library or to find out how to pronounce a word.

I also lamented to him that John Peel appears to disappear from the BBC WS schedule after next week, replaced by Steve Lamacq, who plays a more commercial alternative-rock style than the wide variety of styles Peel has been playing for decades. It was bad enough that we went to 1 x 25 min. Now we're losing it completely, with absolutely no explanation (Mike Cooper, *DXLD*)

John Peel is also not as prevalent on the UK domestic schedules as he has been; now only 2100-2300 UT on Tues, Weds & Thurs, but remember he has been presenting in this slot for over 30 years now. Steve Lamacq partially replacing here as well. Radio 1 is of course streamed over the net at **www.bbc.co.uk/radio1** If you want to hear him in a non-musical but still wry mood, try his Radio 4 program on Saturdays at 0800, repeated Monday at 2200, also streamed at **www.bbc.co.uk/radio4** (Nigel Watkinson, *DXLD*)

U S A WWCR/WNQM's motion to dismiss Art Bell's defamation suit also against Ted Gunderson failed and the suit will be heard in court. Bell didn't just threaten to sue, he really did file it. Judging from what the station is alleged to have done, and the value of standalone AMs these days, if Mr. Bell wins this case one might expect him to become a station owner (Doug Smith, Nashville, NRC-AM)

Depositions were made in April 28, but there is so much paperwork, that Judge Marietta Shipley may not be ready for trial in the Circuit Court of Davidson County until later in the year. WWCR is confident it will prevail (gh)

A heartfelt Open Letter to the Director of VOA, by a Czech editor about to lose his job, and a follow-up after no reply, may be read at **http://www.angelfire.com/ok/worldofradio/voaltr.txt** (*World of Radio*)

Union Township, Ohio, proposes to name a recreational park on the site of the destroyed VOA-Bethany station the "Voice of America Park" (Cincinnati *Enquirer* via Artie Bigley)

We've moved *A Different Kind Of Oldies Show* web site to **www.dorsai.org/~bigsteve** ("Big Steve" Coletti) on WBCQ, 7415 kHz Shortwave Saturday Evenings at 8:00 ET, 0000 UT-Sunday or 24/7 on **/www.live365.com**, open MP3 player to **http://216.32.166.82:7970** *bigsteve@dorsai.org* or P.O. Box 396, New York, NY 10002 (Coletti, *DXLD*)

Continuous reggae music, from as early as 1400, armchair quality at midday 1600, on 25950, even faintly till 0200, turns out to be the auxiliary station for KGON, Portland, Oregon, with occasional IDs (Donna Ring, NJ, ***DXLD***)

The WLIO-TV, Lima-OH link on 26410, 30 watts, may test with World Radio Network off the ch. 35 SAP, including *World of Radio*, Saturdays at 1600. It uses a GE MSTR-II radio which is narrowband FM. The base 5.5 dB gain antenna is 157 feet up on the east side of the tower. This is to feed out what we have on the air (audio) to our crew in the field. At the truck, the 26.410 is received, and sent to a 10 mW FM exciter. The anchors in the field then use a "Walkman" to hear what's on the FM radio/26.410 link so they don't have to schlep a cord around. The 26.410 link has a directors' override, so while you might hear just the audio broadcast, you could hear someone break in and say, "30 second," "wrap it up," "coming out to Jeff in 10 seconds." Anyway, when the skip gets decent here in Western Ohio, I can turn on the link. The SAP channel is programming World Radio Network except at 1000-1300, 1600-1630 M-F; 2200-2300, 0300-0330 UT daily [during local news]. The channel IDs in a British voice as "This is the Secondary Audio Program Channel of WLIO Lima" on the hour and half hour (Fred Vobbe, NRC-AM)

"700 WLW" heard on 26450 at 2318 with talk show, weather (Dinan Rogério, Brasil, *DXLD*)

[non] World Beacon (1800-2200 on 9675 via UK) invites us to tune in a new program *DX-QSL* Sat 2100 (Nick Pashkevitch, Russia) No doubt just their mailbag (gh)

VIETNAM [non] With the Canadian government taking the first steps toward full-blown diplomatic and economic sanctions against Vietnam for the execution of Canadian Nguyen Thi Hiep on drug smuggling charges, look for the possible end of the Voice of Vietnam relays via Radio Canada International. (Mickey Delmage, Sherwood Park, Alberta, *hard-core-dx*)

We then observed for three nights in a row, UT May 2-4, and part of May 5 that the VOV relays on 9695 and 9795 were replaced by music (Ivan Grishin and gh) The VOV relays are booked through Merlin. Merlin gets the signal from VOV Hanoi, and then routes it through to RCI. VOV was having technical problems, and couldn't deliver the signals to Merlin. Hence the fill music on the RCI frequencies – not connected with the execution at all (Bill Westenhaver, RCI, *DXLD*)

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

Broadcast Logs

GLOBAL FORUM

Gayle Van Horn

0057 UTC on 11800
ITALY: RAI. News item on two policemen killed in the continuing drug war // 6010. (Bob Fraser, Cohasset, MA)

0107 UTC on 5040.05
ECUADOR: La Voz del Upano. Spanish. Tentative station ID amid regional Ecuadorian music. (Mark Veldhuis, Borne, Netherlands/*Hard Core DX*) **Radio Federacion** 4960, 2335-2345, fair to poor quality. (Sam Wright, Biloxi, MS)

03337 UTC on 6265
ZAMBIA: Radio Zambia. Good reception at tune-in with mentions of Lusaka and Zambia in local languages. (Walter R. Salmaniw, MD, Victoria, BC Canada/*HCDX*)

0426 UTC on 4990.9
SURINAME: Radio Apintie. Non-stop pop ballads including music from group Chicago. Considering their very low power, this morning's reception was relatively good. (Veldhuis, NLD/*HCDX*)

0600 UTC on 6184.97
MEXICO: Radio Educacion. Spanish/English programming with station IDs and ballad music program monitored to 0615. (Gehrig, ES/*HCDX)* Mexico's **Radio Mexico Intl** 9705, 0214-0218 segment on speaking and writing in Spanish. "Emisoras de Mexico" ID. (Frodge, MI) Presumed Mexico's ***XERTA***, 4800.53. ID format 1057 in Spanish to sign-off. (Salmaniw, CAN/*HCDX*)

0830 UTC on 3385
PAPUA NEW GUINEA: Radio East New Britain. Weak signal for local PNG music. PNG's **NBC** on 4890, 0840+ with Pidgin text. **Radio Manus** 3315, very weak 1050 in Pidgin/English. (Frank Hillton, Charleston, SC) PNGs monitored: **Radio Sandau** 3205, 1106-1202*; **Radio Morobe** 3220, 1116-1158+; **Radio Gulf** 3245, 1130 including Pidgin/English rock and country & western tunes, instrumental anthem to 1200*. (Frodge, MI)

0845 UTC on 3925
JAPAN: Radio Tampa. Rapid Japanese text of fair quality // 6055, 9595 excellent. Noted on 6115, 0857+ with Carley Simon music, excellent signal despite Peru's **Radio Union** underneath! // 3945 fair signal. (Joe Talbot, Alberta, Canada/*HCDX*) **Radio Japan** 11850, 2152 with letters and "RJ" ID. (Frodge, MI)

1029 UTC on 12085
MONGOLIA: Voice of. Interval signal to English service 1030-1100, good signal quality. (Silvi, OH) Audible 9720, 1501, good signal quality. (Salmaniw, CAN/*HCDX*)

1130 UTC on 9590
SINGAPORE: Radio Singapore Intl. Infrequently reported station with excellent reception going into English newscast after ID and time check at 1130 // 6150 fair. (Salmaniw, CAN/*HCDX*)

1325 UTC on 9470
RUSSIA: Radiostantya Chechnya Svobotna. Russian text to musical variety and editorials. No mentions of "Chechnya" heard until "RCS" identification. SIO=343, // 11635 good // 15605 fair. Signal noted past 1400 at good level, 9470 still there but much weaker. (Frodge, MI)

1545 UTC on 7083
AFGHANISTAN: Voice of Sha'ria. Arabic talks to 1555. Interference from jammer and signal drifting. Religious format 1615 on 7085 to 1630; Russian to 1645 mostly news text. Noted drifting again with a rate of 15 Hz per minute S6 or 33333 SINPO rate. (Liangas, GRC/*HCDX*) Tentative log with Middle Eastern chants to unid language at 1630. Best to monitor in lower side band 7073.25. (Salmaniw, CAN/*HCDX*)

1653 UTC on 5015
TURKMENISTAN: Turkmen Radio. Russian to 1700. Local instrumental music pause at the hour to station identification. Signal fair with Morse code and local interferences. (Giovanni Serra, Rome Italy) Presumed station heard 5015, 1353 with subcontinental music of fair reception. (Salmaniw, CAN/*HCDX*)

1659 UTC on 6210
ETHIOPIA: Radio Fana. Parallel 6940 with local language newscast suffering from Morse code interference. Fair signal quality. (Zacharias Liangas, Thessaloniki, Greece/*HCDX*)

1720 UTC on 4910
INDIA: All India Radio via Jaipur. English/local languages to 1737. Indian chants to lady announcer's chat between segments. Time tips signal 1730 with "this is All India Radio" identification. English noted to 1735 into unid language. (Serra, Italy) 11715, 2201-2210* (Frodge MI) World to regional news 9705, 2300. (Fraser, MA) **Radio Kashmir** 1704, 4904 with poor quality. (Serra, Italy)

1843 UTC on 4935
KENYA: KBC. Local tribal chants to announcer's mention of Nairobi. Brief news item mentioning America and Sudan. (Serra, Italy)

1930 UTC on 11670
IRAN: VOIRI. English service to Europe // 9022 with fair-good signal quality. (Fraser, MA)

1932 UTC on 11675
RUSSIA: Voice of. *This is Russia* segment on the ancient town of Skol, // 12070. (Fraser, MA)

2000 UTC on 15725
CONGO: Radio Liberte. Very low signal at 2000 with program on Lingala and full commentaries. Brief music pieces to S4 signal noise. Significantly improved signal for subsequent monitoring 2153. (Liangas, GRC/*HCDX*) **Radio Congo** 9610, 1635 French/vernacular service. (Salmaniw, CAN/*HCDX*)

2010 UTC on 11605
ISRAEL: Kol Israel. News item on Israel to continue to ban Syria from using Lake Tiberias near the Sea of Galilee. (Fraser, CO)

2030 UTC on 11787
IRAQ: Radio Iraq Intl. English commentary lambasting the world's media for telling untruths about Iraq. (*Imagine that!*) Musical bridge into comments on continuing sanctions. Quite good signal except for bothersome heterodyne. (Fraser, MA)

2045 UTC on 4834.98
MALI: RTV Malienne. French chat to instrumental rhythms. Tribal chorus and chats to ID announcement at 2103. Fair signal quality. (Serra, Italy)

2050 UTC on 13710
BOTSWANA: Voice of America relay. Phone interviews discussing African politics. Focus on Nigeria's national economy. (Brian Bagwell, St. Louis, MO)

2049 UTC on 7255
NIGERIA: Voice of. *Africa Hour* program with news and sports updates. Segment on Mozambique's continued struggle and recovery from floods. English ID and program close down with drum signal 2058. Local languages 2059, best to monitor in lower side band. (Frodge, MI)

2220 UTC on 5035
CENTRAL AFRICAN REP.: Radio Centrafrique. French IDs and promos for African high life music, terrific signal for Texas. (Tom Banks, Dallas, TX)

2240 UTC on 4760
LIBERIA: ELWA. Religious vocals at tune in to listeners letters. Station ID to national anthem and 2258*. (Sam Wright, Biloxi, MS) Noted 4760, 0600 music to choral anthem 0603. (Salmaniw, CAN/*HCDX*)

2245 UTC on 13670
BONAIRE: Radio Vlaanderen Intl. *Focus on Europe* program featuring aid to African nations, particularly Mozambique. (Fraser, MA; Wright, MS)

2340 UTC on 4515.7
PERU: Radio Amistad. Peruvian music with DJ's rapid voice-overs. Local time check to flutes and identification. I don't often get audio on this one except for a weak carrier. Peru's **Radio Difusora Huancabamba** 6535.7, 2356-0008. Nice Andean flute music to male's mention of **Radio Andina** twice (co-production of program, maybe?) Station ID at 2358. (Veldhuis, NLD; Enzio Gehrig, Spain/*HCDX*) Peru's **Radio Ondas del Rio Mayo** 6797.6, 2316 with program presentation. (Liangas, GRC/Schnitzer, Germany/*HCDX*)

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

Gayle Van Horn, gayle@webworkz.com

QSLs Hotter than the Fourth of July!

One of the great things about writing this column is the terrific mail I receive from our readers! Each month I am amazed at the persistence and patience of many DXers in verifying a station.

For a hot July, we have some scorching QSLs to share, and back by popular reader demand – an issue jam packed with nothing but QSLs! If you haven't shared your QSLing story, or best-ever tale, why not?

All contributions are welcome via email or regular mail, and if you need a personal reply please include a self-addressed envelope. Good luck on your summer (or winter for our southern friends) DXing and QSLing!

BELARUS

Radio Minsk, 7210 kHz. Full data Orthodox Church card unsigned, plus letter, schedule and station stickers. Received in five weeks for an English report. Station address: Radio Station Belarus, English Language Dept., Krasnaya Street 4, Minsk 220807, Belarus. (Joe Talbot, Canada/*Cumbre DX*)

Radio Rossii, 17600 kHz via Minsk, Belarus. New green English language QSL for *Radio Russia*, plus station sticker in Russian. Received in three months for an English report. Station address: Room 121, ul.Yamskogo 5-A. Polya 19/21, 125124 Moscow, Russia. (Richard Jary, Australia/*Cumbre DX*)

BHUTAN

Bhutan Broadcasting Service. Full data QSL card with dragon wishing Happy New Year (seems they have printed a new stock of QSL cards), plus brief letter with greeting from Bhutan and explaining the late reply from November 1999, signed by Thinley Tobogay Dorji-Coordinator, News & Current Affairs Division. Veri signer email: **<news@druknet.net.bt>**.Station address: P.O. Box 101, Thimphu, Bhutan. (Jan Edh, Hudiksvall, Sweden/*hcdx*) *Nice QSL! BBS replies very irregularly; two IRCs or a $1.00 may assist your reply rate...ed.*

CHINA

China Huayi Broadcast Corp. Full data form letter unsigned, stamped with station seal. Received in one month for a one year follow up English report. Letter states CHBC frequencies as; 4830, 4940, 6185 and 11590 kHz. Handwritten address on envelope as; P.O. Box 251, Fuzhou Fujian 350001, China People's Republic. Station usually a poor verifier, perhaps a good time to QSL. (Jari Savolainen, Kuusankoski, Finland/*hard-core-dx*)

ICELAND

Rikisutvarpid (Icelandic National Broadcasting Service, 189 kHz (longwave). Full data *Map of Iceland* card with illegible signature, plus thank you note from Oskar Ingolfsson-Head of Music. Received in 99 days for an English report, cassette tape, postcard and one U.S. dollar (returned). Station address: Rikisutvarpid, Efstaleiti 1, 150 Reykjavik, Iceland. (Charlie Washburn, Robbinston, ME)

INDIA

All India Radio-Thiruvananthapuram, 5010 kHz. Full data station QSL card signed by A.K. Bhattnagar. Received for an English report. Station address: P.O. Box 403, Bhakti Vilas, Vazuthacaud, Thiruvananthapuram 695 014, Kerala, India. (Daniele Canonica, Muggio, Switzerland) *Due to reported mail theft, letters to India should be sent via registered mail or send correspondence in an unsealed envelope without enclosures...ed.*

MEDIUM WAVE

KGVY, 1080 kHz AM. Received folding *Thank You* card with QSL verification info inside, signed by Bonnie Leigh Crystall-General Manager. Received in 26 days for an AM report. Station address: P.O. Box 767, 1510 West Camino, Antigua, Green Valley, AZ 85622. (Patrick Martin, Rancho Mirage, CA)

WGSR, 1570 kHz AM. Nice QSL letter signed by Dick Boekeloo-Chief Engineer, plus photos of studio and old 5kW transmitter. Received in nine days for a taped report. Apparently when I heard them they had just boosted from 30W (night) to their PSA of 500W. Currently, they run 5kW days with a CP for 10kW. My 18th Florida medium wave QSL. Station address: 707 Dade St., Fernandina Beach, FL 32034. (Martin, CA)

St. Pierre Et Miguelon, RFO St. Pierre, 1375 kHz AM. No data email plus QSL letter via regular mail, signed by Valarie Giacomello-Redacteur en Chef (Editor in Chief). Received in eight days for a French AM report, cassette tape of programming, postcard and one U.S. dollar. Station address: Radio St. Pierre (or RFO St. Pierre) Boite Postal 4227, F-97500 St. Pierre, St. Pierre et Miquelon, North Atlantic Ocean. Station email: **<rfospmbi@cancom.net>** (Washburn, ME) *...Excellent catch Charlie! - ed.*

RUSSIA

Voice of Tatarstan via Samara, 15105 kHz. Postcard of Kazan Kremlin, with Russian details, signed by Ildus Ibatullin-QSL Manager. English form letter enclosed confirming report with handwritten note to advise DXers that the station plans to have QSL cards in summer or autumn 2000. Details included on *Diploma* for regular reporters, Station advises email addresses **<root@gtrkrt.kazan.su>** or **<postmaster@stvcrt.kazan.su>** Received in three months for an English report and one U.S. dollar. Station address: c/o QSL Manager, P.O. Box 134, Kazan, Tartartan, 420136, Russia. (Jary, AUS/*Cumbre DX*)

SINGAPORE

Radio Singapore International, 9590 kHz. Full data Singapore City Hall card unsigned, plus station info sheet and coverage map. Received in 30 days for an English report, postcard and one U.S. dollar. Station address: Farrer Road, P.O. Box 5300, Singapore 912899, South Asia. Email: **<rsieng@pacific.net.sg>** Website: **<rsi.com.sg>** (Washburn, ME)

SOUTH AFRICA

Adventist World Radio, 9745 kHz. Numerous AWR cards via Meyerton for 250 and 500kW transmitters. Cards received for French and English broadcast. Interesting to note, here in northeast Ohio, that I did not observe much difference in signal strength or reception quality between the two Meyerton transmitters. Station address: AWR HQ: 12501 Columbia Pike, Silver Spring, MD 20904-6600. Website: **<www.awr.org/index.html>** email: **<info@awr.org>** (Lee Silvi, Mentor, Ohio)

ST. HELENA

Radio St. Helena, 11092 USB kHz. Full data QSL certificate by email including printed signatures from Tony Leo-Station Manager, Ralph H. Peters-Production Assistant and two other illegible names. Received for final broadcast of October 23, 1999. Email received in 50 days for an English report and two IRCs. (Washburn, ME) Station reportedly will not resume their annual broadcast day for October 2000. Send your comments, questions or complaints to: Broadway House, Main Street, Jamestown, St. Helena, South Atlantic Ocean. Email: **<sthelena.coordinator@sthelena.se>** Website: **<www.sthelena.se/radiosth.htm>** *...ed.*

TANZANIA

Voice of Tanzania, 11734 kHz. Full data QSL card received in 40 days, plus letter signed by Khalid H. Rajab. Station address: P.O. Box 1178, Zanzibar, Tanzania. QSL card was one designed and donated to the station by DXer Guido Schotmanns. (Giovanni D'Amico, Switzerland/*hcdx*)

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Alinco DJ-X10T soft case	CAS 19	$12.95
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How to Use the Shortwave Guide

Convert your time to UTC.

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

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

Find the station you want to hear.

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

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

Day Codes

s	Sunday
m	Monday
t	Tuesday
w	Wednesday
h	Thursday
f	Friday
a	Saturday

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 ⑤ 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 publication.

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
me:	Middle East
na:	North America
om:	omnidirectional
pa:	Pacific
sa:	South America
va:	various

Consult the propagation charts.

To further help you find a strong signal, we've included a chart on page 64 which takes into account conditions affecting the audibility of shortwave broadcasts. Simply pick out the section of the chart for the region in which you live and find the line for the region in which the station you want to hear is located. The chart indicates the optimum frequencies (in megahertz-MHz) for a given time in UTC. (Users outside North America can use the same procedure in reverse to find best reception from North America.)

Choose a program or station you want to hear.

Some selected programs appear on the lower half of the page for prime listening hours – space does not permit 24-hour listings. Our program manager changes the stations and programming featured each month to reflect the variety available on shortwave, though BBC programs are almost always included.

Occasionally program listings will be followed by "See X 0000." This information indicates that the program is a rerun, and refers to a previous summary of the program's content. The capital letter stands for a day of the week, using the same day codes as in the frequency listing (see above), and the four digits represent a time in UTC.

MT Monitoring Team

Gayle Van Horn
Frequency Manager
gayle@webworkz.com

Jim Frimmel
Program Manager
frimmel@star-telegram.com

Mark Fine, VA
fineware@erols.com

Jacques d'Avignon
Propagation Forecasts
monitor@rac.ca

Dan Roberts, CA
outfarpress@saber.net

Program Highlights

Jim Frimmel, Programming manager

World Harvest Radio (WHRI) advised that John Clements, co-host of Marlin Maddoux's "*Point of View*" program, began his own daily 30-minute talk show. "*The John Clements Report*" is broadcast Monday-Friday on WHRI Angel 1 at 2130 UTC (9495 kHz) and WHRI Angel 2 at 2300 UTC (5745 kHz).

The BBC's *On Air* monthly program guide seems to be having trouble keeping up with the seven streams they now have, and which they now refer to as "strands." (For those of you who have never seen this publication, you can view it at major book stores such as Barnes & Noble.)

It seems that the "Radio Highlights Section," the part of the magazine that describes current programs by category (News & Current Affairs, Sport, Weekend, World Living, World Showcase, and World Insight), no longer specifies the times that a program can be heard and on what stream/strand. If you want to know the times that *Waveguide* can be heard, the listing for that program simply notes that it is on Saturday monthly and that it replaces "*Write On*." To find the broadcast times you must refer to each separate schedule page. My search for the June broadcasts of *Waveguide* appear below. Note that all days are for **June**, times are local times in the target area with UTC times in parentheses.

#1 West & Central Africa:
0945 (0845) Sat 17th
2045 (1945) Sun 18th
2045 (1945) Sun 18th
#2 Europe & North Africa:
0545 (0345) Sat 17th
0945 (0745) Sat 17th
#3 East & Southern Africa:
0945 (0645) Sat 17th
1245 (0945) Mon 19th
#4 Middle East & CIS:
1045 (1045) Sat 17th
#5 South Asia:
0345 (2145) Sat 17th
0945 (0300) Sat 17th
#6 East Asia, AUS & Pacific:
0945 (0100) Sat 17th
#7 The Americas:
2345 (0345) Fri 16th
0445 (0845) Sat 17th

Compiling this listing was no easy task. My advice is to not subscribe to "*On Air*" if you have web access. Instead, visit the BBC web site **bbc.co.uk/worldservice/**, select "Radio Schedules" and then the target area you are interested in. You will be presented with the region's program schedule in UTC. (Hurray!) And, if you have the Microsoft Excel you can download spreadsheet files that depict all current program information.

Frequencies

0000	0100		Anguilla, Caribbean Beacon	6090am			
0000	0100	vl	Australia, ABC/Alice Springs	4835do			
0000	0100	vl	Australia, ABC/Katherine	5025do			
0000	0100	vl	Australia, ABC/Tennant Creek	4910do			
0000	0100		Australia, Radio	9660pa	12080va	15240pa	17580pa
				17750as	17795va	21740va	
0000	0015		Cambodia, National Radio Of	11940as	skd0400		
0000	0100		Canada, CBC Northern Service	9625do			
0000	0100		Canada, CFRX Toronto ON	6070do			
0000	0100		Canada, CFVP Calgary AB	6030do			
0000	0100		Canada, CHNX Halifax NS	6130do			
0000	0100		Canada, CHNX Halifax NS	6160do			
0000	0100		Canada, CKZU Vancouver BC	6160do			
0000	0100		Costa Rica, R for Peace Intl	6970va	15049va	25930usb	
0000	0100		Costa Rica, University Network	5030om	6150va	7375na	9725wo
				11870va	13749af		
0000	0027		Czech Rep, Radio Prague Intl	11615na	13580na		
0000	0100		Ecuador, HCJB	9745na	15115na	21455usb	
0000	0030		Egypt, Radio Cairo	9900am			
0000	0100	s	Finland, YLE/R Finland	11985na	13770na		
0000	0100		Guyana, Voice of	3289do	5949do		
0000	0045		India, All India Radio	7410as	9705as	9950as	11620os
				13625as			
0000	0015		Japan, Radio	6050eu	6145eu	6155of	13650as
				17810as			
0000	0100		Kenya, Kenya BC Corp	4885do	4915do	4935do	
0000	0100		Kiribati, Radio	9809do	9825do		
0000	0100		Malaysia, Radio	7295do			
0000	0100		Malaysia, RTM Kota Kinabalu	5980do			
0000	0100		Malaysia, RTM Sarawak	7160do			
0000	0100	vl	Namibia, Namibian BC Corp	3270af	3289af		
0000	0100		Netherlands, Radio	6165na	9845na		
0000	0100		New Zealand, R New Zealond Int	17675va			
0000	0100		New Zealand, ZLXA	3935do	7290do		
0000	0056		North Korea, R Pyongyong	4405vo	11460na	11710na	13760na
				15180no			
0000	0100	vl	Papua New Guinea, NBC	9675do	11880do		
0000	0030	mtwhfa	Serbia, Radio Yugoslavia	11870na			
0000	0100		Singapore R Corp of Singapore	6150do			
0000	0100	vl/as	Solomon Islands, SIBC	5020do			
0000	0100	vl/a	Solomon Islands, SIBC	9545do			
0000	0100		Spain, R Exterior Espona	6055na			
0000	0030		Thailand, Radio	9655af	9690af	11905af	
0000	0030		UK, BBC World Service	3915as	5965as	5975na	6175na
				6195os	7110as	9410me	9590am
				9915sa	11945as	11955as	12095sa
				15280as	15310as	15360as	17615as
				17790as			
0000	0100as		UK, Global Kitchen/Merlin	3955eu	6140eu	7325eu	
0000	0100		Ukraine, R Ukraine International	5905eu	6020eu	9640eu	
0000	0100		USA, Armed Forces Network	4278om	6458am	12689am	
0000	0100		USA, KAIJ Dallas TX	13815va			
0000	0100		USA, KTBN Salt Lake City UT	15590na			
0000	0100		USA, KWHR Naalehu HI	17510as			
0000	0030		USA, Voice of America	7215as	9770as	11760as	
				15185as	15290os	17735as	
				17820as			
0000	0100	twhfa	USA, Voice of America	5995am	6130ca	7405am	
				9455af	9775om	11695co	
				13740am			
0000	0100		USA, WBCQ Monticello ME	7415na	9330na		
0000	0100		USA, WEWN Birmingham AL	5825va	13615na		
0000	0100		USA, WGTG McCaysville GA	5085va	6890om		
0000	0100		USA, WHRA Greenbush ME	7580na			
0000	0100		USA, WHRI Noblesville IN	5745no	7315sa		
0000	0100		USA, WINB Red Lion PA	12160am			
0000	0100		USA, WJCR Upton KY	7490va	13594as		
0000	0030		USA, WRMI Miami FL	9955am			
0000	0100		USA, WRNO New Orleans LA	7355na			
0000	0100		USA, WSHB Cypress Crk SC	9430na	15285am		
0000	0100		USA, WTJC Newport NC	9370na			
0000	0100as		USA, WWBS Macon GA	11915eu			
0000	0100		USA, WWCR Nashville TN	5070na	7435na	9475na	
				13845na			
0000	0100		USA, WYFR Okeechobee FL	6085na	9505na		
0000	0100	vl	Vanuatu, Radio	3945do	4960do	7260do	
0015	0100		Japan, Radio	6050eu	6145na	6155eu	
0030	0100		Iran, VOIRI	6135om	9022ca	9835na	
				11970na			
0030	0100		Lithuania, Radio Vilnius	9855na			
0030	0100		Sri Lanka, Sri Lanka BC Corp	4940do			
0030	0100		Sri Lanka, Sri Lanka BC Corp	4940do	6005as	6075as	
				9730as	15425as		
0030	0100		Thailand, Radio	9655na	11905as	15395na	
0030	0100		UK, BBC World Service	5965as	5975na	6175no	
				6195as	9410as	9590am	
				9915sa	11955as	12095sa	
				15280as	15310os	15360as	
				17790as			
0030	0100		USA, VOA Special English	7215as	9770as	11760as	
				15185as	15290as	17735pa	
				17820as			
0030	0100	twhfa	USA, WRMI Miami FL	7385na			
0030	0100	sm	USA, WRMI Miami FL	3955am			
0050	0100		Italy, RAI International	6010na	9675na	11800na	
0050	0100		UK, International BC Tamil	11570as			

Selected Programs

Sundays

0000 Japan, NHK/Radio: News.
0000 University Network via WWCR #2: Ancient Mysteries. Dr. Scott discusses the world's great mysteries such as Atlantis and the pyramids.
0000 USA, WWCR #1 Nashville TN: What Does the Bible Say? Pastor Dennis Costella of the Fundamental Bible Church of Los Osos, California, exposes false teachings and other religions.
0000 USA, WWCR #3 Nashville TN: Power of Prophecy. Texe Marrs and a guest discuss the evils and pitfalls of today and the outlook for tomorrow.
0010 Japan, NHK/Radio: Hello from Tokyo.
0030 USA, WWCR #1 Nashville TN: Life's Railway to Heaven. WT English evangelizes from South Carolina.

Mondays

0000 Japan, NHK/Radio: News.
0000 University Network via WWCR #2: Mysteries and Wonders. See S 1530.
0000 USA, WWCR #1 Nashville TN: The Jesus Time Network. Walter Baits evangelizes from Gatlinburg, Tennessee.
0000 USA, WWCR #3 Nashville TN: Discoveries in Health (hour 2) (live). The second hour of the health and herbs show from the American Freedom Network.
0010 Japan, NHK/Radio: The Weekend Square.
0030 USA, WWCR #1 Nashville TN: HarvestTime. Gospel music and inspiration from the United Pentecostal Church International.
0045 USA, WWCR #1 Nashville TN: First Hand. Rick Livingood with a world evangelism update.

Tuesday-Saturday

0000 Japan, NHK/Radio: News.
0000 University Network via WWCR #2: Ancient Mysteries. See S 0000.
0000 USA, WWCR #1 Nashville TN: Newswatch Magazine. See M 1100.

Tuesdays

0000 USA, WWCR #3 Nashville TN: To Health with You (live). See M 0530.
0015 Japan, NHK/Radio: 44 Minutes.
0017 Japan, NHK/Radio: Interview Corner.
0031 Japan, NHK/Radio: Close Up.
0047 Japan, NHK/Radio: News Commentary.
0050 Japan, NHK/Radio: Tumbling Dice.

Wednesdays

0000 USA, WWCR #3 Nashville TN: Perspectives on America (live). Jeff Bennett of Republic Radio talks about preparedness issues.
0015 Japan, NHK/Radio: 44 Minutes.
0017 Japan, NHK/Radio: Interview Corner.
0036 Japan, NHK/Radio: Close Up.
0048 Japan, NHK/Radio: News Commentary.
0052 Japan, NHK/Radio: Tumbling Dice.

Thursdays

0000 USA, WWCR #3 Nashville TN: Perspectives on America (live). See W 0000.
0015 Japan, NHK/Radio: 44 Minutes.
0017 Japan, NHK/Radio: Interview Corner.
0031 Japan, NHK/Radio: Close Up.
0049 Japan, NHK/Radio: News Commentary.
0054 Japan, NHK/Radio: AsiaWatch.

Fridays

0000 USA, WWCR #3 Nashville TN: Perspectives on America (live). See W 0000.
0015 Japan, NHK/Radio: 44 Minutes.
0017 Japan, NHK/Radio: Interview Corner.
0034 Japan, NHK/Radio: Close Up.
0047 Japan, NHK/Radio: News Commentary.
0052 Japan, NHK/Radio: Tumbling Dice.

Saturdays

0000 USA, WWCR #3 Nashville TN: American Sovereign (live). Brett Johnson.
0015 Japan, NHK/Radio: 44 Minutes.
0017 Japan, NHK/Radio: Asia in Focus.
0036 Japan, NHK/Radio: Japan Unplugged.
0045 Japan, NHK/Radio: News Commentary.
0049 Japan, NHK/Radio: Stories from the Heart.
0056 Japan, NHK/Radio: Music.

Frequencies

0100	0200		Anguilla, Caribbean Beacon	6090am			
0100	0200	vl	Australia, ABC/Katherine	5025do			
0100	0200	vl	Australia, ABC/Tennant Creek	4910do			
0100	0200		Australia, Radio	9660pa	12080va	15240pa	15415as
				17580pa	17750as	17795va	21725pa
0100	0200		Canada, CBC Northern Service	9625do			
0100	0200		Canada, CFRX Toronto ON	6070do			
0100	0200		Canada, CFVP Calgary AB	6030do			
0100	0200		Canada, CHNX Halifax NS	6130do			
0100	0200		Canada, CKZN St John's NF	6160do			
0100	0200		Canada, CKZU Vancouver BC	6160do			
0100	0130		Canada, R Canada International	5960am	9755am	11715am	13670am
				15170am	15305am		
0100	0200		China, China Radio International	9570na			
0100	0200		Costa Rica, R for Peace Intl	6970va	15049va	25930usb	
0100	0200		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
0100	0200		Cuba, Radio Havana	6000na	9820na	11705na	
0100	0127		Czech Rep, Radio Prague Intl	7345na	11615na		
0100	0200		Ecuador, HCJB	9745na	15115na	21455usb	
0100	0115		Finland, YLE/R Finland	11985na	13770na		
0100	0145		Germany, Deutsche Welle	6040na	9640am	11810na	13720am
0100	0130	s	Germany, Universal Life	9435as			
0100	0200		Guyana, Voice of	3289do	5949do		
0100	0130		Hungary, Radio Budapest	9560na			
0100	0200		Indonesia, Voice of	9525va	11784va	15149va	
0100	0130		Iran, VOIRI	9022am	9835ca	11970na	
0100	0200	as	Italy, IRRS	7120va			
0100	0110		Itay, RAI International	6010na	9675na	11800na	
0100	0200		Japan, Radio	9515me	11860as	11870me	15325as
				15590as	17685pa	17835sa	17845pa
				skd0200			
0100	0200		Kenya, Kenya BC Corp	4885do	4915do	4935do	
0100	0130		Kiribati, Radio	9809do	9825do		
0100	0200		Malaysia, Radio	7295do			
0100	0200		Malaysia, RTM Kota Kinabalu	5980do			
0100	0200		Namibia, Namibian BC Corp	3270af	3289af		
0100	0130		Netherlands, Radio	6165na	9845na		
0100	0200		New Zealand, R New Zealand Int	17675va			
0100	0200		New Zealand, ZLXA	3935do	7290do		
0100	0156		North Korea, R Pyongyang	3560va	11735va	15229va	17734va
0100	0200	vl	Papua New Guinea, NBC	9675do	11880do		
0100	0200		Russia, Voice of Russia WS	9665na	11990na	11990na	12045os
				15595na	17595na		
0100	0200		Singapore R Corp of Singapore	6150do			
0100	0130		Slovakia, R Slovakia International	5930na	7230ca	9440sa	
0100	0200	vl/as	Solomon Islands, SIBC	5020do			
0100	0200	vl/a	Solomon Islands, SIBC	9545do			
0100	0200		Spain, R Exterior Espana	6055na			
0100	0200		Sri Lanka, Sri Lanka BC Corp	4940do	6005os	6075as	9730as
				15425as			
0100	0130		Switzerland, Swiss R International	9885am	9905am		
0100	0200		UK, BBC World Service	5965os	5975na	6175na	6195as
				9410me	9590am	9915sa	11955as
				12095sa	15280as	15310as	15360as
				17790as			
0100	0200		USA, Armed Forces Network	4278am	6458am	12689am	
0100	0200		USA, KAIJ Dallas TX	5755va			
0100	0200		USA, KJES Vado NM	7555no			
0100	0200		USA, KTBN Salt Lake City UT	7510na			
0100	0200		USA, KWHR Naalehu HI	17510as			
0100	0130	twhfa	USA, Voice of America	5995am	6130ca	7405am	9455af
				9775am	13740am		
0100	0200		USA, Voice of America	7115as	9635as	11705as	11725as
				11820os	13650as	15250as	17740as
				17820os			
0100	0200		USA, WBCQ Monticello ME	7415na	9330na		
0100	0200		USA, WEWN Birmingham AL	5825na	13615na		
0100	0200		USA, WGTG McCaysville GA	5085va	6890am		
0100	0200		USA, WHRA Greenbush ME	7580na			
0100	0200		USA, WHRI Noblesville IN	5745na	7315sa		
0100	0200		USA, WINB Red Lion PA	12160am			
0100	0200		USA, WJCR Upton KY	7490va	13594as		
0100	0200	twhfa	USA, WRMI Miami FL	7385na			
0100	0200	sm	USA, WRMI Miami FL	9955am			
0100	0200		USA, WRNO New Orleans LA	7355na			
0100	0200		USA, WSHB Cypress Crk SC	9430na	15285am		
0100	0200		USA, WTJC Newport NC	9370na			
0100	0200		USA, WWCR Nashville TN	3215na	5070na	7435na	13845na
0100	0200		USA, WYFR Okeechobee FL	6065na	15165as		
0100	0130		Uzbekistan, Radio Tashkent	7190as	9375as	9530as	
0100	0200	vl	Vanuatu, Radio	3945do	4960do	7260do	
0100	0127		Vietnam, Voice of	7250na	9695na		
0105	0110		Croatia, Croatian Radio	9925na			
0130	0200		Austria, R Austria International	9655na	9870am	13730am	
0130	0159		Canada, R Canada International	5960am	9755am		
0130	0159	sm	Canada, R Canada International	11715am	13670am	15305am	
0130	0145	VL	Libya, Voice of Africa	11815af	15415af	15435vo	
0130	0200		Slovakia, Adventist World Radio	11600as			
0130	0200		Sweden, Radio	13625as			
0130	0200		UK, RTE Radio	6155am			
0130	0200	twhfa	USA, VOA Special English	7405am	9775am	13740am	
0130	0200	twhfa	USA, Voice of America	5995am	6130ca	9455af	
0140	0200		Vatican City, Vatican Radio	9650au	12055au		
0145	0200		Albania, R Tirana International	6115na	7160na		

Selected Programs

Sundays

0100 Canada, RCI Montreal: RCI News. News, weather, and sports from Radio Canada International.
0100 Japan, NHK/Radio: News.
0100 University Network via WWCR #2: Ancient Mysteries. See S 0000.
0100 USA, WWCR #1 Nashville TN: Faith Holiness Church. Larry Cain evangelizes from South Carolina.
0100 USA, WWCR #3 Nashville TN: Tomorrow's News Today. George Hyatt is not the presenter, he's the evangelist.
0107 Canada, RCI Montreal: Venture Canada. David Blair presents this weekly magazine that promotes Canadian business ventures.
0110 Japan, NHK/Radio: Roundup Asia.
0130 USA, WWCR #1 Nashville TN: The Lights of Spiritual Guidance. Gospel and song with J. Harold Lowman.
0130 USA, WWCR #3 Nashville TN: Dixie Rising. Dan Meredith wants the South to rise again.
0131 Canada, RCI Montreal: Earth Watch. The magazine on environment, science and ecology matters.

Mondays

0100 Canada, RCI Montreal: RCI News. See S 0100.
0100 Japan, NHK/Radio: News.
0100 University Network via WWCR #2: Mysteries and Wonders. See S 1530.
0100 USA, WWCR #1 Nashville TN: Christ Kingdom Ministries. William Smith.
0107 Canada, RCI Montreal: The Arts in Canada. See S 0506.
0110 Japan, NHK/Radio: Hello from Tokyo.
0129 Japan, NHK/Radio: What's New?
0130 USA, WWCR #1 Nashville TN: Alternative Health Care 101. Grant Gerondale.
0131 Canada, RCI Montreal: The Maple Leaf Mailbag. A program entirely devoted to listeners' letters in which host Marc Montgomery answers questions and reads comments on programs and impressions of Canada.
0145 USA, WWCR #1 Nashville TN: The Last Day Message. Rick Long's message is garnished with fire and brimstone.

Tuesday-Saturday

0100 Canada, RCI Montreal: CBC Radio News. See S 0200.
0100 Canada, RCI Montreal: RCI News. See S 0100.
0100 Japan, NHK/Radio: News.
0100 University Network via WWCR #2: Ancient Mysteries. See S 0000.
0100 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
0100 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). A conservative, no-holds-barred commentary on American life that challenges people to become involved in the country's direction.
0111 Canada, RCI Montreal: Spectrum. A weekday magazine program of current affairs, features, and a business report presented by Jim Craig.
0111 Canada, RCI Montreal: Spectrum. See T 0111.
0155 Canada, RCI Montreal: News. See M 0400.

Tuesdays

0105 USA, WWCR #1 Nashville TN: The Grace Hour. See M 1402.
0115 Japan, NHK/Radio: 44 Minutes.
0117 Japan, NHK/Radio: Interview Corner.
0131 Japan, NHK/Radio: Close Up.
0148 Japan, NHK/Radio: News Commentary.
0152 Japan, NHK/Radio: Tumbling Dice.

Wednesdays

0105 USA, WWCR #1 Nashville TN: The Grace Hour. See M 1402.
0115 Japan, NHK/Radio: 44 Minutes.
0117 Japan, NHK/Radio: Interview Corner.
0136 Japan, NHK/Radio: Close Up.
0148 Japan, NHK/Radio: News Commentary.
0152 Japan, NHK/Radio: Tumbling Dice.

Thursdays

0105 USA, WWCR #1 Nashville TN: The Grace Hour. See M 1402.
0115 Japan, NHK/Radio: 44 Minutes.
0117 Japan, NHK/Radio: Interview Corner.
0134 Japan, NHK/Radio: Close Up.
0148 Japan, NHK/Radio: News Commentary.
0152 Japan, NHK/Radio: Tumbling Dice.

Fridays

0105 USA, WWCR #1 Nashville TN: The Grace Hour. See M 1402.
0115 Japan, NHK/Radio: 44 Minutes.
0117 Japan, NHK/Radio: Interview Corner.
0134 Japan, NHK/Radio: Close Up.
0152 Japan, NHK/Radio: News Commentary.

Saturdays

0115 Japan, NHK/Radio: 44 Minutes.
0117 Japan, NHK/Radio: Asia in Focus.
0136 Japan, NHK/Radio: Japan Unplugged.
0145 Japan, NHK/Radio: News Commentary.
0149 Japan, NHK/Radio: Stories from the Heart.
0156 Japan, NHK/Radio: Music.

Frequencies

0200	0300		Anguilla, Caribbean Beacon	6090am			
0200	0300	twhfa	Argentina, RAE	11710am			
0200	0300	vl	Australia, ABC/Alice Springs	4835do			
0200	0300	vl	Australia, ABC/Katherine	5025do			
0200	0300	vl	Australia, ABC/Tennant Creek	4910do			
0200	0300		Australia, Radio	9660pa	12080va	15240pa	15415as
				15515va	17580pa	17750as	21725pa
0200	0210		Bangladesh, Bangla Betar	4882as			
0200	0230	sm w fa	Belarus, Radio Minsk	7210va	11670va		
0200	0300		Bulgaria, Radio	9400na	11700na		
0200	1215		Cambodia, National Radio Of	11940as	skd0400		
0200	0300		Canada, CBC Northern Service	9625do			
0200	0300		Canada, CFRX Toronto ON	6070do			
0200	0300		Canada, CFVP Calgary AB	6030do			
0200	0300		Canada, CHNX Halifax NS	6130do			
0200	0300		Canada, CKZN St John's NF	6160do			
0200	0300		Canada, CKZU Vancouver BC	6160do			
0200	0229		Canada, R Canada International	9755am	11715am	13670am	15170am
				15305am			
0200	0300		Costa Rica, R for Peace Intl	6970va	15049va	25930usb	
0200	0300		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
0200	0300		Cuba, Radio Havana	6000na	9820na	11705na	
0200	0300		Ecuador, HCJB	9745na	15115na	21455usb	
0200	0300		Egypt, Radio Cairo	9475am			
0200	0245		Germany, Deutsche Welle	9615as	11945as	11965as	
0200	0210	mtwhf	Greece, Voice of	7450va	9420va	12110va	15630va
0200	0300		Guyana, Voice of	3289do	5949do		
0200	0300		Kenya, Kenya BC Corp	4885do	4915do	4935do	
0200	0300		Malaysia, Radio	7295do			
0200	0300		Malaysia, RTM Kota Kinabalu	5980do			
0200	0230		Myanmar, Radio	7185do			
0200	0300		Namibia, Namibian BC Corp	3270af	3289af		
0200	0300		New Zealand, R New Zealand Int	17675va			
0200	0300		New Zealand, ZLXA	3935do	7290do		
0200	0256		North Korea, R Pyongyang	11844va	13649va		
0200	0300	vl	Papua New Guinea, NBC	9675do	11880do		
0200	0256		Romania, R Romania International	9510na	9570na	11885na	11940as
				15105pa	15380pa	17790pa	
0200	0300		Russia, Voice of Russia WS	9665na	11990na	13690na	15595na
				17595na			
0200	0300		Singapore R Corp of Singapore	6150do			
0200	0300	vl/as	Solomon Islands, SIBC	5020do			
0200	0300	vl/a	Solomon Islands, SIBC	9545da			
0200	0300		South Korea, R Korea Intl	7275as	11725sa	11810sa	15575na
0200	0300		Sri Lanka, Sri Lanka BC Corp	6005as	6075as	6130do	9730as
				15425as			
0200	0300		Taiwan, R Taiwan International	5950na	9680na	11740as	11825pa
				15345as			
0200	0300		UK, BBC World Service	5975na	6135am	6175na	6195eu
				9410eu	9770af	9915sa	11760me
				11955as	12095sa	15280as	15310as
				15360as	17790as		
0200	0230	a	UK, Wales Radio Intl/Merlin	9765na			
0200	0300		USA, Armed Forces Network	4278am	6458am	12689am	
0200	0300		USA, KAIJ Dallas TX	5755va			
0200	0230		USA, KJES Vado NM	7555na			
0200	0300		USA, KTBN Salt Lake City UT	7510na			
0200	0300		USA, KWHR Naalehu HI	17510as			
0200	0300		USA, Voice of America	7115as	9635as	11705as	11725as
				11820as	13650as	15250as	17740as
				17820as			
0200	0300		USA, WBCQ Monticello ME	7415na	9330na		
0200	0300		USA, WEWN Birmingham AL	5825va			
0200	0300		USA, WGTG McCaysville GA	5085va	6890am		
0200	0300		USA, WHRA Greenbush ME	7580na			
0200	0300		USA, WHRI Noblesville IN	5745na	7315sa		
0200	0300		USA, WINB Red Lion PA	12160am			
0200	0300		USA, WJCR Upton KY	7490va	13594as		
0200	0300		USA, WRMI Miami FL	7385na			
0200	0300		USA, WRNO New Orleans LA	7355na			
0200	0300		USA, WSHB Cypress Crk SC	7535na	9430na		
0200	0300		USA, WTJC Newport NC	9370na			
0200	0300		USA, WWCR Nashville TN	3215na	5070na	5935na	7435na
0200	0300		USA, WYFR Okeechobee FL	6065na	9505na		
0200	0300	vl	Vanuatu, Radio	3945do	4960do	7260do	
0205	0210		Croatia, Croatian Radio	9925na			
0215	0220		Nepal, Radio	5005as	7165as		
0230	0300		Albania, R Tirana International	6115na	7160na		
0230	0300		Hungary, Radio Budapest	9835na			
0230	0300		Sweden, Radio	9495na			
0230	0257		Vietnam, Voice of	7250na	9695na		
0250	0300		Vatican City, Vatican Radio	7305am	9605am		
0250	0300	vl	Zambia, National BC Corp	6165do	6265do		
0257	0300	vl	Malawi, Malawi BC Corp	3380do			

Selected Programs

Sundays

0200 Canada, RCI Montreal: CBC Radio News. News, sports, and weather from the Canadian Broadcasting Corporation.
0200 South Korea, R Korea Intl: News. Seven or ten minutes of world and regional news.
0200 University Network via WWCR #2: Nitro Pill. Dr. Scott orates.
0200 USA, WWCR #1 Nashville TN: Open Bible Dialogue. Joseph Chambers preaches Bible prophecy from North Carolina.
0200 USA, WWCR #3 Nashville TN: Communications World ABC. A look at the people, technologies, economics, and politics involved in modern telecommunications.
0206 Canada, RCI Montreal: The Vinyl Cafe. Host Stuart McLean with gossip and music from the neighborhood music store or with a live concert from around Canada.
0210 South Korea, R Korea Intl: News Commentary. Opinion on developments in Korea and worldwide.
0218 South Korea, R Korea Intl: Report from Developing Countries. What's happening in the Third World.
0230 USA, WWCR #3 Nashville TN: World of Radio. Glenn Hauser's communications program for shortwave radio listeners.
0240 South Korea, R Korea Intl: From Us to You. Listener letters, questions, comments, Q&A Corner and Music Request.

Mondays

0200 Canada, RCI Montreal: CBC Radio News. See S 0200.
0200 South Korea, R Korea Intl: News. See S 0200.
0200 University Network via WWCR #2: God's Mighty Men. Dr. Scott focuses on a man of the Bible.
0200 USA, WWCR #1 Nashville TN: Power of Prophecy. See S 0000.
0200 USA, WWCR #3 Nashville TN: Mike Jarmus Program (hour 1) (live). Mike, his guests, and callers discuss UFOs and other far out topics.
0204 Canada, RCI Montreal: Tapestry. A look at the broad range of spiritual and human issues facing people of various cultures and religions.
0210 South Korea, R Korea Intl: Echoes of Korean Music. See S 1310.
0238 South Korea, R Korea Intl: Multiwave Feedback. See S 1338.

Tuesday-Saturday

0200 Canada, RCI Montreal: CBC Radio News. See S 0200
0200 South Korea, R Korea Intl: News. See S 0200.
0200 University Network via WWCR #2: Nitro Pill. See S 0200.
0200 USA, WWCR #1 Nashville TN: The Sweet Liberty (live). Jackie Patru.
0200 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0210 South Korea, R Korea Intl: News Commentary. See S 0210.
0211 Canada, RCI Montreal: Spectrum. See T 0111.

Tuesdays

0215 South Korea, R Korea Intl: Seoul Calling. See M 1315.
0237 South Korea, R Korea Intl: Economic News Briefs. See M 1340.
0242 South Korea, R Korea Intl: Notes of Nostalgia. See M 1345.

Wednesdays

0215 South Korea, R Korea Intl: Seoul Calling. See M 1315.
0240 South Korea, R Korea Intl: Economic News Briefs. See M 1340.
0245 South Korea, R Korea Intl: Cultural Promenade. See T 1345.

Thursdays

0215 South Korea, R Korea Intl: Seoul Calling. See M 1315.
0237 South Korea, R Korea Intl: Economic News Briefs. See M 1340.
0241 South Korea, R Korea Intl: Reaching Forward. See W 1645.

Fridays

0215 South Korea, R Korea Intl: Seoul Calling. See M 1315.
0240 South Korea, R Korea Intl: Economic News Briefs. See M 1340.
0245 South Korea, R Korea Intl: Tales from Korea's Past. See H 1345.

Saturdays

0215 South Korea, R Korea Intl: Sites and Sounds. See F 1315.
0236 South Korea, R Korea Intl: Globalizing Korea. See F 1345.
0245 South Korea, R Korea Intl: Let's Learn Korean! See F 1330.

IT'S BACK AND BETTER THAN EVER

The Worldwide Shortwave Listening Guide

Edited by John Figliozzi

A *"must"* reference for every shortwave program listener!

See the ad on page 9

Frequencies

0300	0400		Anguilla, Caribbean Beacon	6090am			
0300	0400	vl	Australia, ABC/Alice Springs	4835do			
0300	0400	vl	Australia, ABC/Katherine	5025do			
0300	0400	vl	Australia, ABC/Tennant Creek	4910do			
0300	0400		Australia, Radio	9660pa	12080va	15240pa	
				15415as	15515va	17580pa	
				17750as	21725pa		
0300	0400	vl	Botswana, Radio	3356do	4820do	7255do	
0300	0400		Canada, CBC Northern Service	9625do			
0300	0400		Canada, CFRX Toronto ON	6070do			
0300	0400		Canada, CFVP Calgary AB	6030do			
0300	0400		Canada, CHNX Halifax NS	6130do			
0300	0400		Canada, CKZN St John's NF	6160do			
0300	0400		Canada, CKZU Vancouver BC	6160do			
0300	0356		China China Radio International	9690na			
0300	0400		Costa Rica, Faro del Caribe	5054ca	6175ca	9644ca	
0300	0400		Costa Rica, R for Peace Intl	6970va	15049va		
0300	0400		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
0300	0400		Cuba, Radio Havana	6000na	9820na	11705na	
0300	0327		Czech Rep, Radio Prague Intl	7345na	7385na	11615na	
0300	0400		Ecuador, HCJB	9745na	15115na	21455usb	
0300	0330		Egypt, Radio Cairo	9475am			
0300	0345		Germany, Deutsche Welle	9535na	9640na	11810na	
				13780am	15105na		
0300	0400	vl	Guatemala, Radio Cultural	3300do	5955do		
0300	0400		Guyana, Voice of	3289do	5949do		
0300	0400	sm	Honduras, Radio Luz y Vida	3250ca			
0300	0400	irreg	Iraq, Radio Iraq International	9684va	11787va		
0300	0400		Japan, Radio	17825ca	21610pa		
0300	0400		Kenya, Kenya BC Corp	4885do	4915do	4935do	
0300	0400	vl	Lesotho, Radio	4800do			
0300	0400		Malaysia, Radio	7295do			
0300	0400		Malaysia, Voice of Islam	6175as	9750as	15295as	
0300	0400	stwhfa	Mexico, R Mexico International	9705am			
0300	0400		Namibia, Namibian BC Corp	3270af	3289af		
0300	0400		New Zealand, R New Zealond Int	17675va			
0300	0400		Oman, Radio Sultanate of	15355va			
0300	0400	vl	Papua New Guinea, NBC	9675do	11880do		
0300	0400		Russia, Voice of Russia WS	7125na	9665na	11990na	
				15595na	17595na	17650na	
				17660na	17690na		
0300	0400	vl	Rwanda, Radio	6055do			
0300	0330		S Africa, Adventist World Radio	6015af			
0300	0330		S Africa, Channel Africa	6035af			
0300	0400		Singapore R Corp of Singapore	6150do			
0300	0400	vl/as	Solomon Islands, SIBC	5020do			
0300	0400	vl/a	Solomon Islands, SIBC	9545do			
0300	0400		Sri Lanka, Sri Lanka BC Corp	6005as	6075as	6130do	9730as
				15425as			
0300	0400		Taiwan, R Taiwan International	5950na	9680na	11745as	11825as
				15345as			
0300	0330		Thailand, Radio	9655na	11905am	15395na	
0300	0400		Turkey, Voice of	6155va	11655as	21715as	
0300	0400		Uganda, Radio	4976do	5026do		
0300	0400		UK, BBC World Service	3255af	5975na	6005af	6135am
				6175na	6190af	6195eu	7120af
				7160af	9410eu	11730af	11760me
				11955as	12095af	15280as	15310as
				15360as	17760as	17790as	21660as
0300	0400		Ukraine, R Ukraine International	6020eu	9640eu	12045eu	13590eu
0300	0400		USA, Armed Forces Network	4278am	6458am	12689am	
0300	0400		USA, KAIJ Dallas TX	5755va			
0300	0400		USA, KTBN Salt Lake City UT	7510na			
0300	0400	vl	USA, KVOH Los Angeles CA	9975am			
0300	0400		USA, KWHR Naalehu HI	17510as			
0300	0330	smtwh	USA, Voice of America	4960af			
0300	0400		USA, Voice of America	6080af	6115af	7105af	7275af
				7290af	7340af	9575af	9885af
				17725af			
0300	0400		USA, WBCQ Monticello ME	7415na	9330na		
0300	0400		USA, WEWN Birmingham AL	5825va			
0300	0400		USA, WGTG McCoysville GA	5085va	6890am		
0300	0400		USA, WHRA Greenbush ME	7580na			
0300	0400		USA, WHRI Noblesville IN	5745na	7315sa		
0300	0400		USA, WINB Red Lion PA	12160am			
0300	0400		USA, WJCR Upton KY	7490va	13594as		
0300	0400		USA, WRMI Miami FL	7385na			
0300	0400		USA, WRNO New Orleans LA	7395na			
0300	0400		USA, WSHB Cypress Crk SC	11930eu			
0300	0400		USA, WTJC Newport NC	9370na			
0300	0400		USA, WWCR Nashville TN	3215na	5070na	5935na	7435na
0300	0400		USA, WYFR Okeechobee FL	6065na	9505na		
0300	0400	vl	Vanuotu, Radio	3945do	4960do	7260do	
0300	0310		Vatican City, Vatican Radio	7305am	9605am		
0300	0400	vl	Zambia, National BC Corp	6165do	6265do		
0300	0400	vl	Zimbabwe, Zimbabwe BC Corp	4828do	6045do		
				0			0
0305	0310		Croatia, Croatian Radio	9925na			
0310	0340		Vatican City, Vatican Radio	9660af			
0330	0357		Czech Rep, Radio Prague Intl	11600as	15470as		
0330	0345	vl	Libya, Voice of Africa	11815af	15415af	15435va	
0330	0400		Sweden, Radio	9495na	15240al		
0330	0400		UAE, Radio Dubai	12005na	13675na	15395na	15400na
0330	0357		Vietnam, Voice of	9795na	9830na		
0345	0400	f	Seychelles, FEBA Radio	11885af			
0357	0400	vl	Malawi, Malawi BC Corp	5995do			
0359	0400		Zambia, Christian Voice	6065do			

Selected Programs

Sundays

0300 Japan, NHK/Radio: News.
0300 University Network via WWCR #2: Evening Festival (live). Dr. Scott encourages participation by asking listeners to call in.
0300 USA, WWCR #1 Nashville TN: Watch America. John Pinkston of The Congregation of God Seventh Day with up-to-the-minute Biblical insights on world news and prophetic events.
0300 USA, WWCR #3 Nashville TN: Spectrum (live). SWLs and Hams call Mark Emanuele with technical questions and comments.
0310 Japan, NHK/Radio: Hello from Tokyo.
0329 Japan, NHK/Radio: What's New?
0330 USA, WWCR #1 Nashville TN: Banner of Truth. Cornelius (Neil) Pronk is the radio pastor.
0345 USA, WWCR #1 Nashville TN: A Study in God's Word. From North Carolina, Hezakiah Smith reads Scripture.

Mondays

0300 Japan, NHK/Radio: News.
0300 University Network via WWCR #2: Evening Festival (live). See S 0300.
0300 USA, WWCR #1 Nashville TN: Christ Kingdom Ministries. See M 0100.
0300 USA, WWCR #3 Nashville TN: Mike Jarmus Program (hour 2) (live). See M 0200.
0315 Japan, NHK/Radio: Asian Top News.
0325 Japan, NHK/Radio: Music Journey Around Japan.
0330 USA, WWCR #1 Nashville TN: Leaves from the Tree of Life. Robert McClintock.

Tuesday-Saturday

0300 Japan, NHK/Radio: News.
0300 University Network via WWCR #2: Evening Festival (live). See S 0300.
0300 USA, WWCR #1 Nashville TN: Prophet 3H. Jeffrey McLain.
0330 USA, WWCR #1 Nashville TN: The Prophecy Club. Ston Johnson discusses bible prophecy from Topeka, Kansas.

Tuesdays

0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). See M 1603.
0315 Japan, NHK/Radio: Asian Top News.
0325 Japan, NHK/Radio: Let's Try Japanese.

Wednesdays

0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). See M 1603.
0315 Japan, NHK/Radio: Asian Top News.
0325 Japan, NHK/Radio: Unforgettable Japanese Masterpieces.

Thursdays

0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). See M 1603.
0315 Japan, NHK/Radio: Asian Top News.
0325 Japan, NHK/Radio: Brush Up Your Japanese.

Fridays

0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). See M 1603.
0315 Japan, NHK/Radio: Asian Top News.
0325 Japan, NHK/Radio: Music Beat.

Saturdays

0300 USA, WWCR #3 Nashville TN: Health Programming (live). See F 1603.
0310 Japan, NHK/Radio: The Weekend Square.

Hauser's Highlights

CONGO DR: Radio Télé-Liberté (RTL) has been on since the beginning of the year on shortwave – 9.800 MHz mornings, 12.925 MHz afternoons, and evenings on 15.725 MHz. We have press reviews at 8h, 12h30, and 20h as well as three daily news bulletins at 10h, 14h, and 16h. RTL has a staff of 25 and many outside contributors. Radio Liberté is located in Gbadolite and also operates from Kisangani on FM (*RTL via Hans Johnson via Nick Grace, Cumbre DX*)

Are we sure these times are UT? Anyhow, we have zero reports of anyone hearing the other frequencies (*gh*)

And 15725 also disappeared (*Zacharias Liangas, Greece, DXLD*)

Frequencies

0400	0500		Anguilla, Caribbean Beacon	6090am			
0400	0500	vl	Australia, ABC/Alice Springs	4835da			
0400	0500	vl	Australia, ABC/Katherine	5025da			
0400	0500	vl	Australia, ABC/Tennant Creek	4910da			
0400	0500		Australia, Radia	9660pa	12080va	15240pa	15415as
				15515va	17580pa	17750as	21725pa
0400	0430		Belgium, Radio Vlaanderen Intl	15565am			
0400	0500	vl	Botswana, Radio	3356da	4820do	7255da	
0400	0500	vl	Cameraan, RTV/Yaounde	4850da			
0400	0500		Canada, CBC Northern Service	9625da			
0400	0500		Canada, CFRX Toronto ON	6070da			
0400	0500		Canada, CFVP Calgary AB	6030da			
0400	0500		Canada, CHNX Halifax NS	6130da			
0400	0500		Canada, CKZN St John's NF	6160da			
0400	0500		Canada, CKZU Vancouver BC	6160do			
0400	0429	as	Canada, R Canada International	11835me	11975me	15215me	
0400	0456		China China Radio International	9650na	9730na		
0400	0500		Costa Rica, R for Peace Intl	6970va	15049va		
0400	0500		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
0400	0500		Cuba, Radio Havana	6000na	9820na	11705na	
0400	0500		Ecuador, HCJB	9745na	15115na	21455usb	
0400	0445		Germany, Deutsche Welle	7225af	9565af	9765af	13690af
0400	0500	vl	Guatemala, Radio Cultural	3300do	5955do		
0400	0500		Guyana, Voice of	3289do	5949do		
0400	0430		Israel, Kol Israel	9435va	15640va	17535va	
0400	0500		Kenya, Kenya BC Corp	4885do	4915do	4935do	
0400	0500	vl	Lesotho, Radio	4800do			
0400	0500	vl	Malawi, Malawi BC Corp	3380do	5995do		
0400	0500		Malaysia, Radio	7295do			
0400	0500		Malaysia, Voice of Islam	6175as	9750as	15295as	
0400	0430	twhfa	Mexico, R Mexico International	9705am			
0400	0500		Namibia, Namibian BC Corp	3270af	3289af		
0400	0500		New Zealand, R New Zealand Int	17675va			
0400	0500		New Zealand, ZLXA	3935do	7290do		
0400	0500	vl	Nigeria, Radio/Enugu	6025do			
0400	0430	vl	Nigeria, Radio/Kaduna	6090do	7275do		
0400	0500	vl	Papua New Guinea, NBC	9675do	11880do		
0400	0456		Romania, R Romania International	11940na	15105na	15335as	17745as
0400	0500		Russia, Voice of Russia WS	7125na	9665na	11990na	15595na
				17565na	17650na	17660na	17690na
0400	0500	vl	Rwanda, Radio	6055do			
0400	0430		S Africa, Channel Africa	5955af			
0400	0500		Singapore R Corp of Singapore	6150do			
0400	0500	vl/as	Solomon Islands, SIBC	5020do			
0400	0500	vl/a	Solomon Islands, SIBC	9545do			
0400	0430		Sri Lanka, Sri Lanka BC Corp	6005as	6075as	6130do	9730as
				15425as			
0400	0430		Switzerland, Swiss R International	9610eu	9885am	9905am	
0400	0500		Uganda, Radio	4976do	5026do		
0400	0500		UK, BBC World Service	3255af	5975na	6005af	6005af
				6135am	6175na	6190af	6195eu
				7120af	7160af	9410eu	11760me
				12095eu	15280as	15310eu	15420af
				15575me	17640af	17760as	17790as
				21660as	21830as		
0400	0500		USA, Armed Forces Network	4278am	6458am	12689am	
0400	0500		USA, KAIJ Dallas TX	5755va			
0400	0500		USA, KTBN Salt Lake City UT	7510na			
0400	0500	vl	USA, KVOH Los Angeles CA	9975am			
0400	0500		USA, KWHR Naalehu HI	17780as			
0400	0500		USA, Voice of America	6080af	7170va	7265af	7275af
				7290af	9575af	9885af	11965me
				15205va	17725af		
0400	0500		USA, WBCQ Monticello ME	7415na	9330na		
0400	0500		USA, WEWN Birmingham AL	5825va			
0400	0500		USA, WGTG McCaysville GA	5085va	6890am		
0400	0500		USA, WHRA Greenbush ME	7580na			
0400	0500		USA, WHRI Noblesville IN	5745na	7315sa		
0400	0500		USA, WJCR Upton KY	7490va	13594as		
0400	0500	stwhfa	USA, WRMI Miami FL	7385na			
0400	0500	m	USA, WRMI Miami FL	9955am			
0400	0500		USA, WRNO New Orleans LA	7395na			
0400	0500		USA, WSHB Cypress Crk SC	11930eu	15195af		
0400	0500		USA, WTJC Newport NC	9370na			
0400	0405		USA, WWCR Nashville TN	5070na	5935na	7435na	
0400	0405	sm	USA, WWCR Nashville TN	3210na	3210na		
0400	0405	twhfa	USA, WWCR Nashville TN	3215na			
0400	0455		USA, WYFR Okeechobee FL	6065na	9505na	9985eu	
0400	0500		Zambia, Christian Voice	6065do			
0400	0500	vl	Zambia, National BC Corp	6165do	6265do		
0400	0500	vl	Zimbabwe, Zimbabwe BC Corp	4828do	6045do		
				0			0
0405	0410		Croatia, Croatian Radio	9925na			
0405	05000		USA, WWCR Nashville TN	3210na	5070na	5935na	7435na
0425	0440		Italy, RAI International	5975af	7150af		
0430	0500		Austria, R Austria International	6015na	6155eu	13730eu	
0430	0500		Italy, IRRS	3985va			
0430	0500		Netherlands, Radio	6165na	9590na		
0430	0500	vl	Nigeria, Radio/Ibadan	6050do			
0430	0500	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
0430	0500	vl	Nigeria, Radio/Lagos	3326do	4990do		
0430	0500		S Africa, World Beacon	6115af			
0430	0500		Serbia, Radio Yugoslavia	11870na			
0430	0500		Sri Lanka, Sri Lanka BC Corp	6130do			
0430	0500		Swaziland, Trans World Radio	3200af	4775af		
0430	0500		Switzerland, Swiss R International	9885am	9905am		
0445	0500		USA, WYFR Okeechobee FL	9985eu			

Selected Programs

Sundays

0400 Canada, RC Montreal: RCI News. See S 0100.
0400 Cuba, Radio Havana: International News. See S 0100.
0400 University Network via WWCR #2: Evening Festival (live).
0400 USA, WWCR #1 Nashville TN: USA Radio News. News summary from the USA Radio News Network.
0400 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
0405 Canada, RC Montreal: Venture Canada. See S 0107.
0405 USA, WWCR #1 Nashville TN: The Bible's Greatest Heroes. Sound tracks from animated Bible stories.
0405 USA, WWCR #3 Nashville TN: The Right Perspective (live). Hal, Frank and John.
0410 Cuba, Radio Havana: Stories Making News in Cuba. See S 0111.
0415 Cuba, Radio Havana: Feature Report. See S 0215
0423 Cuba, Radio Havana: Music. See S 0122.
0430 Cuba, Radio Havana: News Supplement. See S 0130.
0446 Cuba, Radio Havana: The World of Stamps. See S 0246.

Mondays

0400 Canada, RC Montreal: News. News from either the Canadian Broadcasting Corporation (CBC) or Radio Canada International (RCI).
0400 Canada, RCI Montreal: RCI News. See S 0100.
0400 Cuba, Radio Havana: Sunday Edition (from 0300). See M 0200.
0400 University Network via WWCR #2: Evening Festival (live).
0400 USA, WWCR #1 Nashville TN: Truth Shall Make You Free.
0400 USA, WWCR #3 Nashville TN: Watch America. See S 0300.
0401 Cuba, Radio Havana: The Mailbag Show. See S 2312.
0407 Canada, RCI Montreal: The Maple Leaf Mailbag. See M 0131.
0410 Canada, RCI Montreal: African Eyes. A 20-minute magazine of features, reports, and music.
0430 Cuba, Radio Havana: Breakthrough. See M 0230.
0430 USA, WWCR #1 Nashville TN: Lyon Gold and Silver Magnet Program (repeat). Lew Lyon hawks a variety of products for healing.
0430 USA, WWCR #3 Nashville TN: Ask WWCR. A mailbag program that answers listener questions about the business of shortwave and radio propagation.
0435 Cuba, Radio Havana: From Havana. See M 0235.
0445 USA, WWCR #3 Nashville TN: Eco Watch. See S 2315.

Tuesday-Saturday

0400 Canada, RCI Montreal: News. See M 0400.
0400 Canada, RCI Montreal: RCI News. See S 0100.
0400 Cuba, Radio Havana: International News. See S 0100.
0400 University Network via WWCR #2: Evening Festival (live).
0400 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
0400 USA, WWCR #3 Nashville TN: Lyon Gold and Silver Magnet Program (live). See M 0430.
0405 USA, WWCR #1 Nashville TN: The Overcomer Broadcast.
0411 Canada, RCI Montreal: Spectrum. See T 0111.
0418 Cuba, Radio Havana: Spotlight on the Americas. See M 2306.

Tuesdays

0410 Canada, RCI Montreal: African Eyes. See M 0410.
0413 Cuba, Radio Havana: National News. See S 0611
0421 Cuba, Radio Havana: Be My Guest. Interviewing a visitor to Cuba.
0426 Cuba, Radio Havana: Music. See S 0122.
0430 Cuba, Radio Havana: News Supplement. See S 0130.
0435 Cuba, Radio Havana: Timeout. See T 0135.
0450 Cuba, Radio Havana: Music. See S 0122.

Wednesdays

0410 Canada, RCI Montreal: African Eyes. See M 0410.
0417 Cuba, Radio Havana: Feature Report. See S 0215.
0427 Cuba, Radio Havana: News Supplement. See S 0130.
0432 Cuba, Radio Havana: Timeout. See T 0135.
0438 Cuba, Radio Havana: Feature Report. See S 0215.

Thursdays

0410 Canada, RCI Montreal: African Eyes. See M 0410.
0413 Cuba, Radio Havana: National News. See S 0611.
0424 Cuba, Radio Havana: Music. See S 0122.
0430 Cuba, Radio Havana: News Supplement. See S 0130.
0438 Cuba, Radio Havana: Timeout. See T 0135.

Fridays

0410 Canada, RCI Montreal: African Eyes. See M 0410.
0417 Cuba, Radio Havana: Feature Report. See S 0215.
0429 Cuba, Radio Havana: News Supplement. See S 0130.
0434 Cuba, Radio Havana: Timeout. See T 0135.
0439 Cuba, Radio Havana: Cuba Today. See F 0239.

Saturdays

0411 Cuba, Radio Havana: National News. See S 0611.
0425 Cuba, Radio Havana: Music. See S 0122.
0430 Cuba, Radio Havana: News Supplement. See S 0130.
0436 Cuba, Radio Havana: Timeout. See T 0135.

Frequencies

0500	0600		Anguilla, Caribbean Beacon	6090am			
0500	0600	vl	Australia, ABC/Alice Springs	4835do			
0500	0600	vl	Australia, ABC/Katherine	5025do			
0500	0600	vl	Australia, ABC/Tennant Creek	4910do			
0500	0600		Australia, Radio	9660pa	12080va	15240pa	15515va
				17580pa	21725pa		
0500	0600as		Australia, Radio	17750as			
0500	0600	vl	Botswana, Radio	3356do	4820do	7255do	
0500	0600	vl	Cameroon, RTV/Yaounde	4850do			
0500	0515		Canada, CBC Northern Service	9625do			
0500	0600		Canada, CFRX Toronto ON	6070do			
0500	0600		Canada, CFVP Calgary AB	6030do			
0500	0600		Canada, CHNX Halifax NS	6130do			
0500	0600		Canada, CKZN St John's NF	6160do			
0500	0600		Canada, CKZU Vancouver BC	6160do			
0500	0529		Canada, R Canada International	5995om	6145va	7290va	9595va
				9755om	11710va	11830om	13755va
				15330va			
0500	0556		China China Radio International	9560na			
0500	0600		Costa Rica, R for Peace Intl	6970va	15049va		
0500	0600		Costa Rica, University Network	5030am	6150va	7375na	9725no
				11870va	13749af		
0500	0600		Cuba, Radio Havana	9550no	9820na	9830no	
0500	0600		Ecuador, HCJB	9745na	15115na	21455usb	
0500	0545		Germany, Deutsche Welle	9670na	9785na	11810na	11985na
0500	0600		Guyana, Voice of	3289do	5949do		
0500	0600		Italy, IRRS	3985va			
0500	0600		Japan, Radio	5975eu	6110na	7230eu	11715as
				11760as	11840as	13630na	15590pa
0500	0600		Kenya, Kenya BC Corp	4885do	4915do	4935do	
0500	0600		Kiribati, Radio	9809do	9825do		
0500	0600		Kuwait, Radio	15110as	15230as		
0500	0600	vl	Lesotho, Radio	4800do			
0500	0600	vl	Liberia, R Liberia International	5100do			
0500	0600	vl	Malawi, Malawi BC Corp	3380do	5995do		
0500	0600		Malaysia, Radio	7295do			
0500	0600		Malaysia, RTM Sarawak	7160do			
0500	0600		Malaysia, Voice of Islam	6175as	9750as	15295as	
0500	0600		Namibia, Namibian BC Corp	3270af	3289af		
0500	0530		Netherlands, Radio	6165na	9590na		
0500	0600		New Zealand, R New Zealand Int	17675va			
0500	0600		New Zealand, ZLXA	3935do	7290do		
0500	0600	vl	Nigeria, Radio/Enugu	6025do			
0500	0600	vl	Nigeria, Radio/Ibadan	6050do			
0500	0600	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
0500	0600	vl	Nigeria, Radio/Lagos	3326do	4990do		
0500	0600	vl	Nigeria, Voice of	7255af	15120af		
0500	0504		Pakistan, Radio	15175me	17834me	21465me	
0500	0600	vl	Papua New Guinea, NBC	9675do	11880do		
0500	0600		Russia, Voice of Russia WS	17625au	17665au	21790au	
0500	0600	vl	Rwanda, Radio	6055do			
0500	0530		S Africa, Adventist World Radio	5960af	6015af		
0500	0530		S Africa, Channel Africa	11720af			
0500	0600		S Africa, World Beacon	6115af			
0500	0600		Singapore R Corp of Singapore	6150do			
0500	0600	vl	Solomon Islands, SIBC	5020do	9545do		
0500	0600		Spain, R Exterior Espana	6055na			
0500	0600		Sri Lanka, Sri Lanka BC Corp	6130do			
0500	0600		Swaziland, Trans World Radio	4775af	6100af	9500af	
0500	0530		Switzerland, Swiss R International	9610eu			
0500	0530		Uganda, Radio	4976do	5026do		
0500	0600		UK, BBC World Service	3255af	5975na	6005af	6175am
				6190af	6195eu	7160af	9410eu
				9740as	11760me	11765af	11955pa
				12095eu	15280as	15310as	15360as
				15420af	15575me	17640me	17760as
				17790as	17885af	21660as	
0500	0600		USA, Armed Forces Network	4278am	6458am	12689am	
0500	0600		USA, KAIJ Dallas TX	5755va			
0500	0600		USA, KTBN Salt Lake City UT	7510na			
0500	0600	vl	USA, KVOH Los Angeles CA	9975am			
0500	0600		USA, KWHR Naalehu HI	11565pa	17780as		
0500	0600		USA, Voice of America	5970af	6035af	6080af	7170va
				7195af	11965me	12080af	13670af
				15205va			
0500	0600		USA, WBCQ Monticello ME	7415na	9330na		
0500	0600		USA, WEWN Birmingham AL	5825va			
0500	0600		USA, WGTG McCaysville GA	5085va	6890am		
0500	0600		USA, WHRA Greenbush ME	11565af			
0500	0600		USA, WHRI Noblesville IN	5745na	7315sa		
0500	0600		USA, WJCR Upton KY	7490va	13594as		
0500	0530		USA, WRMI Miami FL	7385na			
0500	0600		USA, WRNO New Orleans LA	7395na			
0500	0600		USA, WSHB Cypress Crk SC	11930eu	9840af		
0500	0600		USA, WTJC Newport NC	9370no			
0500	0600		USA, WWCR Nashville TN	2390na	3210na	5070na	5935no
0500	0600		USA, WYFR Okeechobee FL	5985na	9985eu	11580eu	
0500	0600	vl	Vanuatu, Radio	3945do	4960do	7260do	
0500	0520		Vatican City, Vatican Radio	4005eu	5880eu	7250eu	9660af
				11625af	15570af		
0500	0600		Zambia, Christion Voice	6065do			
0500	0600	vl	Zambia, National BC Corp	6165do	6265do		
0500	0530	vl	Zimbabwe, Zimbabwe BC Corp	4828do	6045do		
0505	0510		Croatia, Croatian Radio	9470au	11970am		
0520	0530		Vatican City, Vatican Radio	9660af	11625af	15570af	
0525	0600	vl	Ghana, Ghana BC Corp	3366do	4915do		
0530	0600		Georgia, Georgian Radio	11805eu			
0530	0600		Thailand, Radio	9655eu	11905eu	15445eu	
0530	0600		UAE, Radio Dubai	13675au	15435au	21700au	
0530	0600	mtwhfa	USA, WRMI Miami FL	7385na			
0530	0600	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		

Selected Programs

Sundays

0500 Canada, RCI Montreal: RCI News. See S 0100.
0500 Japan, NHK/Radio: News.
0500 University Network via WWCR #2: Evening Festival (live).
0500 USA, WWCR #1 Nashville TN: The Great American Polka Show. An hour of polka favorites both old and new.
0500 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
0505 USA, WWCR #3 Nashville TN: The Right Perspective (live). See S 0405.
0506 Canada, RCI Montreal: The Arts in Canada. David Blair takes a look at Canadian cultural events taking place across the country and around the world.
0510 Japan, NHK/Radio: Roundup Asia.
0530 USA, WWCR #1 Nashville TN: The Lutheran Reformation Hour. Richard Shekner preaches from Chicago Heights, Illinois.

Monday-Friday

0500 Canada, RCI Montreal: RCI News. See S 0100.
0500 Japan, NHK/Radio: News.
0500 University Network via WWCR #2: Evening Festival (live). See S 0300.
0515 Japan, NHK/Radio: 44 Minutes.
0517 Japan, NHK/Radio: Interview Corner.
0530 USA, WWCR #3 Nashville TN: Uncertain Glory. Jeff Bennett.
0534 Japan, NHK/Radio: Close Up.
0547 Japan, NHK/Radio: News Commentary.
0552 Japan, NHK/Radio: Tumbling Dice.

Mondays

0500 USA, WWCR #1 Nashville TN: World of Radio. See S 0230.
0500 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
0505 USA, WWCR #3 Nashville TN: Lyra. Joe Allen.
0510 Canada, RCI Montreal: First Edition. Wojtek Gwiazda provides best way for listeners in Europe, Africa and the Middle East to get updated on the previous day's news and what's happening in Canada.
0530 USA, WWCR #1 Nashville TN: Communications World ABC. See S 0200.

Tuesdays

0500 USA, WWCR #1 Nashville TN: The Overcomer Broadcast (live). See M 1200.
0500 USA, WWCR #3 Nashville TN: Ask WWCR. See M 0430.
0510 Canada, RCI Montreal: First Edition. See M 0510.
0515 USA, WWCR #3 Nashville TN: Haney in the Rock. Marie Harnsby.

Wednesdays

0500 USA, WWCR #1 Nashville TN: The Overcomer Broadcast (live). See M 1200.
0500 USA, WWCR #3 Nashville TN: Divine Network. Lowell Brooks.
0510 Canada, RCI Montreal: First Edition. See M 0510.
0515 USA, WWCR #3 Nashville TN: Moment of Truth. Michael Baldea.

Thursdays

0500 USA, WWCR #1 Nashville TN: The Overcomer Broadcast (live).
0500 USA, WWCR #3 Nashville TN: Joni and Friends. See M 1315.
0505 USA, WWCR #3 Nashville TN: Messianic Minutes. See M 1320.
0510 Canada, RCI Montreal: First Edition. See M 0510.
0510 USA, WWCR #3 Nashville TN: Life Issues. See M 1325.
0515 USA, WWCR #3 Nashville TN: Moment of Truth. See W 0515.

Fridays

0500 USA, WWCR #1 Nashville TN: The Overcomer Broadcast (live).
0500 USA, WWCR #3 Nashville TN: A Visit with Mrs. G. Bible stories for children.
0510 Canada, RCI Montreal: First Edition. See M 0510.

Saturdays

0500 Canada, RCI Montreal: RCI News. See S 0100.
0500 Japan, NHK/Radio: News.
0500 University Network via WWCR #2: Evening Festival (live). See S 0300.
0500 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
0500 USA, WWCR #3 Nashville TN: The Old Country Church. Allen Dickerson.
0505 USA, WWCR #1 Nashville TN: America's Greatest Heroes. USA Radio Network.
0506 Canada, RCI Montreal: Earth Watch. See S 0131.
0510 Japan, NHK/Radio: Hello from Tokyo.
0515 USA, WWCR #3 Nashville TN: Shower of Power. See M 1230.
0529 Japan, NHK/Radio: What's New?
0530 USA, WWCR #3 Nashville TN: Battle Cry Sounding. See F 1230.

Today the World ... Tomorrow the Universe

GRUNDIG

GRUNDIG Tunes in the

The Millennium begins. The wait is over. The Grundig Satellit Legend continues. The Satellit 800 Millennium is your assurance of staying in touch with the world... Access radio programs the world over... fast-breaking news from the farthest corners of the globe... music from faraway countries.

CUTTING EDGE IN SPACE TECHNOLOGY

- You'll appreciate the smooth flowing design and functional control panel.
- Superbly appointed, fold away, easy grip handle for portability.
- Enter any station on the key pad, then tune up or down frequency or search specific meter bands.
- The tuner receives AM/FM and all shortwave frequencies from 100 to 30,000 KHz, FM from 87 to 108 MHz and VHF aircraft 118 to 137 MHz and locks onto broadcasts with digital accuracy...

World

"Performance ... exceptionally promising ..., Audio quality is delightful, superior to that of any other portable on today's market ..., This ergonomic radio is a cinch to operate straight out of the box"

Lawrence Magne,
Editor-in-Chief, Passport to World Band Radio

- Receives FM stereo with the included high-quality headphones.
- Superior audio quality for which Grundig is known.
- A direct input digital key pad combined with manual tuning.
- 70 user-programmable memories.
- Upper and lower sideband capability (USB/LSB).
- A large 6" by 3½" multifunction LCD.
- Last station memory.
- Synchronous detector for superior AM and shortwave reception.
- Multi voltage (110, 220 V) AC adapter.
- Dual clocks.
- Low battery indicator.

Whether you are cruising offshore, enjoying the cottage, or relaxing on an extended vacation in some distant land, the Satellit 800 Millennium is the most powerful and precise radio in the World. Search the globe, you can discover the hottest news first hand... listen to and witness the ongoing fascination with our evolving world today... tomorrow the universe.

by GRUNDIG

The Ultimate in Digital Technology

The LCD
Big! Bold! Brightly Illuminated 6" by 3½". Liquid Crystal Display shows all important data: Frequency, Meter band, Memory position, Time, LSB/USB Synchronous Detector and more.

The Tuning Controls
- For the traditionalist: a smooth, precise tuning knob, produces no audio muting during use. Ultra fine-tuning of 50Hz on LSB/USB, 100Hz in SW, AM and Aircraft Band and 20 KHz in FM.
- For Fixed-step Tuning: Big, responsive Up/Down tuning buttons.
- For direct frequency entry: a responsive, intuitive numeric keypad.

The Signal Strength Meter
Elegant in its traditional Analog design, like the gauges in the world's finest sports cars. Large. Well Lit. Easy to read.

The Frequency Coverage
Longwave, AM and shortwave: continuous 100-30,000 KHz. FM: 87-108 MHz VHF Aircraft Band: 118-137 MHz.

The Technology
Today's latest engineering:
- Dual conversion superheterodyne circuitry.
- PLL synthesized tuner.

The Operational Controls
Knobs where you want them; Buttons where they make sense. The best combination of traditional and high-tech controls

The Many Features
- 70 user-programmable memories.
- Two, 24 hour format clocks.
- Two ON/OFF sleep timers.
- Massive, built-in telescopic antenna.
- Connectors for external antennas – SW, AM, FM and VHF Aircraft Band.
- Line-out, headphone and external speaker jacks.

The Sound
Legendary Grundig Audio Fidelity with separate bass and treble controls, big sound from its powerful speaker and FM-stereo with the included high quality headphones.

The Power Supply
A multi voltage (110, 220V) AC adapter is included. Also operates on 6 size D batteries (not included)

Dimensions:
20.5" L x 9" H x 8" W

Weight: 14.50 lbs.

by GRUNDIG

Lextronix / Grundig, P.O. Box 2307, Menlo Park, CA 94026 • Tel: 650-361-1611 • Fax: 650-361-1724
Shortwave Hotlines: (US) 1-800-872-2228 (CA) 1-800-637-1648 • Web: www.grundigradio.net

Frequencies

0600	0700		Anguilla, Caribbean Beacon	6090am			
0600	0700	vl	Australia, ABC/Alice Springs	4835do			
0600	0700	vl	Australia, ABC/Katherine	5025do			
0600	0700	vl	Australia, ABC/Tennant Creek	4910do			
0600	0700		Australia, Radio	9660as	12080va	15240pa	15415cs
				15515va	17580pa	17750as	21725pa
0600	0700	vl	Botswana, Radio	7255do	9600do	7255do	
0600	0700	vl	Cameroon, RTV/Yaounde	4850do			
0600	0700		Canada, CFRX Toronto ON	6070do			
0600	0700		Canada, CFVP Calgary AB	6030do			
0600	0700		Canada, CHNX Halifax NS	6130do			
0600	0700		Canada, CKZU Vancouver BC	6160do			
0600	0700		Costa Rica, R for Peace Intl	6970va	15049va		
0600	0700		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
0600	0700		Cuba, Radio Havana	9550na	9820na	9830na	
0600	0700		Ecuador, HCJB	9745na	15115na	15160usb	21455na
0600	0645		Germany, Deutsche Welle	6140eu	13790af	15275af	17860af
0600	0700		Germany, Overcomer Ministries	13810au			
0600	0700	vl	Ghana, Ghana BC Corp	3366do	4915do		
0600	0700		Guyana, Voice of	3289do	5949do		
0600	0700	vl/mtwhf	Italy, IRRS	7120va			
0600	0700		Japan, Radio	5975eu	7230eu	11740as	11840as
				13630na	15230pa	21570po	
0600	0630		Kenya, Kenya BC Corp	4885do	4915do	4935do	
0600	0700		Kiribati, Radio	9809do	9825do		
0600	0700		Kuwait, Radio	15110as	15230as		
0600	0700	vl	Lesotho, Radio	4800do			
0600	0700	vl	Liberia, ELWA	4760do			
0600	0700	vl	Liberia, R Liberia International	5100do			
0600	0700	vl	Malawi, Malawi BC Corp	3380do	5995do		
0600	0700		Malaysia, Radio	7295do			
0600	0700		Malaysia, RTM Sarawak	7160do			
0600	0700		Malaysia, Voice of	6175as	9750as	15295as	
0600	0630	mtwhfa	Malta, Voice of Mediterranean	7150eu			
0600	0700		Namibia, Namibian BC Corp	3270af	3289af		
0600	0605		New Zealand, R New Zealand Int	17675va			
0600	0700		New Zealand, ZLXA	3935do	7290do		
0600	0700	vl	Nigeria, Radio/Enugu	6025do			
0600	0700	vl	Nigeria, Radio/Ibadan	6050do			
0600	0700	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
0600	0700	vl	Nigeria, Radio/Lagos	3326do	4990do		
0600	0700	vl	Nigeria, Voice of	7255af	15120af		
0600	0700	vl	Papua New Guinea, NBC	9675do	11880do		
0600	0641		Romania, R Romania International	11940na	15335na		
0600	0700		Russia, Voice of Russia WS	15490au	17625au	17655au	17665au
				21790ou			
0600	0630		S Africa, Channel Africa	15215af			
0600	0615		S Africa, Trans World Radio	11640af			
0600	0700		S Africa, World Beacon	6115af			
0600	0700		Sierra Leone, Sierra Leone BS	3316do			
0600	0700		Singapore R Corp of Singapore	6150do			
0600	0700	vl	Solomon Islands, SIBC	5020do	9545do		
0600	0700		Sri Lanka, Sri Lanka BC Corp	6130do			
0600	0700		Swaziland, Trans World Radio	4775af	6100af	9500af	
0600	0700		Uganda, Radio	5026do	7110do	7196do	
0600	0700		UK, BBC World Service	6055af	6175am	6190af	6195eu
			7160af	9410eu	9580va	9740as	11760me
			11765af	11940af	11940af	11955pa	12095eu
			15310as	15360as	15420af	15485eu	15565as
			15575af	17640af	17760as	17790as	17885af
			21660as				
0600	0700		USA, Armed Forces Network	4278am	6458am	12689am	
0600	0700		USA, KAIJ Dallas TX	5755vo			
0600	0700		USA, KTBN Salt Lake City UT	7510na			
0600	0700		USA, KWHR Naalehu HI	11565pa	17780as		
0600	0630		USA, Voice of America	5970af	6035af	6080af	7170va
				7195af	9680af	11805af	11965me
				11995af	12080af	13670af	15205va
0600	0615		USA, WBCQ Monticello ME	7415na			
0600	0615		USA, WBCQ Monticello ME	7415na			
0600	0700		USA, WEWN Birmingham AL	5825va			
0600	0700	twhfa	USA, WGTG McCaysville GA	5085va	6890am		
0600	0700		USA, WHRA Greenbush ME	11565af			
0600	0700		USA, WHRI Noblesville IN	5745na	7315sa		
0600	0700		USA, WJCR Upton KY	7490va	13594as		
0600	0700	twhfa	USA, WRMI Miami FL	7385na			
0600	0700		USA, WRNO New Orleans LA	7395na			
0600	0700		USA, WSHB Cypress Crk SC	13650af			
0600	0700		USA, WTJC Newport NC	9370na			
0600	0700		USA, WWCR Nashville TN	2390na	3210na	5070na	5935no
0600	0700		USA, WYFR Okeechobee FL	5985na	7355eu		
0600	0700	vl	Vanuatu, Radio	3945do	4960do	7260do	
0600	0700		Yemen, Rep of Yemen Radio	9779me			
0600	0700		Zambia, Christian Voice	9865do			
0600	0700	vl	Zambia, National BC Corp	6165do	6265do		
0600	0700	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
0605	0610		Croatia, Croatian Radio	9470au	11870am		
0610	0620	mtwhf	Greece, Voice of	7475va	9375va	9420va	15630va
0615	0630	a	S Africa, Trans World Radio	11640af			
0615	0700as		USA, WBCQ Monticello ME	7415na			
0630	0645		Finland, YLE R Finland	15250va	21670va		
0630	0700	th	Georgia, Georgian Radio	6080eu			
0630	0700		Kenya, Kenya BC Corp	7125do	7150do	7210do	
0630	0700	mtwhfa	UK, BBC World Service	6175am			
0630	0700		USA, Voice of America	7170va	9680af	11805af	11965me
				15205va			
0630	0700as		USA, Voice of America	5970af	6035af	6080af	7195af
				11995af	12080af	13670af	
0630	0645		Vatican City, Vatican Radio	11625af	13765af	15570af	
0630	0645	mtwhf	Vatican City, Vatican Radio	4005eu	5880eu	7250eu	9645eu
				11740eu	15595eu		
0641	0656		Romania, R Romania International	9570eu	11885na	11940na	15250eu
				15335na			
0645	0700		Germany, Deutsche Welle	6140eu			
0645	0655as		Germany, Trans World Radio	6045eu			
0645	0655as		Monaco, Trans World Radio	9870eu			
0655	0700		Germany, Trans World Radio	6045eu			
0655	0700		Monaco, Trans World Radio	9870eu			

Selected Programs

Sundays

0600 Japan, NHK/Radio: News.
0600 University Network via WWCR #2: Pastoral Nugget. Dr. Scot explains scripture.
0600 USA, WWCR #1 Nashville TN: Music and Dancing. Miguel Dabul's program of music and inspiration originates from Norfolk, Virginia.
0600 USA, WWCR #3 Nashville TN: Prophecy Flash. William Dankenbring preaches about the second coming.
0610 Japan, NHK/Radio: The Weekend Square.
0630 USA, WWCR #1 Nashville TN: The Old Record Shop. Ken Berryhill with thirty minutes of selections of music from the days of the 78 rpm record. Recommended.
0630 USA, WWCR #3 Nashville TN: World of Radio. See S 0230.

Monday-Friday

0600 Canada, RCI Montreal: News. See M 0400.
0600 Japan, NHK/Radio: News.
0600 University Network via WWCR #2: Pastoral Nugget. See S 0600.
0600 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
0600 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
0605 USA, WWCR #1 Nashville TN: Uncertain Glory. See M 0530.
0605 USA, WWCR #3 Nashville TN: Freedom Calls. Bo Gritz hosts this talk radio program.
0610 Canada, RCI Montreal: African Eyes. See M 0410.
0615 Japan, NHK/Radio: Asian Top News.

Mondays

0625 Japan, NHK/Radio: Music Journey Around Japan.
0635 USA, WWCR #1 Nashville TN: Ken's Country Classics. Key Berryhill with country music from a bygone era.

Tuesdays

0625 Japan, NHK/Radio: Let's Try Japanese.
0635 USA, WWCR #1 Nashville TN: Natural Health Clinic. Terrance Sullivan of Oklahoma offers natural supplement products for the body.

Wednesdays

0625 Japan, NHK/Radio: Unforgettable Japanese Masterpieces.
0635 USA, WWCR #1 Nashville TN: Natural Health Clinic. See T 0635.

Thursdays

0625 Japan, NHK/Radio: Brush Up Your Japanese.
0635 USA, WWCR #1 Nashville TN: Natural Health Clinic. See T 0635.

Fridays

0625 Japan, NHK/Radio: Music Beat.
0635 USA, WWCR #1 Nashville TN: Natural Health Clinic. See T 0635.

Saturdays

0600 Japan, NHK/Radio: News.
0600 University Network via WWCR #2: Pastoral Nugget. See S 0600.
0600 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
0600 USA, WWCR #3 Nashville TN: Steps to Christ. Hector Perez.
0605 USA, WWCR #1 Nashville TN: Rock the Universe. Rich Adcock's selections of rock recordings includes some rare treats.
0610 Japan, NHK/Radio: Roundup Asia.
0630 USA, WWCR #3 Nashville TN: Words of Hope. See S 1100.
0645 USA, WWCR #3 Nashville TN: Wonderful Words of Life. The international ministry of the Salvation Army.

FREQUENCIES

0700	0800		Anguilla, Caribbean Beacon	6090am			
0700	0800	vl	Australia, ABC/Alice Springs	4835do			
0700	0800	vl	Australia, ABC/Katherine	5025do			
0700	0800	vl	Australia, ABC/Tennant Creek	4910do			
0700	0800		Australia, Radio	9660pa	12080va	15240pa	15415as
				17580pa	17750as	21725pa	
0700	0730		Belgium, Radio Vlaanderen Intl	5985am			
0700	0800	vl	Botswana, Radio	7255do	9600do	7255do	
0700	0800	vl	Cameroon, RTV/Yoounde	4850do			
0700	0800		Canada, CFRX Toronto ON	6070do			
0700	0800		Canada, CFVP Calgary AB	6030do			
0700	0800		Canada, CHNX Halifax NS	6130do			
0700	0800		Canada, CKZU Vancouver BC	6160do			
0700	0800		Costa Rica, R for Peace Intl	6970va	15049va		
0700	0800		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
0700	0727		Czech Rep, Radio Prague Intl	9880eu	11600eu		
0700	0800		Ecuador, HCJB	11755pa	15160eu	21455usb	21455va
0700	0800	mtwhf	Eqt Guinea, Radio Africa	15185af			
0700	0800	as/vl	Eqt. Guinea, Radio East Africa	15185af			
0700	0800		Germany, Deutsche Welle	6140eu			
0700	0800		Germany, Trans World Radio	6045eu			
0700	0800		Germany, Voice of Hope	5975eu			
0700	0800	vl	Ghana, Ghana BC Corp	3366do	4915do		
0700	0800	vl	Ghana, Ghana BC Corp	3366do	4915do		
0700	0800		Guyana, Voice of	3289do	5949do		
0700	0800	vl/as	Italy, IRRS	7120va			
0700	0800		Kenya, Kenya BC Corp	7125do	7150do	7210do	
0700	0800		Kiribati, Radio	9809do	9825do		
0700	0800		Kuwait, Radio	15110as	15230as		
0700	0800	vl	Lesotho, Radio	4800do			
0700	0800	vl	Liberia, ELWA	4760do			
0700	0800	vl	Liberia, R Liberia International	5100do			
0700	0800	vl	Malawi, Malawi BC Corp	3380do	5995do		
0700	0800		Malaysia, Radio	7295do			
0700	0800		Malaysia, RTM Sarawak	7160do			
0700	0800		Malaysia, Voice of	6275as	9750as	15295as	
0700	0800		Monaco, Trans World Radio	9870eu			
0700	0800		Myanmar, Radio	9730do			
0700	0800		Namibia, Namibian BC Corp	3270af	3289af		
0700	0800		New Zealand, ZLXA	3935do	7290do		
0700	0800	vl	Nigeria, Radio/Enugu	6025do			
0700	0800	vl	Nigeria, Radio/Ibadan	6050do			
0700	0800	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
0700	0800	vl	Nigeria, Radio/Lagos	3326do	4990do		
0700	0800		Palau, KHBN/Voice of Hope	9965as	9985as	15725as	
0700	0730	vl	Papua New Guinea, N8C	4890do	9675do		
0700	0756		Romania, R Romania International	15580af	17735af		
0700	0800		Russia, Voice of Russia WS	15490au	17495au	17625au	17655au
				21790au			
0700	0800		Sierra Leone, Sierro Leone BS	3316do			
0700	0800		Singapore R Corp of Singapore	6150do			
0700	0730		Slovakia, R Slovakia International	9440au	15460au	17550au	
0700	0800	vl	Solomon Islands, SIBC	5020do	9545do		
0700	0800		Sri Lanka, Sri Lanka BC Corp	6130do			
0700	0720		Swaziland, Trans World Radio	4775af	6100af	9500af	
0700	0800		Taiwan, R Taiwan International	5950na			
0700	0800		Uganda, Radio	5026do	7110do	7196do	
0700	0730	as	UK, BBC World Service	17885af			
0700	0730	mtwhfo	UK, BBC World Service	6190af			
0700	0800		UK, BBC World Service	6190af	9580va	9740as	11760me
				11765af	11940af	11955pa	12095eu
				15310as	15360as	15400af	15485eu
				15565eu	17640eu	17760as	17790as
				17830af	21660as		
0700	0800		USA, Armed Forces Network	4278am	6458am	12689am	
0700	0800		USA, KAIJ Dallas TX	5755va			
0700	0800		USA, KTBN Salt Lake City UT	7510na			
0700	0800		USA, KWHR Naalehu HI	11565pa	17780as		
0700	0730	a	USA, Voice of America	6873va			
0700	0800		USA, WBCQ Monticello ME	7415na			
0700	0800		USA, WEWN Birmingham AL	5825va			
0700	0800		USA, WHRA Greenbush ME	11565af			
0700	0800		USA, WHRI Noblesville IN	5745na	7315sa		
0700	0800		USA, WJCR Upton KY	7490va	13594as		
0700	0800		USA, WRNO New Orleans LA	7395na			
0700	0800		USA, WSHB Cypress Crk SC	13650af			
0700	0800		USA, WTJC Newport NC	9370no			
0700	0800		USA, WWCR Nashville TN	2390na	3210na	5070na	5935na
0700	0745		USA, WYFR Okeechobee FL	7355eu	13695va	15170eu	
0700	0800	vl	Vanuatu, Radio	3945do	4960do	7260do	
0700	0800		Zambia, Christian Voice	9865do			
0700	0800	vl	Zambia, National BC Corp	6165do	6265do		
0700	0800	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
0705	0710		Croatia, Croatian Radio	13820au			
0705	0800	as	New Zealand, R New Zealand Int	11720va			
0706	0800		New Zealand, R New Zealand Int	11720va			
0730	0800		Austria, R Austria International	15410me	17870me		
0730	0800		Georgia, Georgian Radio	11910eu			
0730	0740	as	Guam, Trons World Radio	15200as			
0730	0800	vl/mtwhfo	Papua New Guinea, NBC	4890do			
0730	0800		Switzerland, Swiss R International	15545af	17685af	21750af	
0730	0800	as	UK, BBC World Service	15575as	17885af		
0740	0800		Guam, Trans World Radio	15200as			
0750	0800	as	Greece, Voice of	9775au			

0800	0900		Anguilla, Caribbean Beacon	6090am			
0800	0830	vl	Australia, ABC/Alice Springs	4835do			
0800	0830	vl	Australia, ABC/Katherine	5025do			
0800	0830	vl	Australia, ABC/Tennant Creek	4910do			
0800	0900		Australia, Radio	5995pa	9710pa	12080va	13605pa
				15240va	15415as	17750as	21725pa
0800	0900	vl	Botswana, Radio	7255do	9600do	7255do	
0800	0900	vl	Cameroon, RTV/Yoounde	4850do			
0800	0900		Canada, CFRX Toronto ON	6070do			
0800	0900		Canada, CFVP Calgary AB	6030do			
0800	0900		Canada, CHNX Halifax NS	6130do			
0800	0900		Canada, CKZU Vancouver BC	6160do			
0800	0900		Costa Rica, R for Peace Intl	6970va	15049va		
0800	0900		Costa Rica, University Network	5030am	6150va	7375na	9725no
				11870va	13749af		
0800	0900		Ecuador, HCJB	11755pa	15150eu	21455usb	
0800	0900	mtwhf	Eqt Guinea, Radio Africa	15185af			
0800	0900	os/vl	Eqt. Guinea, Radio East Africa	15185af			
0800	0900	a	Finland, YLE/R Finland	9560eu			
0800	0900		Germany, Deutsche Welle	6140eu			
0800	0900		Germany, Overcomer Ministries	13810au			
0800	0820		Germany, Trans World Radio	6045eu			
0800	0900		Germany, Voice of Hope	5975eu			
0800	0900	vl	Ghana, Ghana BC Corp	3366do	4915do		
0800	0900	os	Guam, Trans World Radio	15200as	15330as		
0800	0900		Guyana, Voice of	3289do	5949do		
0800	0900		Indonesia, Voice of	9525va	11784va	15149va	
0800	0900	vl/as	Italy, IRRS	7120va			
0800	0900		Kenya, Kenya BC Corp	7125do	7150do	7210do	
0800	0900		Kiribati, Radio	9809do	9825do		
0800	0900	vl	Lesotho, Radio	4800do			
0800	0900	vl	Liberia, ELWA	4760do			
0800	0900	vl	Liberia, R Liberia International	5100do			
0800	0810	vl	Malawi, Malawi BC Corp	3380do	5995do		
0800	0900		Malaysia, Radio	7295do			
0800	0825		Malaysia, Voice of	6275as	9750as	15295as	
0800	0900	s	Malta, Voice of Mediterronean	11770eu			
0800	0820		Monaco, Trans World Radio	9870eu			
0800	0830		Myanmar, Radio	9730do			
0800	0900		Namibia, Namibian BC Corp	7165af	7215af		
0800	0900		New Zealand, R New Zealand Int	11720va			
0800	0900		New Zealand, ZLXA	3935do	7290do		
0800	0900	vl	Nigeria, Radio/Enugu	6025do			
0800	0900	vl	Nigeria, Radio/Ibadan	6050do			
0800	0900	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
0800	0900	vl	Nigeria, Radio/Lagos	3326do	4990do		
0800	0900		Palau, KHBN/Voice of Hope	9955as	9965as	9985as	15725as
0800	0900	vl	Papua New Guinea, N8C	4890do			
0800	0900		Russia, Voice of Russia WS	15490au	17495au	17625au	17665au
				21790au			
0800	0900	s	S Africa, Amateur Radio League	9750af	21560af		
0800	0900		Sierra Leone, Sierra Leone BS	3316do			
0800	0900		Singapore R Corp of Singapore	6150do			
0800	0900	vl	Solomon Islands, SIBC	5020do			
0800	0900		South Korea, R Korea Intl	9570au	13670eu		
0800	0900		Sri Lanka, Sri Lanka BC Corp	6130do			
0800	0900		Uganda, Radio	5026do	7110do	7196do	
0800	0900		UK, BBC World Service	6190af	9740as	11940af	11955pa
				12095eu	15360as	15400af	15485eu
				15565eu	17640eu	17760as	17830af
				21660as			
0800	0900	as	UK, BBC World Service	15310as	17885af	21830va	
0800	0900		USA, Armed Forces Network	4278am	6458am	12689am	
0800	0900		USA, KAIJ Dallas TX	5755va			
0800	0900		USA, KNLS Anchor Point AK	11765as			
0800	0900		USA, KTBN Salt Lake City UT	7510na			
0800	0900		USA, KWHR Naalehu HI	11565pa	17780as		
0800	0900		USA, Voice of America	11775as	13610as	15150as	
0800	0900		USA, WEWN Birmingham AL	5825va			
0800	0900		USA, WHRA Greenbush ME	11565af			
0800	0900		USA, WHRI Noblesville IN	5745na	7315sa		
0800	0900		USA, WJCR Upton KY	7490va	13594as		
0800	0900		USA, WRNO New Orleans LA	7395na			
0800	0900		USA, WSHB Cypress Crk SC	9845au	9860eu		
0800	0900		USA, WTJC Newport NC	9370no			
0800	0900		USA, WWCR Nashville TN	2390na	3210na	5070na	5935na
0800	0900	vl	Vanuatu, Radio	3945do	4960do	7260do	
0800	0900		Zambia, Christian Voice	9865do			
0800	0900	vl	Zambia, National BC Corp	6165do	6265do		
0800	0900	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
0804	0820		Pakistan, Radio	17834eu	21465eu		
0805	0810		Croatia, Croatian Radio	13820au			
0815	0900	f	Seychelles, FEBA Radio	15460as			
0820	0850	s	Germany, Trans World Radio	6045eu			
0820	0850	s	Monaco, Trans World Radio	9870eu			
0830	0900	vl	Australia, ABC/Alice Springs	2310do			
0830	0900	vl	Australia, ABC/Katherine	2485do			
0830	0900	vl	Australia, ABC/Tennant Creek	2325do			
0830	0900	a	Austria, R Austria International	21650as	21765au		
0830	0900		Georgia, Georgian Radio	11910me			
0830	0900		Switzerland, Swiss R International	9885au	13685au		
0840	0900	s	Armenia, Voice of	4810eu	15270eu		

FREQUENCIES

0900	1000		Anguilla, Caribbean Beacon	6090am			
0900	1000	vl	Australia, ABC/Alice Springs	2310da			
0900	1000	vl	Australia, ABC/Katherine	2485da			
0900	1000	vl	Australia, ABC/Tennant Creek	2325da			
0900	1000		Australia, Radio	13605pa	21820as		
0900	1000	as	Australia, Radio	11550va	11880va	17750va	
0900	1000	vl	Botswana, Radio	7255da	9600do	7255do	
0900	1000	vl	Cameroon, RTV/Yaounde	4850do			
0900	1000		Canada, CFRX Toronto ON	6070do			
0900	1000		Canada, CFVP Calgary AB	6030do			
0900	1000		Canada, CHNX Halifax NS	6130da			
0900	1000		Canada, CKZU Vancouver BC	6160do			
0900	0956		China China Radio International	11730pa	15210pa		
0900	1000		Costa Rica, R for Peace Intl	6970va	15049va		
0900	1000		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
0900	0929		Czech Rep, Radio Prague Intl	21745va			
0900	1000		Ecuador, HCJB	11775pa	21455usb		
0900	1000	mtwhf	Eqt Guinea, Radio Africa	15185af			
0900	1000	as/vl	Eqt. Guinea, Radio East Africa	15185af			
0900	0945		Germany, Deutsche Welle	6140eu	6160pa	9565af	15105as
				15210af	15410af	15470as	17770as
				17800af	21560as	21680as	21790af
0900	1000	s	Germany, Good News World R	13740au			
0900	1000	a	Germany, Good News World R	5985eu	5995eu		
0900	1000		Germany, Voice of Hope	5975eu			
0900	0915	vl	Ghana, Ghana BC Corp	3366do	4915do		
0900	0915		Guam, Trans World Radio	15200as	15330as		
0900	1000		Guyana, Voice of	3289do	5949do		
0900	1000	vl/as	Italy, IRRS	7120va			
0900	1000		Kenya, Kenya BC Corp	7125do	7150do	7210do	
0900	0930		Kiribati, Radio	9809do	9825do		
0900	1000	vl	Lesotho, Radio	4800do			
0900	1000	vl	Liberia, ELWA	4760do			
0900	1000	vl	Liberia, R Liberia International	6100do			
0900	1000		Malaysia, Radio	7295do			
0900	1000		Namibia, Namibian BC Corp	7165af	7215af		
0900	1000		New Zealand, R New Zealand Int	11720va			
0900	1000		New Zealand, ZLXA	3935do	7290do		
0900	1000	vl	Nigeria, Radio/Enugu	6025do			
0900	1000	vl	Nigeria, Radio/Ibadan	6050do			
0900	1000	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
0900	1000	vl	Nigeria, Radio/Lagos	3326do	4990do		
0900	1000		Palau, KHBN/Voice of Hope	9955as	9965as	9985as	15725as
0900	1000	vl	Papua New Guinea, NBC	4890do			
0900	1000		Sierra Leone, Sierra Leone BS	3316do			
0900	1000		Singapore R Corp of Singapore	6150do			
0900	1000	vl	Solomon Islands, SIBC	5020do			
0900	1000		Sri Lanka, Sri Lanka BC Corp	6130do			
0900	1000		Uganda, Radio	5026do	7110do	7196do	
0900	0930		UK, BBC World Service	6190af	6195va	9605as	9740as
				11760me	11765as	11940af	11945af
				11955pa	12095eu	15190as	15310as
				15360as	15400af	15485eu	15565eu
				15575as	17640eu	17760as	17790as
				17830af	17885af	21470af	21660as
0900	0930	mtwhfa	UK, BBC World Service	11945as			
0900	1000		UK, Merlin Network One	6130eu			
0900	1000		USA, Armed Forces Network	4278am	6458am	12689am	
0900	1000		USA, KAIJ Dallas TX	5755va			
0900	1000		USA, KTBN Salt Lake City UT	7510na			
0900	1000		USA, KWHR Naalehu HI	11565pa	17780as		
0900	1000		USA, Voice of America	11775as	13610as	15150as	
0900	1000		USA, WEWN Birmingham AL	5825va			
0900	1000		USA, WHRA Greenbush ME	11565af			
0900	1000		USA, WHRI Noblesville IN	5745na	7315sa		
0900	1000		USA, WJCR Upton KY	7490va	13594as		
0900	1000		USA, WRNO New Orleans LA	7395na			
0900	1000		USA, WSHB Cypress Crk SC	9455sa	9860eu		
0900	1000		USA, WTJC Newport NC	9370na			
0900	1000		USA, WWCR Nashville TN	2390na	5070na	5935na	7435na
0900	1000	vl	Vanuatu, Radio	3945do	4960do	7260do	
0900	1000		Zambia, Christian Voice	9865do			
0900	1000	vl	Zambia, National BC Corp	6165do	6265do		
0900	1000	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
0915	1000	vl	Ghana, Ghana BC Corp	6130do	4915do		
0915	1000	vl/as	Ghana, Ghana BC Corp	4915do	4915do		
0915	0930		Guam, Trans World Radio	15330as			
0915	1000	mtwh-	USA, WRMI Miami FL	9955am			
0930	1000		Guam, Trans World Radio	9865as			
0930	1000		Lithuania, Radio Vilnius	9710eu			
0930	1000		Netherlands, Radio	9795as	12065as	13710as	
0930	1000		UK, BBC World Service	6190af	6195as	9740as	11760me
				11940af	11945as	11955pa	12095eu
				15190so	15310as	15400af	15485eu
				15565eu	15575as	17640eu	17760as
				17790as	17830af	17885af	21470af
				21660as			
0945	1000		Germany, Deutsche Welle	6140eu			

1000	1100		Anguilla, Caribbean Beacon	11775am			
1000	1100	vl	Australia, ABC/Alice Springs	2310do			
1000	1100	vl	Australia, ABC/Katherine	2485da			
1000	1100	vl	Australia, ABC/Tennant Creek	2325da			
1000	1100		Australia, Radio	11880va	13605so	17750as	21820as
1000	1100	as	Bhutan, Bhutan BC Service	6035da			
1000	1100	vl	Botswana, Radio	7255da	9600do	7255da	
1000	1100	vl	Cameroon, RTV/Yaounde	4850do			
1000	1100		Canada, CFRX Toronto ON	6070do			
1000	1100		Canada, CFVP Calgary AB	6030do			
1000	1100		Canada, CHNX Halifax NS	6130do			
1000	1100		Canada, CKZN St John's NF	6160do			
1000	1100		Canada, CKZU Vancouver BC	6160da			
1000	1056		China China Radio International	11730pa	15210pa		
1000	1100		Costa Rica, R for Peace Intl	6970va	15049va		
1000	1100		Costa Rica, University Network	5030am	6150va	7375na	9725no
				11870va	13749af		
1000	1100		Ecuador, HCJB	11755pa	21455usb		
1000	1100	mtwhf	Eqt Guinea, Radio Africa	15185af			
1000	1100	as/vl	Eqt. Guinea, Radio East Africa	15185af			
1000	1100		Germany, Deutsche Welle	6140eu			
1000	1100		Germany, Voice of Hope	5975eu			
1000	1100	vl	Ghana, Ghana BC Corp	6130do	4915do		
1000	1100	vl/as	Ghana, Ghana BC Corp	4915do	4915do		
1000	1100		Guam, Trans World Radio	9865as			
1000	1100		Guyana, Voice of	5949do			
1000	1100		India, All India Radio	11585as	13700au	15020as	17485au
				17840as	17895au		
1000	1100	vl/as	Italy, IRRS	7120vo			
1000	1100		Japan, Radio	9695as	15590as	21570pa	
1000	1100		Jordan, Radio	17680eu			
1000	1100		Kenya, Kenya BC Corp	7125do	7150do	7210do	
1000	1100	vl	Lesotho, Radio	4800do			
1000	1100	vl	Liberia, ELWA	4760do			
1000	1100	vl	Liberia, R Liberia International	6100do			
1000	1100		Malaysia, Radio	7295do			
1000	1100		N Marianas, KHBI Saipan	11840as			
1000	1100		Namibia, Namibian BC Corp	7165af	7215af		
1000	1030		Netherlands, Radio	9795as	12065as	13710as	
1000	1100		New Zealand, R New Zealand Int	11720va			
1000	1100		New Zealand, ZLXA	3935do			
1000	1100	vl	Nigeria, Radio/Enugu	6025do			
1000	1100	vl	Nigeria, Radio/Ibadan	6050do			
1000	1100	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
1000	1100	vl	Nigeria, Radio/Lagos	4990do	7285do		
1000	1100	vl	Nigeria, Voice of	7255af	15120af		
1000	1100		Palau, KHBN/Voice of Hope	9955as	9965as	9985as	15725as
1000	1100	vl	Papua New Guinea, NBC	4890do			
1000	1100		Sierra Leone, Sierra Leone BS	5980do			
1000	1100		Singapore R Corp of Singapore	6150do			
1000	1100	vl	Solomon Islands, SIBC	5020do			
1000	1030		Sri Lanka, Sri Lanka BC Corp	4940do			
1000	1030		Switzerland, Swiss R International	15315eu			
1000	1100		Uganda, Radio	5026do	7110do	7196do	
1000	1100		UK, BBC World Service	5965na	6190af	6195va	9740as
				11760me	11940af	11955pa	12095eu
				15310as	15360as	15485eu	15565eu
				15575as	17640eu	17760as	17790as
				17885af	21470af	21660as	
1000	1100	as	UK, BBC World Service	15190so	15400af	17830af	
1000	1030		UK, RTE Radio	11740au			
1000	1100		USA, Armed Forces Network	4278am	6458am	12689am	
1000	1100		USA, KAIJ Dallas TX	5755va			
1000	1100		USA, KTBN Salt Lake City UT	7510na			
1000	1100		USA, KWHR Naalehu HI	9930as	11565po		
1000	1100		USA, Voice of America	6160as	9645as	9760as	9770po
				15160as	15240as	15425as	
1000	1100		USA, WEWN Birmingham AL	7425na	15745eu		
1000	1100		USA, WHRI Noblesville IN	6040na	9495sa		
1000	1100		USA, WJCR Upton KY	7490va	13594as		
1000	1100	mtwhfa	USA, WRMI Miami FL	9955am			
1000	1100		USA, WRNO New Orleans LA	7395na			
1000	1100		USA, WSHB Cypress Crk SC	6095am	9455sa		
1000	1100		USA, WTJC Newport NC	9370na			
1000	1100		USA, WWCR Nashville TN	2390na	5070na	5935na	9475na
1000	1100		USA, WYFR Okeechobee FL	5950na			
1000	1100	vl	Vanuatu, Radio	3945do	4960do	7260do	
1000	1027		Vietnam, Voice of	9839as	12019as		
1000	1100		Zambia, Christian Voice	9865do			
1000	1100	vl	Zambia, National BC Corp	6165do	6265do		
1000	1100	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
1015	1030	mtwhf	Vatican City, Vatican Radio	5880eu	9645eu	11740eu	15595eu
				21850eu			
1030	1057		Czech Rep, Radio Prague Intl	9880eu	11615eu		
1030	1045	mtwhf	Ethiopia, Radio	5990do	7110do	9704do	
1030	1100		Guam, Adventist World Radio	11795as			
1030	1100		Israel, Kol Israel	15650va	17535va		
1030	1100		Malaysia, RTM Sarawak	7160do			
1030	1100		Mongolia, Voice of	12085au			
1030	1100		Netherlands, Radio	6045eu	9795as	9860eu	12065as
				13710as			
1030	1100		South Korea, R Korea Intl	11715na			
1030	1100		Sri Lanka, Sri Lanka BC Corp	4940do	11835as	15120as	17850as
1030	1100		UAE, Radio Dubai	13675eu	15370eu	15395eu	21605eu

Frequencies

1100	1200		Anguilla, Caribbean Beacon	11775om			
1100	1200	vl	Australia, ABC/Alice Springs	2310do			
1100	1200	vl	Australia, ABC/Katherine	2485do			
1100	1200	vl	Australia, ABC/Tennant Creek	2325do			
1100	1200		Australia, Radio	5995pa	6020pa	9580va	13605po
				21820as			
1100	1200	vl	Botswana, Radio	7255do	9600do	7255do	
1100	1200		Bulgaria, Radio	15700eu	17500eu		
1100	1200	vl	Cameroon, RTV/Yaounde	4850do			
1100	1200		Canada, CBC Northern Service	9625do			
1100	1200		Canada, CFRX Toronto ON	6070do			
1100	1200		Canada, CFVP Calgary AB	6030do			
1100	1200		Canada, CHNX Halifax NS	6130do			
1100	1200		Canada, CKZN St John's NF	6160do			
1100	1200		Canada, CKZU Vancouver BC	6160do			
1100	1200	mtwhf	Canada, R Canada International	9640na	13650na	17765na	17820na
1100	1200		Costa Rica, R for Peace Intl	6970va	15049va		
1100	1200		Costa Rica, University Network	5030am	6150va	7375na	9725no
				11870va	13749af		
1100	1200		Ecuador, HCJB	12005am	15115am	21455usb	
1100	1200	mtwhf	Eqt Guinea, Radio Africa	15185af			
1100	1200	as/vl	Eqt Guinea, Radio East Africa	15185af			
1100	1145		Germany, Deutsche Welle	6140eu	11785af	15410af	17680af
				17860af			
1100	1200		Germany, Overcomer Ministries	5850eu			
1100	1200	vl	Ghana, Ghana BC Corp	6130do	4915do		
1100	1200	vl/as	Ghana, Ghana BC Corp	4915do	4915do		
1100	1200		Guyana, Voice of	5949do			
1100	1200		Iran, VOIRI	15385as	15430as	15585as	21470as
				21730as			
1100	1200	vl/as	Italy, IRRS	7120va			
1100	1200		Japan, Radio	6120na	9695as	15590as	
1100	1200		Jordan, Radio	17680eu			
1100	1120	fa	Kazakhston, Radio Almaty	11840eu			
1100	1200		Kenya, Kenya BC Corp	7125do	7150do	7210do	
1100	1200	vl	Lesotho, Radio	4800do			
1100	1200	vl	Liberia, ELWA	4760do			
1100	1200	vl	Liberia, R Liberia International	6100do			
1100	1200		Malaysia, Radio	7295do			
1100	1200		Malaysia, TRM Sarawak	7160do			
1100	1125		Moldova Radio Moldova Intl	11580am			
1100	1200		N Morianas, KHBI Saipan	11840as			
1100	1200		Namibia, Namibian BC Corp	7165af	7215af		
1100	1130		Netherlands, Radio	6045eu	9795as	9860eu	12065as
				13710as			
1100	1200		New Zealand, R New Zealand Int	11720va			
1100	1200		New Zealand, ZLXA	3935do			
1100	1200	vl	Nigeria, Radio/Enugu	6025do			
1100	1200	vl	Nigeria, Radio/Ibadan	6050do			
1100	1200	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
1100	1200	vl	Nigeria, Radio/Lagos	4990do	7285do		
1100	1104		Pakistan, Radio	7110do	17834eu	21465eu	
1100	1200		Palau, KHBN/Voice of Hope	9955as	9965as	9985as	13840as
1100	1200	vl	Papua New Guinea, NBC	4890do			
1100	1200		Sierra Leone, Sierra Leone BS	5980do			
1100	1200		Singapore, R Singapore Intl	6150as	9590os	skd0100	
1100	1130	vl	Solomon Islands, SIBC	5020do			
1100	1130		Sri Lanka, Sri Lanka BC Corp	4940do	11835as	15210as	17850as
1100	1200		Switzerland, Swiss R International	13735as	21770as		
1100	1200		Taiwan, Voice of Asia	7445as			
1100	1200		Uganda, Radio	5026do	7110do	7196do	
1100	1130	mtwhf	UK, BBC Caribbean Report	6195ca	15220ca		
1100	1130	as	UK, BBC World Service	5965na	6195as	9580as	9740as
				11760me	11955as	12095eu	15280as
				15220am	15310as	15400af	15485eu
				15565eu	15575as	17640as	17700as
				17790sa	17830af	17885af	21470af
1100	1130	os	UK, BBC World Service	6195na	15190sa	15220am	
1100	1200	mtwhfa	UK, BBC World Service	6190af	11940af		
1100	1200	a	UK, Virgin Radio/Merlin	21455me	21515af		
1100	1200		Ukraine, R Ukraine Internotional	21520au			
1100	1200		USA, Armee Forces Network	4278am	6458am	12689am	
1100	1200		USA, KAIJ Dallas TX	5755va			
1100	1200		USA, KTBN Salt Lake City UT	7510na			
1100	1200		USA, KWHR Naalehu HI	9930as	11565as		
1100	1130	mtwhf	USA, Voice of Americo	13675af	15550af	17650af	17780af
				21600af			
1100	1130	mtwhf	USA, Voice of America	13675af	15550af	17650af	17780af
				21600af			
1100	1200		USA, Voice of Americo	6160as	9645as	9760as	9770pa
				15160as	15240as	15425as	
1100	1200		USA, WEWN Birmingham AL	7425na	15745eu		
1100	1200		USA, WHRI Noblesville IN	6040no	9495sa		
1100	1200		USA, WJCR Upton KY	7490va	13594as		
1100	1130	mtwhfa	USA, WRMI Miami FL	9955om			
1100	1200		USA, WRNO New Orleans LA	7395na			
1100	1200		USA, WSH8 Cypress Crk SC	6095am	11660am		
1100	1200		USA, WTJC Newport NC	9370na			
1100	1200		USA, WWCR Nashville TN	5070na	5935na	7435na	15685na
1100	1200		USA, WYFR Okeechobee FL	5850na	5950na		
1100	1200	vl/s	Vanuatu, Radio	3945do	4960do	7260da	
1100	1127		Vietnam, Voice of	7285as			
1100	1200		Zambia, Christian Voice	9865do			
1100	1200	vl	Zambia, Notional BC Corp	6165do	6265do		
1100	1200	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
1110	1120		Greece, Voice of	9420va	15630va		
1115	1145		Nepal, Radio	5005as	7165as		
1120	1140	w	Kzaakhstan, Radio Almaty	9620eu	11840eu		
1130	1200		Belgium, Radio Vlaanderen Intl	9865as	9925eu		
1130	1157		Czech Rep, Radio Prague Intl	6055eu	21745os		
1130	1145	vl	Libya, Voice of Africa	11815af	15415af	15435va	
1130	1200		Netherlands, Radio	6045eu	9860eu		
1130	1200		Sri Lanka, Sri Lanka BC Corp	4940do			
1130	1200		Sweden, Radio	18960na			
1130	1200		USA, WRMI Miami FL	9955am			
1130	1200	f	Vatican City, Vatican Radio	15595va	17515va		
1140	1200	t	Kzaakhstan, Radio Almaty	9620eu	11840eu		
1145	1200		Germany, Deutsche Welle	6140eu			

Selected Programs

Sundays

1100 Japan, NHK/Radio: News.
1100 University Network via WWCR #2: Communion. Dr. Scott at the "Table of the Lord."
1100 University Network via WWCR #2: Communion. See S 1100.
1100 USA, WWCR #1 Nashville TN: Words of Hope. Eugene Brown preaches from McFerrin Missionary Baptist Church of Nashville, TN.
1100 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1105 USA, WWCR #3 Nashville TN: Inspirations Across America (hour 1). Bert Johnson plays contemporary Christian music.
1110 Japan, NHK/Radio: Hello from Tokyo.
1115 USA, WWCR #1 Nashville TN: Love Light. Kenneth Peterson.
1129 Japan, NHK/Radio: What's New?
1130 USA, WWCR #1 Noshville TN: Staff of Life. Irene Armstrong evangelizes from Zion, Illinois.
1145 USA, WWCR #1 Nashville TN: Sonshine. Lloyd Meyer.

Monday-Friday

1100 Canada, RCI Montreal: World Report. See S 1300.
1100 Japan, NHK/Radio: News.
1100 University Network via WWCR #2: Communion. See S 1100.
1100 USA, WWCR #3 Nashville TN: Newswatch Magazine. David Smith compares world news to bible prophecy and is anti-United Nation.
1113 Canada, RCI Montreal: Ontario Morning. The third hour of CBC Radio One's wake-up program. Hosted by Joe Cote with newreader Ted Fairhurst, and sportscaster Bruce Dowbiggin.
1115 Japan, NHK/Radio: Asian Top News.

Mondays

1100 USA, WWCR #1 Nashville TN: Voice of the Past. Franklin Lewis.
1115 USA, WWCR #1 Nashville TN: Phil Hensler Ministry. Phil Hensler.
1125 Japan, NHK/Radio: Music Journey Around Japan.
1130 USA, WWCR #1 Nashville TN: Grace and Truth. Reginald Mitchell.

Tuesdays

1100 USA, WWCR #1 Nashville TN: Afterglow. Don Johnson plays beautiful sacred music.
1125 Japan, NHK/Radio: Let's Try Japanese.
1130 USA, WWCR #1 Nashville TN: Fighting the Good Fight. Dan Comer.

Wednesdays

1100 USA, WWCR #1 Nashville TN: We Believe. Jim Walsh focuses on bringing Christians back together.
1125 Japan, NHK/Radio: Unforgettable Japanese Masterpieces.
1130 USA, WWCR #1 Nashville TN: Faith for Today. William Rowe of Pennsylvania with a bible-teaching program.

Thursdays

1100 USA, WWCR #1 Noshville TN: The Big Backyard. Thirty minutes of rock music from Australia.
1115 USA, WWCR #1 Nashville TN: Willingheart. Rick Booye of Trail Christian Fellowship in Medford, OR teaches the New Testament.
1125 Japan, NHK/Radio: Brush Up Your Japanese.

Fridays

1100 USA, WWCR #1 Nashville TN: Spiritual Awakening. James Bean with wisdom from the scriptures.
1125 Japan, NHK/Radio: Music Beat.
1130 USA, WWCR #1 Nashville TN: World Crusade. Kent Clark.
1145 USA, WWCR #1 Nashville TN: Walking with the Word. ReAnne Hyde.

Saturdays

1100 Japan, NHK/Radio: News.
1100 University Network via WWCR #2: Communion. See S 1100.
1100 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
1100 USA, WWCR #3 Nashville TN: Rutledge World Outreach. Rendall Rudledge.
1105 USA, WWCR #1 Nashville TN: Word of Wisdom. Howard Kirkwood evangelizes from Arkansas.
1110 Japan, NHK/Radio: Roundup Asia.
1110 USA, WWCR #1 Nashville TN: The View from Europe. Harvey Thomas presents the European point of view on current events.
1115 USA, WWCR #1 Nashville TN: Eca Watch. See S 2315.
1130 USA, WWCR #1 Nashville TN: World of Radio. See S 0230.

Frequencies

1200	1300		Anguilla, Caribbean Beacon	11775am			
1200	1300	vl	Australia, ABC/Alice Springs	2310do			
1200	1300	vl	Australia, ABC/Katherine	2485do			
1200	1300	vl	Australia, ABC/Tennant Creek	2325do			
1200	1300		Australia, Radio	5995pa	6020pa	9580va	11650pa
				21820os			
1200	1300	mtwhf	Bhutan, Bhutan BC Service	5030do			
1200	1300	vl	Botswana, Radio	7255do	9600do	7255do	
1200	1300		Brazil, Radio Nacional Bras	15445om			
1200	1300	vl	Cameroon, RTV/Yaounde	4850do			
1200	1300	vl	Canada, CBC Northern Service	9625do			
1200	1300		Canada, CFRX Toronto ON	6070do			
1200	1300		Canada, CFVP Calgary AB	6030do			
1200	1300		Canada, CHNX Halifax NS	6130do			
1200	1300		Canada, CKZN St John's NF	6160do			
1200	1300		Canada, CKZU Vancouver BC	6160do			
1200	1230		Canada, R Canada International	9640na	9660as	13650na	15195as
				17765na	17820na		
1200	1256		China China Radio International	9715as	9760po	11675pa	11980as
				15415os			
1200	1300		Costa Rica, R for Peace Intl	6970va	15049va		
1200	1300		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
1200	1300		Ecuador, HCJB	12005am	15115am	21455usb	
1200	1300	as/vl	Eqt. Guinea, Radio East Africa	15185af			
1200	1300		France, R France International	11670eu	15155eu	15195af	15540af
1200	1300		Germany, Deutsche Welle	6140eu			
1200	1300		Germany, Overcomer Ministries	5850eu			
1200	1300	vl	Ghana, Ghana BC Corp	4915do	6130do		
1200	1300		Guyana, Voice of	5949do			
1200	1230		Iran, VOIRI	15385as	15430as	15585os	21470os
				21730os			
1200	1300	vl/os	Italy, IRRS	7120va			
1200	1300		Jordan, Radio	11690eu			
1200	1300		Kenya, Kenya BC Corp	7125do	7150do	7210do	
1200	1300	vl	Lesotho, Radio	4800do			
1200	1300	vl	Liberia, ELWA	4760do			
1200	1300	vl	Liberia, R Liberia International	6100do			
1200	1300		Malaysia, Radio	7295do			
1200	1300		N Marianos, KHBI Saipan	11550as			
1200	1300		Namibia, Namibian BC Corp	7165af	7215af		
1200	1230		Netherlands, Radio	6045eu	9860eu		
1200	1205		New Zealand, R New Zealand Int	11720va			
1200	1300	occsnal	New Zealand, R New Zealand Int	6100va			
1200	1300		New Zealand, ZLXA	3935do			
1200	1300	vl	Nigeria, Radio/Enugu	6025do			
1200	1300	vl	Nigeria, Radio/Ibadan	6050do			
1200	1300	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
1200	1300	vl	Nigeria, Radio/Lagos	4990do	7285do		
1200	1256		North Korea, R Pyongyang	3560va	9640va	9850va	9975vc
				11335va	13650va		
1200	1300		Palau, KHBN/Voice of Hope	9955as	9965as	9985as	13840as
1200	1300	vl/mtwhfa	Papua New Guinea, NBC	4890do	9675do		
1200	1255		Poland, Radio Polonia	6095eu	7270eu	9525eu	11820eu
1200	1300		Sierra Leone, Sierra Leone BS	5980do			
1200	1300		Singapore, R Singapore Intl	6150as	9590as	skd0100	
1200	1300	vl	Solomon Islands, SIBC	5020do			
1200	1230		Sri Lanka, Sri Lanka BC Corp	4940do			
1200	1230		Switzerland, Swiss R International	15315eu			
1200	1300		Taiwan, R Taiwan International	7130as	9610au	skd0200	
1200	1300		Uganda, Radio	5026do	7110do	7196do	
1200	1220	as	UK, BBC World Service	6195na	15220am		
1200	1300		UK, BBC World Service	5965na	6190af	6195os	9515na
				9580as	9740as	11760me	11940af
				11955as	12095eu	15280as	15310as
				15485eu	15565eu	15575me	17640eu
				17700as	17830af	17885af	21470af
1200	1300	a	UK, Virgin Radio/Merlin	21455me	21515af		
1200	1300		USA, Armed Forces Network	4278am	6458am	12689am	
1200	1300		USA, KAIJ Dallas TX	13815va			
1200	1300		USA, KTBN Salt Lake City UT	7510na			
1200	1300		USA, KWHR Naalehu HI	9930as	11565pa		
1200	1300		USA, Voice of America	6160os	9645as	9760os	15160as
				15240as	15425as		
1200	1300		USA, WEWN Birmingham AL	7425na	15745eu		
1200	1300	mtwhf	USA, WGTG McCaysville GA	9400va	12172am		
1200	1300		USA, WHRI Noblesville IN	6040na	9495sa		
1200	1300		USA, WJCR Upton KY	7490va	13594as		
1200	1300		USA, WRMI Miami FL	9955am			
1200	1300		USA, WRNO New Orleans LA	7395na			
1200	1300		USA, WSH8 Cypress Crk SC	6095am	11660am		
1200	1300		USA, WTJC Newport NC	9370na			
1200	1300		USA, WWCR Nashville TN	5070na	7435na	13845na	15685na
1200	1245		USA, WYFR Okeechobee FL	5850na	5950na	17750na	
1200	1230		Uzbekistan, Radio Toshkent	7285as	9715as	15295as	17775as
1200	1300	vl/s	Vanuatu, Radio	3945do	4960do	7260do	
1200	1300		Zambia, Christian Voice	9865do			
1200	1300	vl	Zambia, National BC Corp	6165do	6265do		
1200	1300	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
1204	1220	mtwhf	UK, BBC Caribbean Report	6195ca	15220ca		
1206	1300	occsnal	New Zealand, R New Zealand Int	6100va			
1215	1300		Egypt, Radio Cairo	17595as			
1220	1300	mtwhf	UK, BBC World Service	15220am			
1230	1300		Austria, R Austria International	6155eu	13730va		
1230	1300		Bangladesh, Bangla Betar	7184as	9558as		
1230	1259		Canada, R Canada International	9640na	13650na	17765na	17820na
1230	1300		Guam, Adventist World Radio	15330va			
1230	1300		Italy, Adventist World Radio	9610eu			
1230	1300		Sri Lanka, Sri Lanka BC Corp	4940do	6005as	6075as	9735as
				15425as			
1230	1300		Sweden, Radio	17505as	18960na	21810os	
1230	1300		Thailand, Radio	9655as	9885as	11905as	
1230	1300		Turkey, Voice of	17830as	21540eu		
1230	1300	a	UK, Wales Radio Intl/Merlin	17650au			
1230	1257		Vietnam, Voice of	9839as	12019as		
1245	1300	a	Seychelles, FEBA Radio	15535me			

Selected Programs

Sundays

1200 Canada, RCI Montreal (as): RCI News. News, weather, and sports from Radio Canada International.
1200 Canada, RCI Montreal: CBC Radio News. See S 0200.
1200 USA, WWCR #1 Nashville TN: Voice of Hope. Oliver Fenison.
1200 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1205 Canada, RCI Montreal: Quirks and Quarks. Bob McDonald with a what's new and what's next in science.
1205 USA, WWCR #3 Nashville TN: Inspirations Across Amer. (hour 2).
1207 Canada, RCI Montreal (as): The Arts in Canada. David Blair takes a look at Canadian cultural events taking place across the country and around the world.
1230 USA, WWCR #1 Nashville TN: Words of Hope. See S 1100.

Monday-Friday

1200 Canada, RCI Montreal (as): RCI News. See S 1200.
1200 Canada, RCI Montreal: CBC Radio News. See S 0200.
1200 USA, WWCR #3 Nashville TN: The Overcomer Broadcast (live). Brother R. G. Stair preaches about the last days.
1211 Canada, RCI Montreal (as): Spectrum. Magazine program of current affairs, features, and a business report presented by Jim Craig.
1213 Canada, RCI Montreal: Ontario Morning. See M 1113.

Mondays

1200 USA, WWCR #1 Nashville TN: New Harvest Int'l. Dennis Deruz.
1215 USA, WWCR #1 Nashville TN: Cross Talk. Lenny Meyer.
1230 USA, WWCR #1 Nashville TN: Shower of Power (1/3/5). Marty Drake.
1230 USA, WWCR #1 Nashville TN: Victory Baptist Church (2/4). David Robinson preaches from Hildebrand, NC.
1245 USA, WWCR #1 Nashville TN: Walking Through the Land of Promises. Bobbie Lively evangelizes from Tennessee.

Tuesdays

1200 USA, WWCR #1 Nashville TN: The King is Coming. Steve Johnson evangelizes from the Faith Covenant Community Church of America in Florida.
1215 USA, WWCR #1 Nashville TN: One Nation Under God. EJ Rodriguez.
1230 USA, WWCR #1 Nashville TN: World of Radio. See S 0230.

Wednesdays

1200 University Network via WWCR #2: New Testament Teaching. Dr. Scott examines a book of scripture.
1200 USA, WWCR #1 Nashville TN: Faith and Truth. Ken Aegilligan.
1215 USA, WWCR #1 Nashville TN: Faith Revival Ministries. Randolph Scott.
1230 USA, WWCR #1 Nashville TN: The Chapel Hour. Otis Tillman evangelizes from Buffalo, New York.

Thursdays

1200 University Network via WWCR #2: New Testament Teaching.
1200 USA, WWCR #1 Nashville TN: Abounding Grace. Gary Jones of the Charismatic Teaching Center near Orlando, Florida.
1215 USA, WWCR #1 Nashville TN: Roberta Reads the Word. Roberta Lightfoot with 15 minutes of scripture reading.
1230 USA, WWCR #1 Nashville TN: Communications World ABC.

Fridays

1200 University Network via WWCR #2: New Testament Teaching.
1200 USA, WWCR #1 Nashville TN: Faith for Today. See W 1130.
1230 USA, WWCR #1 Nashville TN: Battle Cry Sounding. Deborah Green evangelizes from El Paso, Texas.

Saturdays

1200 Canada, RCI Montreal (as): RCI News. See S 1200.
1200 Canada, RCI Montreal: CBC Radio News. See S 0200.
1200 University Network via WWCR #2: New Testament Teaching.
1200 USA, WWCR #1 Nashville TN: Bible Prophecy for Today. Tom Benevetti analyzes the news and its application to Bible prophecy.
1200 USA, WWCR #3 Nashville TN: Rock the Universe. See A 0605.
1206 Canada, RCI Montreal (as): Earth Watch. The magazine on environment, science and ecology matters.
1211 Canada, RCI Montreal: The House. A weekly program that takes you behind the scenes in the world of Canadian politics.
1215 USA, WWCR #1 Nashville TN: New Horizons. See S 2315.
1230 USA, WWCR #1 Nashville TN: Battle Cry Sounding. See F 1230.

Frequencies

1300	1400		Anguilla, Caribbean Beacon	11775am			
1300	1400	vl	Australia, ABC/Alice Springs	2310do			
1300	1400	vl	Australia, ABC/Katherine	2485do			
1300	1400	vl	Australia, ABC/Tennant Creek	2325da			
1300	1400		Australia, Radio	5995pa	6020pa	9580va	11650pa
				21820as			
1300	1400	vl	Botswana, Radio	7255do	9600do	7255do	
1300	1320		Brazil, Radio Nacional Bras	15445am			
1300	1400	vl	Cameroon, RTV/Yaounde	4850do			
1300	1400	vl	Canada, CBC Northern Service	9625do			
1300	1400		Canada, CFRX Toronto ON	6070do			
1300	1400		Canada, CFVP Calgary AB	6030do			
1300	1400		Canada, CHNX Halifax NS	6130do			
1300	1400		Canada, CKZN St John's NF	6160do			
1300	1400		Canada, CKZU Vancouver BC	6160do			
1300	1400	smtwhf	Canada, R Canada International	13650na			
1300	1400	s	Canada, R Canada International	17800na			
1300	1400	mtwhf	Canada, R Canada International	9640na	11795na	17820na	
1300	1356		China China Radio International	7405na	9570na	11675pa	11900pa
				11980as	15180as		
1300	1400		Costa Rica, R for Peace Intl	15049va	25930va		
1300	1400		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
1300	1329		Czech Rep, Radio Prague Intl	13580eu	17485as		
1300	1400		Ecuador, HCJB	12005am	15115am	21455usb	
1300	1330		Egypt, Radio Cairo	17595as			
1300	1400	as/vl	Eqt. Guinea, Radio East Africa	15185af			
1300	1400		Germany, Deutsche Welle	6140eu			
1300	1400	s	Germany, Good News World R	15330as			
1300	1400		Germany, Overcomer Ministries	5850eu	13810eu		
1300	1330	s	Germany, Universal Life	9710eu	9955na		
1300	1400	vl	Ghana, Ghana BC Corp	4915do	6130do		
1300	1400		Guyana, Voice of	5949do			
1300	1400	vl/as	Italy, IRRS	7120va			
1300	1400		Jordan, Radio	11690eu			
1300	1330		Kenya, Kenya BC Corp	7125do	7150da	7210do	
1300	1400		Lebanon, Voice of Hope	11530va			
1300	1400	vl	Lesotho, Radio	4800do			
1300	1400	vl	Liberia, ELWA	4760da			
1300	1400	vl	Liberia, R Liberia International	6100do			
1300	1400		Malaysia, Radio	7295do			
1300	1400		N Marianas, KHBI Saipan	9940as			
1300	1400		Namibia, Namibian BC Corp	7165af	7215af		
1300	1400	occsnal	New Zealand, R New Zealand Int	6100va			
1300	1400		New Zealand, ZLXA	3935do			
1300	1400	vl	Nigeria, Radio/Enugu	6025do			
1300	1400	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
1300	1400	vl	Nigeria, Radio/Lagos	4990do	7285do		
1300	1400		Palau, KHBN/Voice of Hope	9955as	9965as	9985as	13840as
1300	1400	vl/mtwhfa	Papua New Guinea, NBC	4890do	9675do		
1300	1356		Romania, R Romania International	15250na	15390na	17770eu	17790na
1300	1400	as	S Africa, Channel Africa	11720af	17780af	21725af	
1300	1400		Sierra Leone, Sierra Leone BS	5980do			
1300	1400		Singapore, R Singapore Intl	6150as	9590as	skd0100	
1300	1400	vl	Solomon Islands, SIBC	5020do			
1300	1400		South Korea, R Korea Intl	9570as	9640am	13670as	
1300	1400		Sri Lanka, Sri Lanka BC Corp	4940do	6005as	6075as	9735as
				15425as			
1300	1330		Turkey, Voice of	17830as	21540eu		
1300	1400		Uganda, Radio	4976do	5026do		
1300	1400		UK, BBC World Service	5965na	5990as	6190af	6195va
				9515na	9740as	11760me	11865na
				11940af	12095eu	15220am	15310as
				15420af	15485eu	15565eu	15575me
				17640eu	17700as	17830af	17885af
				21470af			
1300	1400	a	UK, Global Kitchen/Merlin	9750eu	12005eu	15235eu	
1300	1400	a	UK, Virgin Radio/Merlin	21455me	21515af		
1300	1400		USA, Armed Forces Network	4278am	6458am	12689am	
1300	1400		USA, KAIJ Dallas TX	13815va			
1300	1400		USA, KJES Vado NM	11715na			
1300	1400		USA, KNLS Anchor Point AK	9615as			
1300	1400		USA, KTBN Salt Lake City UT	7510na			
1300	1400		USA, KWHR Naalehu HI	9930as	11565pa		
1300	1400		USA, Voice of America	6160as	9645as	9760as	15160as
				15425as			
1300	1400		USA, WEWN Birmingham AL	11875na	15745eu		
1300	1400	mtwhf	USA, WGTG McCaysville GA	9400va	12172am		
1300	1400		USA, WHRI Noblesville IN	6040na	15105sa		
1300	1400		USA, WJCR Upton KY	7490va	13594as		
1300	1315	smtwhf	USA, WRMI Miami FL	9955am			
1300	1400		USA, WRNO New Orleans LA	7395na			
1300	1400		USA, WSHB Cypress Crk SC	9430am	9455na		
1300	1400		USA, WTJC Newport NC	9370na			
1300	1400		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1300	1400		USA, WYFR Okeechobee FL	11550as	11830na	11970na	17750na
1300	1400		Zambia, Christian Voice	9865da			
1300	1400	vl	Zambia, National BC Corp	6165do	6265do		
1300	1400	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
1315	1400	s	USA, WRMI Miami FL	9955am			
1325	1400		Germany, Voice of Hope	15715as	17550af		
1330	1400		Australia, Radio	5995pa	6020pa	9475as	9580va
				11650pa	11660va	21820as	
1330	1400		Canada, R Canada International	9535as	17795as		
1330	1400		Guam, Adventist World Radio	11705as	11750as		
1330	1400		India, All India Radio	9710as	11620as	13710as	
1330	1400		Kenya, Kenya BC Corp	4885do	4915do	4935do	
1330	1400		Sweden, Radio	17505va	18960na	21810as	
1330	1400		UAE, Radio Dubai	13675eu	15395eu	21605eu	
1330	1400		Uzbekistan, Radio Tashkent	7285as	9715as	15295as	17775as
1330	1357		Vietnam, Voice of	7145eu	9730eu		
1345	1400		Vatican City, Vatican Radio	17515au	21620au		

Selected Programs

Sundays

1300 Canada, RCI Montreal: World Report. Ten minutes of CBC News.
1300 South Korea, R Korea Intl: News. See S 0200.
1300 University Network via WWCR #2: The Lost Tribes. Dr. Scott reads from "The Story of the Britons" and "Lost Books of the Bible."
1300 USA, WWCR #1 Nashville TN: Wings of Healing. Evelyn Wyatt directs this international broadcast from Los Angeles.
1300 USA, WWCR #3 Nashville TN: Answers for Life. Gospel music and a sermon by Pastor Hoover of Wichita, Kansas.
1310 South Korea, R Korea Intl: Echoes of Korean Music. A weekly selection of Korean music and the story behind it.
1311 Canada, RCI Montreal: This Morning (hour 1). David Enright and Avril Benoit co-host the Sunday Edition of this CBC magazine program (hour 1 of 3 hours).
1330 Canada, RCI Montreal (as): RCI News. See S 1200.
1330 USA, WWCR #1 Nashville TN: Wayne Avenue Church of God. J.C. Wilber preaches from Columbus, Ohio.
1335 Canada, RCI Montreal (as): The Maple Leaf Mailbag. A program devoted to listeners' letters. Host Marc Montgomery answers questions and reads comments on programs and impressions of Canada.
1338 South Korea, R Korea Intl: Multiwave Feedback. A listener-contact show with alternating DX Report and Technical Corner.

Monday-Friday

1300 Canada, RCI Montreal: CBC Radio News. See S 0200.
1300 South Korea, R Korea Intl: News. See S 0200.
1300 University Network via WWCR #2: The Lost Tribes. See S 1300.
1300 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
1300 USA, WWCR #3 Nashville TN: The Free American (live). Clay Douglas hosts the program that promotes America for Americans.
1305 USA, WWCR #1 Nashville TN: Pro Life Perspective. Anti-abortion message from the National Right-to-Life Committee.
1306 Canada, RCI Montreal: This Morning. David Enright and Avril Benoit co-host this CBC magazine program.
1310 South Korea, R Korea Intl: News Commentary. See S 0210.
1310 USA, WWCR #1 Nashville TN: Outdoor Tips. Communing with nature.
1312 USA, WWCR #1 Nashville TN: Travel Tips/Bog Frog. S. Carvell/Water Foundation.
1315 USA, WWCR #1 Nashville TN: Joni and Friends. Joni Eareckson Tada presents help and advice especially for the disabled.
1320 USA, WWCR #1 Nashville TN: Messianic Minutes. Ted Simon presents five minutes of scriptural interpretation for Jewish listeners.
1325 USA, WWCR #1 Nashville TN: Life Issues. John Wilke.
1330 Canada, RCI Montreal (as): RCI News. See S 1200.
1330 USA, WWCR #1 Nashville TN: Bible Pathway. Rick Hash with a five minute devotional commentary.
1335 USA, WWCR #1 Nashville TN: The Bright Spot Hour. Music and meditation by Harold Sightler of Greenville, South Carolina.
1339 Canada, RCI Montreal (as): Spectrum. See M 1211.

Mondays

1315 South Korea, R Korea Intl: Seoul Calling. A magazine program of features and short interviews with pop songs in between.
1340 South Korea, R Korea Intl: Economic News Briefs. Five minutes of financial news and import/export information.
1345 South Korea, R Korea Intl: Notes of Nostalgia. Discover the rich heritage of music that is distinctly Koreas and the people who created it.

Tuesdays

1315 South Korea, R Korea Intl: Seoul Calling. See M 1315.
1340 South Korea, R Korea Intl: Economic News Briefs. See M 1340.
1345 South Korea, R Korea Intl: Cultural Promenade. A look at Korean cultural, artistic traditions and highlights of activities in Korea.

Wednesdays

1317 South Korea, R Korea Intl: Weekly Economic Reports.
1323 South Korea, R Korea Intl: Economic Focus. A look at how people are using tools such as the Internet.

Thursdays

1315 South Korea, R Korea Intl: Seoul Calling. See M 1315.
1340 South Korea, R Korea Intl: Economic News Briefs. See M 1340.
1345 South Korea, R Korea Intl: Tales from Korea's Past.

Fridays

1310 South Korea, R Korea Intl: News Commentary. See S 0210.
1315 South Korea, R Korea Intl: Sites and Sounds. A look at Korea's tourist attractions and industry.
1330 South Korea, R Korea Intl: Let's Learn Korean! Korean language lessons for native English speakers.
1345 South Korea, R Korea Intl: Globalizing Korea. How ordinary Koreans from different walks of life deal and cope with their lives.

Saturdays

1300 South Korea, R Korea Intl: News. See S 0200.
1300 University Network via WWCR #2: The Lost Tribes. See S 1300.
1300 USA, WWCR #1 Nashville TN: The Jesus Time Network.
1300 USA, WWCR #3 Nashville TN: Lyon Gold and Silver Magnet.
1310 South Korea, R Korea Intl: News Commentary. See S 0210.
1318 South Korea, R Korea Intl: Report from Developing Countries.
1330 Canada, RCI Montreal (as): RCI News. See S 1200.
1330 USA, WWCR #1 Nashville TN: The Hour of Reasoning. Pete Mobley preaches to his congregation in Oakland, California.
1335 Canada, RCI Montreal (as): Venture Canada. David Blair presents this weekly magazine that promotes Canadian business ventures.
1340 South Korea, R Korea Intl: From Us to You. See S 0240.

Frequencies

1400	1500		Anguilla, Caribbean Beacon	11775am			
1400	1500	vl	Australia, ABC/Alice Springs	2310do			
1400	1500	vl	Australia, ABC/Katherine	2485do			
1400	1500	vl	Australia, ABC/Tennant Creek	2325do			
1400	1500		Australia, Radio	5995as	6080va	9475as	9580va
				11650pa	11660as		
1400	1500	vl	Botswana, Radio	7255do	9600do	7255do	
1400	1500	vl	Cameroon, RTV/Yaounde	4850do			
1400	1500	vl	Canada, CBC Northern Service	9625do			
1400	1500		Canada, CFRX Toronto ON	6070do			
1400	1500		Canada, CFVP Calgary AB	6030do			
1400	1500		Canada, CHNX Halifax NS	6130do			
1400	1500		Canada, CKZN St John's NF	6160do			
1400	1500		Canada, CKZU Vancouver BC	6160do			
1400	1500	s	Canada, R Canada International	13650na	17800na		
1400	1456		China China Radio International	7405na	9700as	11675as	11825as
				13685af	15110as	15125af	
1400	1500		Costa Rica, R for Peace Intl	15049va	25930usb		
1400	1500		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
1400	1500		Ecuador, HCJB	12005am	15115am	21455usb	
1400	1500	as/vl	Eqt. Guinea, Radio East Africa	15185af			
1400	1500		France, R France International	11610as	17620va	17680as	
1400	1500		Germany, Deutsche Welle	6140eu			
1400	1500		Germany, Overcomer Ministries	5850eu	13810eu		
1400	1500		Germany, RTE Radio	15625eu			
1400	1500		Germany, Voice of Hope	15715as	17550af		
1400	1500	vl	Ghana, Ghana BC Corp	4915do	6130do		
1400	1500		Guyana, Voice of	5949do			
1400	1500		India, All India Radio	9710as	11620as	13710as	
1400	1430		Israel, Kol Israel	15650va	17535va		
1400	1500	vl/as	Italy, IRRS	7120va			
1400	1500		Japan, Radio	9505na	9860as	11730as	11880me
1400	1500		Jordan, Radio	11690eu			
1400	1500		Kenya, Kenya BC Corp	4885do	4915do	4935do	
1400	1500		Lebanon, Voice of Hope	11530va			
1400	1500	vl	Lesotho, Radio	4800do			
1400	1500	vl	Liberia, ELWA	4760do			
1400	1500	vl	Liberia, R Liberia International	6100do			
1400	1500		Malaysia, Radio	7295do			
1400	1500		Malaysia, RTM Sarawak	7160do			
1400	1430		Mexico, R Mexico International	5985am	9705am		
1400	1500		Namibia, Namibian BC Corp	7165af	7215af		
1400	1500	occsnal	New Zealand, R New Zealand Int	6100va			
1400	1500		New Zealand, ZLXA	3935do			
1400	1500	vl	Nigeria, Radio/Enugu	6025do			
1400	1500	vl	Nigeria, Radio/Ibadan	6050do			
1400	1500	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
1400	1500	vl	Nigeria, Radio/Lagos	4990da	7285do		
1400	1500		Oman, Radio Sultanate of	15140va			
1400	1500		Palau, KHBN/Voice of Hope	9955as	9965as	9985as	13840as
1400	1500	vl/mtwhfa	Papua New Guinea, NBC	4890do	9675do		
1400	1500		Russia, Voice of Russia W.	11695as	12025as	12055me	
1400	1455	as	S Africa, Channel Africa	11720af	17780af	21725af	
1400	1500		Sierra Leone, Sierra Leone BS	5980do			
1400	1500		Singapore R Corp of Singapore	6150do			
1400	1430	vl	Solomon Islands, SIBC	5020do			
1400	1500		Sri Lanka, Sri Lanka BC Corp	4940do	6005as	6075as	9735as
				15425as			
1400	1500		Switzerland, Swiss R International	9575as	17670as		
1400	1500		Taiwan, R Taiwan International	15125as			
1400	1430		Thailand, Radio	9655as	9830as	11905as	
1400	1500		Uganda, Radio	4976do	5026do		
1400	1500		UK, BBC World Service	5990as	6190af	6195as	9515na
				9740as	11865na	11940af	12095eu
				15220na	15310as	15485eu	15565eu
				15575me	17640eu	17700as	17830af
				17840am	21470af	21660af	
1400	1500	a	UK, Global Kitchen/Merlin	9750eu	12005eu	15235eu	
1400	1500	a	UK, Virgin Radio/Merlin	21455me	21515af		
1400	1500		USA, Armed Forces Network	4278am	6458am	12689am	
1400	1500		USA, KAIJ Dallas TX	13815va			
1400	1500		USA, KJES Vado NM	11715na			
1400	1500		USA, KTBN Salt Lake City UT	7510na			
1400	1500		USA, KWHR Naalehu HI	9930as	11565as		
1400	1430	s	USA, Voice of America	18275va			
1400	1500		USA, Voice of America	6160as	7125as	9645as	9760as
				15160as	15255va	15425as	
1400	1500		USA, WEWN Birmingham AL	11875na	15745eu		
1400	1500		USA, WGTG McCaysville GA	12172am			
1400	1500	mtwhf	USA, WGTG McCaysville GA	9400va			
1400	1500		USA, WHRI Noblesville IN	6040na	15105sa		
1400	1500		USA, WJCR Upton KY	7490va	13594as		
1400	1500	s	USA, WRMI Miami FL	9955am			
1400	1500		USA, WRNO New Orleans LA	7395na			
1400	1500		USA, WTJC Newport NC	9370na			
1400	1500		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1400	1500		USA, WYFR Okeechobee FL	11550as	11830na	11970na	17750na
1400	1405		Vatican City, Vatican Radio	17515au	21620au		
1400	1500		Zambia, Christian Voice	9865do			
1400	1500	vl	Zambia, National BC Corp	6165do	6265do		
1400	1500	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
1415	1420		Nepal, Radio	5005as	7165as		
1430	1500		Guam, Adventist World Radio	9355as			
1430	1500		Guam, Trans World Radio	15330as			
1430	1500		Malaysia, RTM Kota Kinabalu	5980do			
1430	1500		Myanmar, Radio	5985do			
1430	1500		Netherlands, Radio	9890as	12065as	15590as	
1430	1500		Slovakia, Adventist World Radio	17525as			
1430	1500		Sweden, Radio	18960na			
1445	1500		USA, WINB Red Lion PA	13570am			

Selected Programs

Sundays

1400 Canada, RCI Montreal: CBC Radio News. See S 0200.
1400 France, R France Intl: News. See S 1200.
1400 Japan, NHK/Radio: News.
1400 University Network via WWCR #2: The Lost Tribes. See S 1300.
1400 USA, WWCR #3 Nashville TN: Harvestfire. Clarence McClendon preaches from the Church of the Harvest in Los Angeles.
1406 Canada, RCI Montreal: This Morning (hour 2). David Enright and Avril Benoit co-host the Sunday Edition of this CBC magazine program (hour 2 of 3 hours).
1410 Japan, NHK/Radio: Roundup Asia.
1419 France, R France Intl: Asia File. See S 1219.
1430 USA, WWCR #1 Nashville TN: A Temple of Jesus Christ. Cleveland Waters preaches from Philadelphia.
1434 France, R France Intl: Club 9516. See S 1234.

Monday-Friday

1400 France, R France Intl: News. See S 1200.
1400 Japan, NHK/Radio: News.
1400 University Network via WWCR #2: The Lost Tribes. See S 1300.
1400 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1402 USA, WWCR #1 Nashville TN: The Grace Hour (live). Carl Stevens of Baltimore answers listener questions about religion.
1405 USA, WWCR #3 Nashville TN: Freedom Calls (live). See M 0605.
1415 Japan, NHK/Radio: 44 Minutes.
1417 Japan, NHK/Radio: Interview Corner.
1425 France, R France Intl: Review of the French Newspapers. See M 1225.
1445 Japan, NHK/Radio: Asia in Focus.

Mondays

1431 France, R France Intl Sports Magazine. See M 1231.
1434 Japan, NHK/Radio: Close Up.
1436 France, R France Intl RFI Europe. See M 1236.
1445 France, R France Intl: Arts in France. See M 1245.
1450 France, R France Intl: Insight. See M 1250.

Tuesdays

1429 France, R France Intl: Books. See T 1229.
1434 France, R France Intl: Discovery. See T 1234.
1434 Japan, NHK/Radio: Close Up.
1442 France, R France Intl: Land of France. See T 1242.
1448 France, R France Intl: Echoes from Africa. See T 1248
1452 Japan, NHK/Radio: Tumbling Dice.

Wednesdays

1430 France, R France Int: News Headlines. See S 1232.
1431 France, R France Int: RFI Europe. See M 1236.
1436 Japan, NHK/Radio: Close Up.
1439 France, R France Int: Power and Policy. See W 1239.
1447 France, R France Int: The Americas. See W 1247.
1450 Japan, NHK/Radio: Tumbling Dice.
1452 France, R France Int: Letter from a Listener. See W 1252.

Thursdays

1431 France, R France Intl: The Bottom Line. See H 1231.
1434 Japan, NHK/Radio: Close Up.
1437 France, R France Intl: Reach Out. See H 1237.
1439 France, R France Intl: Planet Earth (biweekly). See H 1239.
1444 France, R France Intl: Letter from a Listener. See W 1252.
1447 France, R France Intl: Paris Promenade. See H 1247.
1450 Japan, NHK/Radio: Tumbling Dice.

Fridays

1431 France, R France Intl: Weekend. See F 1231.
1434 Japan, NHK/Radio: Business Focus.

Saturdays

1400 France, R France Intl: News. See S 1200.
1400 Japan, NHK/Radio: News.
1400 University Network via WWCR #2: The Lost Tribes. See S 1300.
1400 USA, WWCR #1 Nashville TN: The Inflctible Truth. John Standifer.
1400 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1405 USA, WWCR #3 Nashville TN: Travel Smart (live). Jaqueline Wolfe offers tips & ideas for traveling safely and economically.
1410 Japan, NHK/Radio: The Weekend Square.
1423 France, R France Intl: Focus on France. See A 1223.
1425 France, R France Intl: Review of the French Newspapers.
1430 USA, WWCR #1 Nashville TN: Sonrise. Larry Reichardt.
1431 France, R France Intl: Spotlight on Africa. See A 1231.
1445 France, R France Intl: French Lesson See A 1245.
1452 France, R France Intl: Letter from a Listener. See W 1252.

Frequencies

1500	1515		Afghanistan, Voice of Shari'ah	7002da	7073da		
1500	1600		Anguilla, Caribbean Beacon	11775am			
1500	1600	vl	Australia, ABC/Alice Springs	2310do			
1500	1600	vl	Australia, ABC/Katherine	2485da			
1500	1600	vl	Australia, ABC/Tennant Creek	2325da			
1500	1600		Australia, Radio	5995as	6080va	9475as	9580va
				11650pa	11660as		
1500	1530		Austria, R Austria International	17865na			
1500	1600	vl	Botswana, Radio	7255do	9600do	7255do	
1500	1600	vl	Cameroon, RTV/Yaounde	4850do			
1500	1600	vl	Canada, CBC Northern Service	9625do			
1500	1600		Canada, CFRX Toronto ON	6070do			
1500	1600		Canada, CFVP Calgary AB	6030do			
1500	1600		Canada, CHNX Halifax NS	6130do			
1500	1600		Canada, CKZN St John's NF	6160do			
1500	1600		Canada, CKZU Vancouver BC	6160do			
1500	1559	s	Canada, R Canada International	13650na	17800na		
1500	1556		China China Radio International	7160as	7405na	9785as	13685af
				15125af			
1500	1600		Costa Rica, R far Peace Intl	15049va	25930usb		
1500	1600		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
1500	1530		Ecuador, HCJB	12055am	15115am	21455usb	
1500	1600	as/vl	Eqt. Guinea, Radio East Africa	15185af			
1500	1600		Germany, Deutsche Welle	6140eu			
1500	1600		Germany, Overcomer Ministries	5850eu			
1500	1600		Germany, Voice of Hope	15715as	17550af		
1500	1600	vl	Ghana, Ghana BC Corp	4915da	6130do		
1500	1600		Guam, Trans World Radio	15330as			
1500	1600		Guyana, Voice of	5949do			
1500	1600		Japan, Radio	9750as	9860as	11730as	
1500	1600		Jordan, Radio	11690eu			
1500	1600		Kenya, Kenya BC Corp	4885do	4915do	4935do	
1500	1600		Lebanon, Voice of Hope	11530va			
1500	1600	vl	Lesotho, Radio	4800do			
1500	1600	vl	Liberia, ELWA	4760do			
1500	1600	vl	Liberia, R Liberia International	6100do			
1500	1600		Malaysia, Radio	7295da			
1500	1600		Malaysia, RTM Kota Kinabalu	5980da			
1500	1600		Malaysia, RTM Sarawak	7160do			
1500	1530	twhfa	Mexico, R Mexico International	5985am	9705am		
1500	1530		Mongolia, Voice of	12015as	12085as		
1500	1600		Myanmar, Radio	5985do			
1500	1600		Namibia, Namibian BC Corp	7165af	7215af		
1500	1600		Netherlands, Radio	9890as	12065as	15590as	
1500	1505	accsnal	New Zealand, R New Zealand Int	6100va			
1500	1600		New Zealand, ZLXA	3935da			
1500	1600	vl	Nigeria, Radio/Enugu	6025do			
1500	1600	vl	Nigeria, Radio/Ibadan	6050do			
1500	1600	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
1500	1600	vl	Nigeria, Radio/Lagos	4990do	7285do		
1500	1600	vl	Nigeria, Voice of	7255af	15120af		
1500	1556		North Korea, R Pyongyang	4405va	6574na	9335na	11710na
				13760na			
1500	1600		Palau, KHBN/Voice of Hope	9955as	9965as	9985as	13840as
1500	1600	vl/mtwhfa	Papua New Guinea, NBC	4890da	9675do		
1500	1600		Russia, Voice of Russia WS	4940me	4965me	4975me	7325me
				9730eu	11500as	12015me	
1500	1530		S Africa, Channel Africa	17770af			
1500	1600		Seychelles, FEBA Radio	11600as			
1500	1600		Sierra Leone, Sierra Leone BS	5980da			
1500	1600		Singapore R Corp of Singapore	6150da			
1500	1600		Sri Lanka, Sri Lanka BC Corp	4940do	6005as	6075as	9735as
				15425as			
1500	1600		Uganda, Radio	4976da	5026do		
1500	1600		UK, BBC World Service	5975as	5990as	6190af	6195as
				9515na	9740as	11860af	11865na
				11940af	12095eu	15220na	15310as
				15400af	15420af	15485eu	15575eu
				17700as	17830af	17840am	21470af
				21490af	21660af		
1500	1600	a	UK, Global Kitchen/Merlin	9750eu	11785eu	15235eu	
1500	1600	a	UK, Virgin Radio/Merlin	21455me	21515af		
1500	1600		USA, Armed Forces Network	4278am	6458am	12689am	
1500	1600		USA, KAIJ Dallas TX	13815va			
1500	1600		USA, KJES Vado NM	11715na			
1500	1600		USA, KTBN Salt Lake City UT	15590na			
1500	1600		USA, KWHR Naalehu HI	9930as	11565pa		
1500	1600		USA, VOA Special English	6160as	9760as	9845as	12040as
				15235as			
1500	1600		USA, Voice of America	7125as	9645as	9700me	9780as
				15205va	15255va		
1500	1600		USA, WEWN Birmingham AL	11875na	15745eu		
1500	1600		USA, WGTG McCaysville GA	12172am			
1500	1600	mtwhf	USA, WGTG McCaysville GA	9400va			
1500	1600		USA, WHRA Greenbush ME	17650af			
1500	1600		USA, WHRI Noblesville IN	13760na	15105sa		
1500	1600		USA, WINB Red Lion PA	13570am			
1500	1600		USA, WJCR Upton KY	7490va	13594as		
1500	1600	s	USA, WRMI Miami FL	9955am			
1500	1600		USA, WRNO New Orleans LA	7395na	15420al		
1500	1600		USA, WTJC Newport NC	9370na			
1500	1600		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1500	1600		USA, WYFR Okeechobee FL	11830na	17750na		
1500	1600		Zambia, Christian Voice	9865do			
1500	1600	vl	Zambia, National BC Corp	6165do	6265da		
1500	1600	vl	Zimbabwe, Zimbabwe BC Corp	5975da	6045do		
				0			0
1506	1600	accsnal	New Zealand, R New Zealand Int	6145va			
1515	1600	vl	Malawi, Malawi BC Corp	3380do			
1530	1545		Bangladesh, Bangla Betar	4882as	15520as		
1530	1600	vl	Botswana, Radio	3356do	4820do	7255do	
1530	1600		Ecuador, HCJB	12005am	15115am		
1530	1600		Georgia, Georgian Radio	6180me			
1530	1600		Iran, VOIRI	7115as	9635as	11775na	
1545	1600	sh	Bangladesh, Bangla Betar	4882as	15520as		
1550	1600		Vatican City, Vatican Radio	12065au	13765au	17730au	

Selected Programs

Sundays

1500 Canada, RCI Montreal: RCI News. See S 0100.
1500 Japan, NHK/Radio: News1.
1500 University Network via WWCR #2: Communion. See S 1100.
1500 USA, WWCR #1 Nashville TN: Prophetic Word Program. A message of salvation from Don Kubish of the House of Yaweh.
1500 USA, WWCR #3 Nashville TN: The Whole Truth. Anthonee Patterson conducts services from Pennsylvania.
1506 Canada, RCI Montreol: This Moming (hour 3). David Enright and Avril Benoit co-host the Sunday Edition of this CBC magazine program (hour 3 of 3 hours).
1510 Japan, NHK/Radio: Roundup Asia.
1530 University Network via WWCR #2: Mysteries and Wonders. Dr. Scott discusses some of the world's great mysteries.
1530 USA, WWCR #1 Nashville TN: Cross Roads Baptist Church. Lloyd Ferguson preaches from Lawrenceville, Georgia.

Monday-Friday

1500 Japan, NHK/Radio: News.
1500 University Network via WWCR #2: Communion. See S 1100.
1500 USA, WWCR #1 Nashville TN: The End Time Evangel. Jack Frost.
1500 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1506 USA, WWCR #3 Nashville TN: Freedom Calls (live). See M 0605.
1530 University Network via WWCR #2: The Great Pyramid. Dr. Scott will hold your attention when speaking on this subject.
1530 USA, WWCR #1 N'ville TN: The Time of Deliverance. Benjamin Smith, from the Time of Deliverance Evangelistic Church in Philadelphia.
1545 USA, WWCR #1 N'ville TN: Focus on the Kingdom. Anthony Buzzard.

Mondays

1515 Japan, NHK/Radio: Hello from Tokyo.
1515 USA, WWCR #1 Nashville TN: The Living Waters Broadcast. Father Bob Guste evangelizes from Louisiana.
1529 Japan, NHK/Radio: What's New?

Tuesdays

1515 Japan, NHK/Radio: Asian Top News.
1515 USA, WWCR #1 Nashville TN: The Living Waters Broadcast.
1525 Japan, NHK/Radio: Music Journey Around Japan.

Wednesdays

1515 Japan, NHK/Radio: Asian Top News.
1515 USA, WWCR #1 Nashville TN: The Living Waters Broadcast.
1525 Japan, NHK/Radio: Let's Try Japanese.

Thursdays

1515 Japan, NHK/Radio: Asian Top News.
1515 USA, WWCR #1 Nashville TN: The Living Waters Broadcast.
1525 Japan, NHK/Radio: Unforgettable Japanese Masterpieces.

Fridays

1515 Japan, NHK/Radio: Asian Top News.
1515 USA, WWCR #1 Nashville TN: The Living Waters Broadcast. See M 1515.
1525 Japan, NHK/Radio: Brush Up Your Japanese.

Saturdays

1500 Japan, NHK/Radio: News.
1500 University Network via WWCR #2: Communion. See S 1100.
1500 USA, WWCR #1 Nashville TN: Let the Bible Speak. James Hickey with o program from New Testament Christianity in Oklahoma.
1500 USA, WWCR #3 Nashville TN: The Free American (live). See M 1300.
1510 Japan, NHK/Radio: Asian Top News.
1515 USA, WWCR #1 Nashville TN: Real Truth. Darlene Bishop.
1525 Japan, NHK/Radio: Music Beat.
1530 University Network via WWCR #2: The Great Pyramid. See M 1530.
1530 USA, WWCR #1 Nashville TN: The Showers of Blessings Broadcast. Ed McAbee sermonizes before a live congregation.
1545 USA, WWCR #1 Nashville TN: Words of Hope. See S 1100.

Frequencies

1600	1700		Algeria, R Algiers International	11715va	15160va		
1600	1700		Anguilla, Caribbean Beacon	11775om			
1600	1700	vl	Australia, ABC/Alice Springs	2310do			
1600	1700	vl	Australia, ABC/Katherine	2485do			
1600	1700	vl	Australia, ABC/Tennant Creek	2325do			
1600	1700		Australia, Radio	5995as	6080va	9475as	9580va
				11650pa	11660as		
1600	1700	vl	Botswana, Radio	3356do	4820do	7255do	
1600	1700	vl	Cameroon, RTV/Yaounde	4850do			
1600	1700	vl	Canada, CBC Northern Service	9625do			
1600	1700		Canada, CFRX Toronto ON	6070do			
1600	1700		Canada, CFVP Calgary AB	6030do			
1600	1700		Canada, CHNX Halifax NS	6130do			
1600	1700		Canada, CKZN St John's NF	6160do			
1600	1700		Canada, CKZU Vancouver BC	6160do			
1600	1656		China China Radio International	7190af	9565af	9870af	
1600	1700		Costa Rica, R for Peace Intl	15049va	25930usb		
1600	1700		Costa Rica, University Network	5030om	6150va	7375na	9725na
				11870va	13749af		
1600	1627		Czech Rep, Radio Prague Intl	5930eu	21745af		
1600	1630		Ecuador, HCJB	12005am	15115am		
1600	1700		Ethiopia, Radio	5990af	7110af	7165af	9560af
				9704af	11800af		
1600	1700		France, R France International	11615af	11995af	12015af	15210af
				17605af	17850af		
1600	1645		Germany, Deutsche Welle	6140eu	6170as	7225as	9735af
				11810af	17595as	21775af	
1600	1700	a	Germany, Good News World R	15105af			
1600	1700		Germany, Overcomer Ministries	5850eu	13810af		
1600	1630	s	Germany, Universal Life	15105af			
1600	1630		Germany, Voice of Hope	15715as	17550af		
1600	1700	vl	Ghana, Ghana BC Corp	4915do	6130do		
1600	1700	o	Greece, Voice of	9420va	15455va	15630va	
1600	1700		Guam, Adventist World Radio	9355as			
1600	1630as		Guam, Trans World Radio	15330as			
1600	1700		Guyana, Voice of	5949do			
1600	1630		Iran, VOIRI	9635as	11775as		
1600	1700	irreg	Iraq, Radio Iraq International	7070va			
1600	1630		Jordan, Radio	11690eu			
1600	1700		Kenya, Kenya BC Corp	4885do	4915do	4935do	
1600	1700		Lebanon, Voice of Hope	6280me	11530va		
1600	1700	vl	Lesotho, Radio	4800do			
1600	1700	vl	Liberia, ELWA	4760do			
1600	1700	vl	Liberia, R Liberia International	6100do			
1600	1700	vl	Malawi, Malawi BC Corp	3380do			
1600	1700		Malaysia, Radio	7295do			
1600	1700		Namibia, Namibian BC Corp	7165af	7215af		
1600	1630		Netherlands, Radio	9890as	12065as	15590os	
1600	1650	occsnal	New Zealand, R New Zealand Int	6145va			
1600	1650	occsnal	New Zealand, R New Zealand Int	6145va			
1600	1700		New Zealand, ZLXA	3935do			
1600	1700	vl	Nigeria, Radio/Enugu	6025do			
1600	1700	vl	Nigeria, Radio/Ibadan	6050do			
1600	1700	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570dc
1600	1700	vl	Nigeria, Radio/Lagos	3326do	4990do		
1600	1700	vl	Nigeria, Voice of	7255af	15120af		
1600	1656		North Korea, R Pyongyang	3560va	6520va	9600va	9975va
1600	1615		Pakistan, Radio	11570me	15100af	15334af	17510me
				17720af	17720af	skd0100	
1600	1700		Palau, KHBN/Voice of Hope	9955as	9965as		
1600	1700	vl/mtwhfa	Papua New Guinea, NBC	4890do	9675do		
1600	1700		Russia, Voice of Russia WS	9730eu	9875as	12015me	12025cs
				12055me			
1600	1700	vl	Rwanda, Radio	6055do			
1600	1630		S Africa, Channel Africa	9525af			
1600	1700		S Africa, World Beacon	6145af			
1600	1700		Sierra Leone, Sierra Leone BS	5980do			
1600	1700		South Korea, R Korea Intl	5975om	9515af	9870af	
1600	1700		Sri Lanka, Sri Lanka BC Corp	4940do			
1600	1700		Swaziland, Trans World Radio	9500af			
1600	1615		Switzerland, Swiss r International	9575va	17670as		
1600	1640		UAE, Radio Dubai	13675eu	15395eu	21605eu	
1600	1700		Uganda, Radio	4976do	5026do		
1600	1700		UK, BBC World Service	3195as	5975as	6190af	6195af
				7160as	9515na	9740as	11940af
				12095eu	15310as	15400af	15485eu
				15575eu	17700as	17830am	17840am
				21470af	21660af		
1600	1700	a	UK, Global Kitchen/Merlin	9750eu	11785eu	15235eu	
1600	1700		USA, Armed Forces Network	4278am	6458am	12689am	
1600	1700		USA, KAIJ Dallas TX	13815va			
1600	1700		USA, KTBN Salt Lake City UT	15590no			
1600	1700		USA, KWHR Noalehu HI	9930as			
1600	1700		USA, VOA Special English	13600af	15445af	17895af	
1600	1700		USA, Voice of America	6035af	6160as	7125as	9645as
				9700me	9760as	13710af	15205va
				15225af	15255va	15410af	
1600	1700		USA, WEWN Birmingham AL	11875na	13615na	15745eu	
1600	1700		USA, WGTG McCaysville GA	12172om			
1600	1700	mtwhf	USA, WGTG McCaysville GA	9400va			
1600	1700		USA, WHRA Greenbush ME	17650af			
1600	1700		USA, WHRI Noblesville IN	13760na	15105sa		
1600	1700		USA, WINB Red Lion PA	13570eu			
1600	1700		USA, WJCR Upton KY	7490va	13594as		
1600	1700	mtwhf	USA, WMLK Bethel PA	9465eu			
1600	1700	s	USA, WRMI Miami FL	9955am			
1600	1700		USA, WRNO New Orleans LA	7395na	15420al		
1600	1700		USA, WSHB Cypress Crk SC	18910af			
1600	1700		USA, WTJC Newport NC	9370na			
1600	1700		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1600	1700		USA, WYFR Okeechobee FL	11830na	15600na	17750no	18980na
				21455eu	21525af		
1600	1610		Vatican City, Vatican Radio	12065ou	13765au	17540au	
1600	1700		Zambia, Christian Voice	4965do			
1600	1700	vl	Zambia, National BC Corp	6165do	6265do		
1600	1630	vl	Zimbabwe, Zimbabwe BC Corp	5975do	6045do		
				0			0
1615	1630as		UK, BBC World Service	11860af	15420af	21490af	
1615	1630		Vatican City, Vatican Radio	4005eu	5880eu	7250eu	9645eu
				15595eu			
1625	1640		Armenia, Trans World Radio	5895me			
1625	1640		Monaco, Trans World Radio	6145me			
1630	1700		Austria, R Austria International	6155eu	13730va	15240me	17765as
1630	1657		Canada, R Canada International	6140as	7150os		
1630	1700		Egypt, Radio Cairo	15255af			
1630	1700	s	Seychelles, FEBA Radio	11605as			
1630	1700		Slovakia, R Slovakia International	5920eu	6055eu	7345eu	
1630	1700as		UK, BBC World Service	11860af	21490af		
1630	1700	mtwhf	UK, Merlin Network One	12065as			
1630	1657		Vietnam, Voice of	7145eu	9730eu		
1630	1700	vl	Zimbabwe, Zimbabwe BC Corp	4828do	6045do		
1645	1700		Germany, Deutsche Welle	6140eu			
1650	1700	mtwhf	New Zealand, R New Zealand Int	6145va			

Selected Programs

Sundays

1600 South Korea, R Korea Intl: News. See S 0200.
1600 University Network via WWCR #2: Mysteries and Wonders.
1600 USA, WWCR #1 Nashville TN: Latin Catholic Mass. Father Gommar De Pauw conducts the traditional Latin Mass.
1600 USA, WWCR #3 Nashville TN: Apostolic Assembly. Lonnie Wollard preaches from Milltown, Connecticut.
1610 South Korea, R Korea Intl: Echoes of Korean Music. See S 1310.
1630 Canada, RCI Montreal (as): RCI News. See S 1200.
1630 University Network via WWCR #2: The Lost Tribes. See S 1300.
1630 USA, WWCR #1 Nashville TN: Blessed Assurance Ministry. Edward Maloof conducts services from Massachusetts.
1637 Canada, RCI Montreal (as): The Maple Leaf Mailbag. See S 1335.
1638 South Korea, R Korea Intl: Multiwave Feedback. See S 1338.

Monday-Friday

1600 South Korea, R Korea Intl: News. See S 0200.
1600 University Network via WWCR #2: The Great Pyramid.
1600 USA, WWCR #1 Nashville TN: World Wide Country Radio (live). News, weather and the best of country music.
1600 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1603 USA, WWCR #3 Nashville TN: Scriptures for America (live). Peter J. Peters hosts this outreach ministry from LaPorte Church of Christ in Colorado.
1610 South Korea, R Korea Intl: News Commentary. See S 0210.
1615 South Korea, R Korea Intl: Seoul Calling. See M 1315.
1630 Canada, RCI Montreal (as): RCI News. See S 1200.
1640 South Korea, R Korea Intl: Economic News Briefs. See M 1340.
1641 Canada, RCI Montreal (as): Spectrum. See M 1211.

Mondays

1645 South Korea, R Korea Intl: Notes of Nostalgia. See M 1345.

Tuesdays

1645 South Korea, R Korea Intl: Cultural Promenade. See T 345

Wednesdays

1645 South Korea, R Korea Intl: Reaching Forward. A look at South Korea's advancements in technology and coping with the financial crisis.

Thursdays

1645 South Korea, R Korea Intl: Tales from Korea's Past. See H 1345.

Fridays

630 South Korea, R Korea Intl: Let's Learn Korean! See F 1330.
1645 South Korea, R Korea Intl: Globalizing Korea. See F 1345.

Saturdays

1600 South Korea, R Korea Intl: News. See S 0200.
1600 University Network via WWCR #2: The Great Pyramid.
1600 USA, WWCR #1 Nashville TN: A Brighter Day. Jane Rogowski evangelizes from Maryland.
1600 USA, WWCR #3 Nashville TN: Strength for Today. Lane Brown.
1610 South Korea, R Korea Intl: News Commentary. See S 0210.
1615 USA, WWCR #1 Nashville TN: Ask WWCR. See M 0430.
1618 South Korea, R Korea Intl: Report from Developing Countries.
1630 Canada, RCI Montreal (as): RCI News. See S 1200.
1630 USA, WWCR #1 Nashville TN: The Word of Victory. Joyce Corbitt preaches from Great Britain.
1630 USA, WWCR #3 Nashville TN: The Baptist Hour. A half-hour of sermon and song from Fort Worth, Texas.
1636 Canada, RCI Montreal (as): Venture Canada. See A 1335.
1640 South Korea, R Korea Intl: From Us to You. See S 0240.
1645 USA, WWCR #1 Nashville TN: Hope for Today. J. Otis Yoder of Pennsylvania with a spiritual message.

Frequencies

1700	1800		Anguilla, Caribbean Beacon	11775am			
1700	1800	vl	Australia, ABC/Alice Springs	2310da			
1700	1800	vl	Australia, ABC/Katherine	2485da			
1700	1800	vl	Australia, ABC/Tennant Creek	2325do			
1700	1800		Australia, Radio	5995as	6080va	9475as	9580va
				9815pa	11880va		
1700	1730		Azerbaijan, Voice of	9165eu			
1700	1800	vl	Botswana, Radio	3356da	4820da	7255do	
1700	1800	vl	Cameroon, RTV/Yaounde	4850da			
1700	1800	vl	Canada, CBC Northern Service	9625do	CFRX Toronto ON		6070da
1700	1800		Canada, CFVP Calgary AB	6030do	CHNX Halifax NS		6130da
1700	1800		Canada, CKZN St John's NF	6160do	CKZU Vancouver BC		6160da
1700	1756		China China Radio International	9570af	9670af	9675af	11910al
				13700af			
1700	1800		Costa Rica, R for Peace Intl	15049va	25930usb		
1700	1800		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
1700	1727		Czech Rep, Radio Prague Intl	5930eu	21745af		
1700	1800		Egypt, Radio Cairo	15255af			
1700	1800	mtwhf	Eqt Guinea, Radio Africa	15185af			
1700	1730		France, R France International	15210af	17605af		
1700	1730		Georgia, Georgian Radio	11910eu			
1700	1800		Germany, Deutsche Welle	6140eu			
1700	1800	a	Germany, Good News World R	11795me			
1700	1800	vl	Ghana, Ghana BC Corp	3366da	4915do		
1700	1800		Guyana, Voice of	5949da			
1700	1800	vl	Italy, IRRS	3980va	3985		
1700	1800		Japan, Radio	9505na	12000eu	15355af	
1700	1800		Kenya, Kenya BC Corp	4885do	4915da	4935da	
1700	1800		Lebanon, Voice of Hope	6280me	11530va		
1700	1800	vl	Lesotho, Radio	4800da			
1700	1800	vl	Liberia, ELWA	4760da			
1700	1800	vl	Liberia, R Liberia International	6100do			
1700	1800	vl	Malawi, Malawi BC Corp	3380do			
1700	1800		Malaysia, Radio	7295do			
1700	1800		Namibia, Namibian BC Corp	3270af	3289af		
1700	1800	mtwh	New Zealand, R New Zealand Int	6145va			
1700	1800		New Zealand, ZLXA	3935do			
1700	1800	vl	Nigeria, Radio/Enugu	6025do			
1700	1800	vl	Nigeria, Radio/Ibadan	6050do			
1700	1800	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
1700	1800	vl	Nigeria, Radio/Lagos	3326do	4990do		
1700	1800		Palau, KHBN/Voice of Hope	9955as	9965as		
1700	1800	vl/mtwhfa	Papua New Guinea, NBC	4890do	9675do		
1700	1755		Poland, Radio Polonia	6000eu	7285eu		
1700	1756		Romania, R Romania International	15250eu	15390eu	17735eu	17805eu
1700	1800	sm wh a	Russia, Voice of Russia WS	9820eu			
1700	1800		Russia, Voice of Russia WS	9710eu	9775eu	9890eu	11510af
				11675eu	12015af	12055me	
1700	1800	vl	Rwanda, Radio	6055do			
1700	1730		S Africa, Channel Africa	17860af			
1700	1800		S Africa, World Beacon	6145af			
1700	1800		Sierra Leone, Sierra Leone BS	5980do			
1700	1800	irreg	Sri Lanka, Sri Lanka BC Corp	4940do			
1700	1800	vl	Sudan, Radio Omdurman	7199do	9200do	9505do	
1700	1730		Swaziland, Trans World Radio	9500af			
1700	1800		Uganda, Radio	4976do	5026do		
1700	1800		UK, BBC World Service	3255af	3915af	5975as	6005af
				6190af	7160as	9510as	9630af
				9740as	12095eu	15400af	15420af
				15485eu	15575me	17830af	17840na
1700	1730	mtwhf	UK, Merlin Network One	12065as			
1700	1800		USA, Armed Forces Network	4278am	6458am	12689am	
1700	1800		USA, KAIJ Dallas TX	13815va			
1700	1800		USA, KTBN Salt Lake City UT	15590na			
1700	1800		USA, KWHR Naalehu HI	9930as			
1700	1800		USA, Voice of America	6160as	7125as	7170as	9645as
				9700me	9760af	15255va	15410af
				15445af	17895af		
1700	1800	mtwhf	USA, Voice of America	5990as	6045as	7150as	9550as
				9770as			
1700	1800		USA, WEWN Birmingham AL	11875na	13615na	15745eu	
1700	1800		USA, WGTG McCaysville GA	12172am			
1700	1800	mtwhf	USA, WGTG McCaysville GA	9400va			
1700	1800		USA, WHRA Greenbush ME	17650af			
1700	1800		USA, WHRI Noblesville IN	9495sa	13760na		
1700	1800		USA, WINB Red Lion PA	13570eu			
1700	1800		USA, WJCR Upton KY	7490va	13594as		
1700	1800	mtwhf	USA, WMLK Bethel PA	9465eu			
1700	1800		USA, WRNO New Orleans LA	7395na	15420al		
1700	1800		USA, WSHB Cypress Crk SC	18910af			
1700	1800		USA, WTJC Newport NC	9370na			
1700	1800		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1700	1800		USA, WYFR Okeechobee FL	18980eu	21455eu		
1700	1800		Zambia, Christian Voice	4965do			
1700	1800	vl	Zambia, National BC Corp	6165do	6265do		
1700	1800	vl	Zimbabwe, Zimbabwe BC Corp	4828do	6045do		
1730	1800		Belgium, Radio Vlaanderen Intl	5910eu	9925eu	13710eu	17590af
1730	1800	os	Georgia, Georgian Radio	6080eu			
1730	1800		Guam, Adventist World Radio	11560va	11965va	11965as	
1730	1745	vl	Libya, Voice of Africa	11815af	15415af	15435va	
1730	1800		Netherlands, Radio	6020af	7120af	11655af	
1730	1800		Philippines, Radio Filipinas	11720me	15190me	17720me	
1730	1800		S Africa, Adventist World Radio	12130va			
1730	1745	mtwhf	Swaziland, Trans World Radio	3200af			
1730	1800	mtwhfa	Sweden, Radio	6065eu			
1730	1800	s	Sweden, Radio	13800eu			
1730	1800	s	UK, BBC World Service	9750as	12045as	15310as	
1730	1800	mtwhf	UK, Merlin Network One	12065as	15560as		
1730	1800		Vatican City, Vatican Radio	13765af	15570af	17515af	
1735	1745	vl/th	Paraguay, Radio Nacional	9739sa			
1745	1800		Bangladesh, Bangla Betar	7184eu	7462eu	9558eu	15520eu
1745	1800		India, All India Radio	7410eu	9950eu	11620eu	11935af
				13750af	15075af	15200af	
1745	1800	as	Swaziland, Trans World Radio	3200af			
1800	1900		Anguilla, Caribbean Beacon	11775am			
1800	1900	mtwhf	Argentina, RAE	15345eu			
1800	1900	vl	Australia, ABC/Alice Springs	2310da			

1800	1900	vl	Australia, ABC/Katherine	2485da			
1800	1900	vl	Australia, ABC/Tennant Creek	2325do			
1800	1900		Australia, Radio	6080pa	7240pa	9475as	9580va
				9815pa	11880va		
1800	1900		Bangladesh, Bangla Betar	7184eu	7462eu	9558eu	15520eu
1800	1900	vl	Botswana, Radio	3356da	4820da		
1800	1900	vl	Cameroon, RTV/Yaounde	4850da			
1800	1900		Canada, CFRX Toronto ON	6070da	CFVP Calgary AB		6030da
1800	1900		Canada, CHNX Halifax NS	6130da	CKZN St John's NF		6160da
1800	1900		Canada, CKZU Vancouver BC	6160da			
1800	1900		Costa Rica, R for Peace Intl	15049va	25930usb		
1800	1900		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
1800	1830		Egypt, Radio Cairo	15255af			
1800	1900	mtwh[f]	Eqt Guinea, Radio Africa	15185af			
1800	1900		Germany, Deutsche Welle	6140eu			
1800	1900	vl	Ghana, Ghana BC Corp	3366da	4915do		
1800	1810		Greece, Voice of	7475eu			
1800	1810	s	Greece, Voice of	9420eu	15630af	17705na	
1800	1900		Guyana, Voice of	5949da			
1800	1900		India, All India Radio	7410eu	9950eu	11620eu	11935af
				13750af	15075af	15200af	
1800	1900	vl	Italy, IRRS	3980va	3985		
1800	1900		Kenya, Kenya BC Corp	4885do	4915da	4935da	
1800	1900		Kuwait, Radio	11990va	15230as		
1800	1900		Lebanon, Voice of Hope	6280me	11530va		
1800	1900	vl	Lesotho, Radio	4800da			
1800	1900	vl	Liberia, ELWA	4760da			
1800	1900	vl	Liberia, R Liberia International	5100da			
1800	1900	vl	Malawi, Malawi BC Corp	3380da			
1800	1900		Malaysia, Radio	7295do			
1800	1900		Namibia, Namibian BC Corp	3270af	3289af		
1800	1830		Netherlands, Radio	6020af	7120af	11655af	
1800	1850	mtwhf	New Zealand, R New Zealand Int	6145va			
1800	1900		New Zealand, ZLXA	3935do			
1800	1900	vl	Nigeria, Radio/Enugu	6025do			
1800	1900	vl	Nigeria, Radio/Ibadan	6050do			
1800	1900	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
1800	1900	vl	Nigeria, Radio/Lagos	3326do	4990do		
1800	1900		Palau, KHBN/Voice of Hope	9965as			
1800	1830	vl/mtwhfa	Papua New Guinea, NBC	4890do	9675da		
1800	1900		Philippines, Radio Filipinas	11720me	15190me	17720me	
1800	1900		Russia, Voice of Russia WS	7330eu	9710eu	9720eu	9775eu
				9820eu	9890eu	11510af	11675eu
				11695af	12015af		
1800	1900	vl	Rwanda, Radio	6055do			
1800	1830		S Africa, Adventist World Radio	5960af	6100af		
1800	1900	m	S Africa, Amateur Radio League	3215af			
1800	1830		S Africa, Channel Africa	17870af			
1800	1900		S Africa, World Beacon	9675af			
1800	1900		Sierra Leone, Sierra Leone BS	5980do			
1800	1900	irreg	Sri Lanka, Sri Lanka BC Corp	4940do			
1800	1900		Swaziland, Trans World Radio	3200af			
1800	1900		Taiwan, R Taiwan International	3955eu			
1800	1900		Uganda, Radio	4976do	5026do		
1800	1830		UK, BBC World Service	3255af	5975as	6190af	9410eu
				9510as	9740pa	12095eu	15400af
				15420af	15575as	17830af	
1800	1900	a	UK, BBC World Service	17840na			
1800	1900	mtwhf	UK, Merlin Network One	12065as			
1800	1900	hf	UK, Merlin Network One	6130af			
1800	1830		UK, RTE Radio	15315me			
1800	1900		UK, World Beacon	9675af			
1800	1900		USA, Armed Forces Network	4278am	6458am	12689am	
1800	1900		USA, KAIJ Dallas TX	13815va			
1800	1900		USA, KTBN Salt Lake City UT	15590na			
1800	1900		USA, KWHR Naalehu HI	17510as			
1800	1900		USA, Voice of America	6035af	7415af	9760af	9770me
				11975af	15410af	15580af	17895af
1800	1900		USA, WEWN Birmingham AL	11875na	13615na	15745eu	
1800	1900		USA, WGTG McCaysville GA	12172am			
1800	1900	mtwhf	USA, WGTG McCaysville GA	9400va			
1800	1900		USA, WHRA Greenbush ME	17650af			
1800	1900		USA, WHRI Noblesville IN	9495sa	13760na		
1800	1900		USA, WINB Red Lion PA	13570eu			
1800	1900		USA, WJCR Upton KY	7490va	13594as		
1800	1900	mtwhf	USA, WMLK Bethel PA	9465eu			
1800	1900		USA, WRNO New Orleans LA	7395na	15420al		
1800	1900		USA, WSHB Cypress Crk SC	15665eu	18910af		
1800	1900		USA, WTJC Newport NC	9370na			
1800	1900		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
1800	1900		USA, WYFR Okeechobee FL	17555eu			
1800	1827		Vietnam, Voice of	7145eu	7440eu	9730eu	12070eu
1800	1900		Yemen, Rep of Yemen Radio	9779me			
1800	1900		Zambia, Christian Voice	4965do			
1800	1900	vl	Zambia, National BC Corp	6165do	6265do		
1800	1900	vl	Zimbabwe, Zimbabwe BC Corp	4828do	6045do		
1810	1900	s	Greece, Voice of	9420eu	15630af	17705na	
1830	1845		Albania, R Tirana International	7180eu	9510eu		
1830	1900		Ascension Is, RTE Radio	21630af			
1830	1900		Austria, R Austria International	13730af			
1830	1900		Canada, RTE Radio	13725va			
1830	1900		Georgia, Georgian Radio	11760eu			
1830	1900		Kiribati, Radio	9809do	9825do		
1830	1900		Netherlands, Radio	6020af	7120af	9895af	11655af
				13700af	17605af	21590af	
1830	1900		Serbia, Radio Yugoslavia	6100eu			
1830	1900		Slovakia, R Slovakia International	5920eu	6055eu	7345eu	
1830	1900		Turkey, Voice of	9785as	11765as		
1830	1900		UK, BBC World Service	3255af	6005af	6190af	9410eu
				9630af	9740pa	12095eu	15400af
				15420af	15575as	17830af	
1830	1900		UK, RTE Radio	13725na	21630af		
1830	1900	os	USA, Voice of America	7170af	11940af	15525af	
1851	1900		New Zealand, R New Zealand Int	11725va			
1855	1900	as	New Zealand, R New Zealand Int	11725va			
1900	2000		Anguilla, Caribbean Beacon	11775am			
1900	2000	vl	Australia, ABC/Katherine	2485do			
1900	2000	vl	Australia, ABC/Tennant Creek	2325do			
1900	2000		Australia, Radio	6080pa	7240pa	9500as	9580va
				9815pa	11880va		
1900	2000	vl	Botswana, Radio	3356do	4820do		

Frequencies

1900	2000		Bulgaria, Radio	9400na	11700eu		
1900	2000	vl	Cameroon, RTV/Yaounde	4850da			
1900	2000		Canada, CFRX Toronto ON	6070da	CFVP Calgary AB		6030do
1900	2000		Canada, CHNX Halifax NS	6130da	CKZN St John's NF		6160da
1900	2000		Canada, CKZU Vancouver BC	6160da			
1900	1956		China China Radio International	9440af	9595af	11750af	
1900	1915		Congo, RTV Congolaise	5985da			
1900	2000		Costa Rica, R for Peace Intl	15049va	25930usb		
1900	2000		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
1900	2000		Ecuador, HCJB	17660eu			
1900	2000	mtwhf	Eqt Guinea, Radio Africa	15185af			
1900	1945		Germany, Deutsche Welle	11765af	11810af	13720af	15390af
				17810af			
1900	2000	vl	Ghana, Ghana BC Corp	3366do	4915da		
1900	1930		Hungary, Radio Budapest	6025eu	9750eu		
1900	1945		India, All India Radio	7410eu	9950eu	11620eu	11935af
				13750af	15075af	15200af	
1900	1930		Israel, Kol Israel	11605af	15640va	15650af	17535va
1900	2000	vl	Italy, IRRS	3980va	3985		
1900	2000		Kenya, Kenya BC Corp	4885da	4915do	4935da	
1900	2000		Kiribati, Radio	9809da	9825do		
1900	2000		Kuwait, Radio	11990va	15230as		
1900	2000		Lebanon, Voice of Hope	6280me	11530va		
1900	2000	vl	Lesotho, Radio	4800do			
1900	2000	vl	Liberia, ELWA	4760do			
1900	2000	vl	Liberia, R Liberia International	5100do			
1900	2000	vl	Malawi, Malawi BC Corp	3380do			
1900	2000		Malaysia, Radio	7295do			
1900	2000	mtwhfa	Malta, Voice of Mediterranean	12060eu			
1900	2000		Namibia, Namibian BC Corp	3270af	3289af		
1900	2000		Netherlands, Radio	6020af	7120af	11655af	13700af
				17605af	21590af		
1900	1950	as	New Zealand, R New Zealand Int	11725va			
1900	2000		New Zealand, ZLXA	3935da			
1900	2000	vl	Nigeria, Radio/Enugu	6025da			
1900	2000	vl	Nigeria, Radio/Ibadan	6050do			
1900	2000	vl	Nigeria, Radio/Kaduna	4770da	6090do	7275do	9570do
1900	2000	vl	Nigeria, Radio/Lagos	3326do	4990do		
1900	2000	vl	Nigeria, Voice of	7255af	15120af		
1900	2000		North Korea, R Pyongyang	4405va	6574na	9335na	11710na
				13760na			
1900	1930	vl/mtwhfa	Papua New Guinea, NBC	4890do	9675da		
1900	1930		Philippines, Radio Filipinas	11720me	15190me	17720pa	
1900	2000		Russia, Voice of Russia WS	9710eu	9775eu	9820eu	9890eu
				11675eu	12070eu		
1900	2000	vl	Rwanda, Radio	6055da			
1900	2000		S Africa, World Beacon	9675af			
1900	2000		Sierra Leone, Sierra Leone BS	3316da			
1900	2000	vl	Solomon Islands, SIBC	5020da			
1900	2000		South Korea, R Korea Intl	5975am	7275eu		
1900	2000	irreg	Sri Lanka, Sri Lanka BC Corp	4940do			
1900	2000	a	Sri Lanka, Sri Lanka BC Corp	6010eu			
1900	2000		Swaziland, Trans World Radio	3200af			
1900	1930		Switzerland, Swiss R International	6110eu			
1900	2000		Thailand, Radio	7195eu	9655eu	11905eu	
1900	1930		Turkey, Voice of	9785as	11765as		
1900	2000		Uganda, Radio	4976da	5026do		
1900	2000		UK, BBC World Service	3255af	6005af	6190af	6190eu
				9410eu	9630af	9740pa	12095eu
				15400af	15575me	17830af	
1900	2000	a	UK, BBC World Service	17840no			
1900	2000	ht	UK, Merlin Network One	6130af			
1900	2000		UK, World Beacon	9675af			
1900	2000		USA, Armed Forces Network	4278am	6458am	12689am	
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, KWHR Naalehu HI	17510as			
1900	2000		USA, VOA Special English	6160me	9680me	13690me	
1900	1930		USA, Voice of America	7260me	9525pa	9760af	9770af
				11870pa	15180pa		
1900	1930	as	USA, Voice of America	6035af	7375af	7415af	11975af
				15410af	15445af	15580af	
1900	1930	a	USA, Voice of America	4950af			
1900	2000	mtwhf	USA, Voice of America	9565eu	9840as	11780me	11970as
				12015as	13725me	15235as	
1900	2000		USA, WEWN Birmingham AL	11875no	13615no	15745eu	
1900	2000		USA, WGTG McCaysville GA	12172am			
1900	2000	mtwhf	USA, WGTG McCaysville GA	9400va			
1900	2000		USA, WHRA Greenbush ME	17650af			
1900	2000		USA, WHRI Noblesville IN	9495sa	13760na		
1900	2000		USA, WINB Red Lion PA	13570eu			
1900	2000		USA, WJCR Upton KY	7490va	13594as		
1900	2000	mtwhf	USA, WMLK Bethel PA	9465eu			
1900	2000	as	USA, WRMI Miami FL	9955am			
1900	2000		USA, WRNO New Orleans LA	7395na	15420al		
1900	2000		USA, WSHB Cypress Crk SC	15665eu	18910af		
1900	2000		USA, WTJC Newport NC	9370na			
1900	2000		USA, WWCR Nashville TN	9475na	12160na	13845na	15685ra
1900	2000		USA, WYFR Okeechobee FL	17555eu			
1900	1927		Vietnam, Voice of	7145eu	9730eu		
1900	2000		Zambia, Christian Voice	4965da			
1900	2000	vl	Zambia, National BC Corp	6165do	6265do		
1900	2000	vl	Zimbabwe, Zimbabwe BC Corp	4828do	6045do		
1930	2000	t h	Belarus, Radio Minsk	7210va	11960va		
1930	1956		Belgium, Radio Vlaanderen Intl	5960eu			
1930	1945		Finland, YLE/R Finland	6110eu			
1930	2000		Iran, VOIRI	9022eu	9575eu	11670eu	
1930	2000	vl	Papua New Guinea, NBC	4890do	9675da		
1930	2000		Poland, Radio Polonia	6035eu	7185eu	7265eu	9525eu
1930	2000		Sweden, Radio	6065eu			
1930	2000		USA, Voice of America	4950af	6035af	7260me	7375af
			7415af	9525pa	9760af	9770af	11870po
			15180pa	15410af	15445af	15580af	
1935	1955		Italy, RAI International	5970eu	7290eu	9750eu	
1940	1950	m	Vatican City, Vatican Radio	9660eu			
1950	2000		Vatican City, Vatican Radio	4005eu	5880eu	7250eu	9645eu
1950	2000	m	Vatican City, Vatican Radio	9660eu			
1951	2000		New Zealand, R New Zealand Int	17675va			
1955	2000	mtwhfa	Armenia, Voice of	4810eu	9965eu		

2000	2100		Algeria, R Algiers International	11750eu	15160eu		
2000	2100		Angola, R. Nacional de Angola	3374va	7245va		
2000	2100		Anguilla, Caribbean Beacon	11775am			
2000	2015	mtwhfa	Armenia, Voice of	4810eu	9965eu		
2000	2100	vl	Australia, ABC/Alice Springs	2310do			
2000	2100	vl	Australia, ABC/Katherine	2485da			
2000	2100	vl	Australia, ABC/Tennant Creek	2325da			
2000	2100		Australia, Radio 9500as	9580va	9815pa	11880va	12080va
2000	2100	vl	Botswana, Radio	3356do	4820do		
2000	2100	vl	Cameroon, RTV/Yaounde	4850do			
2000	2100		Canada, CFRX Toronto ON	6070do	CFVP Calgary AB		6030da
2000	2100		Canada, CHNX Halifax NS	6130do	CKZN St John's NF		6160da
2000	2100		Canada, CKZU Vancouver BC	6160da			
2000	2100		Canada, R Canada International	5995va	11690va	13650va	13670va
				15325va	15470va	17820va	17870va
2000	2056		China China Radio International	9440af	11735af	13640af	15110eu
				17790eu			
2000	2100		Costa Rica, R for Peace Intl	15049va	25930usb		
2000	2100		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
2000	2027		Czech Rep, Radio Prague Intl	5930eu	11600as		
2000	2100		Ecuador, HCJB	17660eu			
2000	2100	mtwhf	Eqt Guinea, Radio Africa	15185af			
2000	2045		Germany, Deutsche Welle	7130eu			
2000	2100	vl	Ghana, Ghana BC Corp	3366do	4915da		
2000	2100		Indonesia, Voice of	9525va	11784va	15149va	
2000	2030		Iran, VOIRI	9022eu	9575eu	11670eu	
2000	2100	irreg	Iraq, Radio Iraq International	9684va	11787va		
2000	2100	vl	Italy, IRRS	3980va	3985		
2000	2100		Kenya, Kenya BC Corp	4885da	4915da	4935do	
2000	2100		Kiribati, Radio	9809da	9825do		
2000	2100		Kuwait, Radio	11990va	15230as		
2000	2100		Lebanon, Voice of Hope	6280me	11530va		
2000	2100	vl	Lesotho, Radio	4800do			
2000	2100	vl	Liberia, ELWA	4760do			
2000	2100	vl	Liberia, R Liberia International	5100do			
2000	2100	vl	Malawi, Malawi BC Corp	3380do			
2000	2100		Malaysia, Radio	7295do			
2000	2030		Mongolia, Voice of	12015eu	12085eu		
2000	2100		Namibia, Namibian BC Corp	3270af	3289af		
2000	2030		Netherlands, Radio	6020af	7120af	11655af	13700af
				17605af	skd0100	21590af	
2000	2100		New Zealand, R New Zealand Int	17675va			
2000	2100		New Zealand, ZLXA	3935da	7290do		
2000	2100	vl	Nigeria, Radio/Enugu	6025da			
2000	2100	vl	Nigeria, Radio/Ibadan	6050do			
2000	2100	vl	Nigeria, Radio/Kaduna	4770da	6090do	7275do	9570do
2000	2100	vl	Nigeria, Radio/Lagos	3326do	4990do		
2000	2100	vl	Nigeria, Voice of	7255af	15120af		
2000	2100	vl	Papua New Guinea, NBC	4890do	9675do		
2000	2025		Poland, Radio Polonia	6035eu	7185eu	7265eu	9525eu
2000	2100		Russia, Voice of Russia WS	9775eu	9775eu	9820eu	9890eu
				11675eu	15485eu		
2000	2100	vl	Rwanda, Radio	6055da			
2000	2100		S Africa, World Beacon	9675af			
2000	2100		Sierra Leone, Sierra Leone ES	3316da			
2000	2100	vl	Solomon Islands, SIBC	5020do			
2000	2100	mtwhf	Spain, R Exterior Espana	9595af	9595af	15285eu	
2000	2100	irreg	Sri Lanka, Sri Lanka BC Corp	4940do			
2000	2015		Swaziland, Trans World Radio	3200af			
2000	2030		Switzerland, Swiss R International	13710af	13770af	15220af	17580af
2000	2100	vl	Syria, Radio Damascus	12085eu	13610eu		
2000	2100		Uganda, Radio	4976da	5026do		
2000	2100		UK, BBC World Service	3255af	5975pa	6005af	6190af
				6195eu	9410eu	9630af	9740po
				11835eu	12095eu	15400af	17830af
2000	2100		UK, World Beacon	9675af			
2000	2100		USA, Armed Forces Network	4278am	6458am	12689am	
2000	2100		USA, KAIJ Dallas TX	13815va			
2000	2100		USA, KJES Vado NM	15385au			
2000	2100		USA, KTBN Salt Lake City UT	15590na			
2000	2100		USA, KWHR Naalehu HI	17510as			
2000	2030		USA, Voice of America	4950af	6035af	6095me	7375af
			7415af	9760af	9770af	11855af	11975af
			15410af	15445af	15580af	17725af	17745af
2000	2100		USA, WBCQ Monticello ME	7415na			
2000	2100		USA, WEWN Birmingham AL	11875no	13615na	15745eu	
2000	2100		USA, WGTG McCaysville GA	12172am			
2000	2100	mtwhf	USA, WGTG McCaysville GA	9400va			
2000	2100		USA, WHRA Greenbush ME	17650af			
2000	2100		USA, WHRI Noblesville IN	5745sa	9495sa		
2000	2100		USA, WINB Red Lion PA	13570eu			
2000	2100		USA, WJCR Upton KY	7490va	13594as		
2000	2100	mtwhf	USA, WMLK Bethel PA	9465eu			
2000	2100	s	USA, WRMI Miami FL	9955am			
2000	2100	a	USA, WRMI Miami FL	7385na			
2000	2100		USA, WRNO New Orleans LA	7395na	15420al		
2000	2100		USA, WSHB Cypress Crk SC	15665eu	18910af		
2000	2100		USA, WTJC Newport NC	9370na			
2000	2100		USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
2000	2100		USA, WYFR Okeechobee FL	17555eu	17845af		
2000	2100	vl	Vanuatu, Radio	3945do	4960do	7260do	
2000	2010		Vatican City, Vatican Radio	4005eu	5880eu	7250eu	9645eu
				9660af	11625af	13765af	
2000	2027		Vietnam, Voice of	7145eu	9730eu		
2000	2100		Zambia, Christian Voice	4965do			
2000	2100	vl	Zambia, National BC Corp	6165do	6265do		
2000	2100	vl	Zimbabwe, Zimbabwe BC Corp	4828do	6045da		
2005	2010		Croatia, Croatian Radio	9430eu	11805af		
2010	2030		Vatican City, Vatican Radio	9660af	11625af	13765af	
2025	2045		Italy, RAI International	7125af	9710af	11880af	
2030	2100	th	Belarus, Radio Minsk	7210va	11960va		
2030	2100		Cuba, Radio Havana	13660eu	13750eu		
2030	2100		Egypt, Radio Cairo	15375af			
2030	2100		Germany, Adventist World Radio	15560af			
2030	2045	vl	Libya, Voice of Africa	11815af	15415af	15435va	
2030	2055		Moldova, Radio Moldova Intl	7520eu			
2030	2100		S Africa, Adventist World Radio	9745af			
2030	2045		Thailand, Radio	9655eu	9680eu	11905eu	
2030	2100		Turkey, Voice of	9525eu			
2030	2100	f	UK, Wales Radio Intl/Merlin	7325eu			
2030	2100	as	USA, Voice of America	4950af			
2030	2100		Uzbekistan, Radio Toshkent	9540eu	9545eu		
2030	2057		Vietnam, Voice of	7145eu	9730eu	9750eu	
2045	2100		India, All India Radio	7150au	7410eu	9650eu	9910au
				9950eu	11715au		

FREQUENCIES

2100	2200		Anguilla, Caribbean Beacon	11775am				
2100	2130	vl	Australia, ABC/Alice Springs	2310do				
2100	2130	vl	Australia, ABC/Katherine	2485do				
2100	2130	vl	Australia, ABC/Tennant Creek	2325do				
2100	2130		Australia, Radio	7240pa	9500as	9580va	9660pa	
				11880va	12080va	17715pa	21740va	
2100	2200	vl	Botswana, Radio	3356do	4820da			
2100	2200		Bulgaria, Radio	9400eu	11700eu			
2100	2200	vl	Cameroon, RTV/Yaounde	4850do				
2100	2200	vl	Canada, CBC Northern Service	9625do				
2100	2200		Canada, CFRX Toronto ON	6070do				
2100	2200		Canada, CFVP Calgary AB	6030do				
2100	2200		Canada, CHNX Halifax NS	6130do				
2100	2200		Canada, CKZN St John's NF	6160do				
2100	2200		Canada, CKZU Vancouver BC	6160do				
2100	2200		Canada, R Canada International	7235va	11690va	13650va	13670va	
				15325va	17820va	17870va		
2100	2130		China China Radio International	11735af	13640af	15110eu	17790eu	
2100	2200		Costa Rica, R for Peace Intl	15049va	25930usb			
2100	2200		Costa Rica, University Network	5030am	6150va	7375na	9725na	
				11870va	13749af			
2100	2130		Cuba, Radio Havana	13660eu	13750eu			
2100	2200		Ecuador, HCJB	17660eu				
2100	2200		Egypt, Radio Cairo	15375af				
2100	2200	mtwhf	Eqt Guinea, Radio Africa	15185af				
2100	2145		Germany, Deutsche Welle	9670as	9765as	9875af	11865af	
				11915as	15135va			
2100	2200	vl	Ghana, Ghana BC Corp	3366do	4915da			
2100	2130		Hungary, Radio Budapest	6025eu				
2100	2200		India, All India Radio	7150va	7410eu	9650eu	9910au	
				9950eu	11715au			
2100	2200	vl	Italy, IRRS	3980va	3985			
2100	2200		Japan, Radio	6035pa	9725eu	11850pa	11855af	
				17825na	21670pa			
2100	2130		Kenya, Kenya BC Corp	4885do	4915da	4935do		
2100	2200		Kiribati, Radio	9809do	9825da			
2100	2200	vl	Lesotho, Radio	4800do				
2100	2200	vl	Liberia, ELWA	4760do				
2100	2200	vl	Liberia, R Liberia International	5100do				
2100	2200	vl	Malawi, Malawi BC Corp	3380do				
2100	2200		Malaysia, Radio	7295do				
2100	2200		Namibia, Namibian BC Corp	3270af	3289af			
2100	2200		New Zealand, R New Zealand Int	17675va				
2100	2200		New Zealand, ZLXA	3935do				
2100	2200	vl	Nigeria, Radio/Enugu	6025do				
2100	2200	vl	Nigeria, Radio/Ibadan	6050do				
2100	2200	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do	
2100	2200	vl	Nigeria, Radio/Lagos	3326do	4990do			
2100	2156		North Korea, R Pyongyang	6574va	9335va			
2100	2200		Palau, KHBN/Voice of Hope	9985as				
2100	2200	vl	Papua New Guinea, NBC	4890do	9675da			
2100	2156		Romania, R Romania International	11740eu	11940eu	15105eu	15180eu	
2100	2200		S Africa, World Beacon	9675af				
2100	2130		Serbia, Radio Yugoslavia	6100eu				
2100	2200		Sierra Leone, Sierra Leone BS	3316da				
2100	2200	vl	Solomon Islands, SIBC	5020do	9545da			
2100	2130		South Korea, R Korea Intl	3970eu	6480eu	15575eu		
2100	2200	as	Spain, R Exterior Espana	9595af	9830eu			
2100	2200	irreg	Sri Lanka, Sri Lanka BC Corp	4940da				
2100	2200	vl	Syria, Radio Damascus	12085eu	13610eu			
2100	2130		Turkey, Voice of	9525as				
2100	2115	mtwhf	UK, BBC World Service	11675ca				
2100	2200		UK, BBC World Service	3255af	3915as	5965as	5975va	
			6005af	6190af	6195va	9410eu	9740pa	
			11835af	11945as	12095sa	15400af		
2100	2200	as	UK, Global Kitchen/Merlin	3955eu	6140eu	7325eu		
2100	2200		UK, World Beacon	9675af				
2100	2200		Ukraine, R Ukraine International	5905eu	6020eu	9640eu	11950eu	
				21510eu				
2100	2200		USA, Armed Forces Network	4278am	6458am	12689am		
2100	2200		USA, KAIJ Dallas TX	13815va				
2100	2200		USA, KTBN Salt Lake City UT	15590na				
2100	2200		USA, KWHR Naalehu HI	17510as				
2100	2130		USA, Voice of America	6035af	6040me	6095me	7375af	
			7415af	9535af	9705pa	9760eu	11870pa	
			11975af	15185as	15410af	15445af	15580af	
			17725af	17735as	17820as			
2100	2200		USA, WBCQ Monticello ME	7415na				
2100	2200	mtwhf	USA, WBCQ Monticello ME	9330na				
2100	2200		USA, WEWN Birmingham AL	11875na	13615na	15745eu		
2100	2200		USA, WGTG McCaysville GA	12172am				
2100	2200	mtwhf	USA, WGTG McCaysville GA	9400va				
2100	2200		USA, WHRA Greenbush ME	17650af				
2100	2200		USA, WHRI Noblesville IN	5745na	9495sa			
2100	2200		USA, WINB Red Lion PA	13570eu				
2100	2200		USA, WJCR Upton KY	7490va	13594as			
2100	2200	s	USA, WRMI Miami FL	9955am				
2100	2200	a	USA, WRMI Miami FL	7385na				
2100	2200		USA, WRNO New Orleans LA	7395na	15420al			
2100	2200		USA, WSHB Cypress Crk SC	15665eu	18910af			
2100	2200		USA, WTJC Newport NC	9370na				
2100	2200		USA, WWCR Nashville TN	9475na	12160na	13845na	15685no	
2100	2145		USA, WYFR Okeechobee FL	15120af	17555eu	17845af		
2100	2200	vl	Vanuatu, Radio	3945do	4960da	7260do		
2100	2200		Zambia, Christian Voice	4965do				
2100	2200	vl	Zambia, National BC Corp	6165da	6265da			
2100	2200	vl	Zimbabwe, Zimbabwe BC Corp	4828da	6045da			
2115	2200		Egypt, Radio Cairo	9990eu				
2115	2130	mtwhf	UK, BBC Caribbean Report	5975ca	11675ca	15390ca		
2115	2130	as	UK, BBC World Service	5975ca				
2120	2200	s	Greece, Voice of	9425au	15650au			
2130	2200		Albania, R Tirana International	7130eu	9540eu			
2130	2200	vl	Australia, ABC/Alice Springs	4835do				
2130	2200	vl	Australia, ABC/Katherine	5025do				
2130	2200	vl	Australia, ABC/Tennant Creek	4910do				
2130	2200		Australia, Radio	7240pa	9660pa	11880va	12080va	
				17715pa	21740va			
2130	2200		Australia, Radio	7240pa	9660pa	11880va	12080va	
				17715pa	21740va			
2130	2200		Austria, R Austria International	5945eu	6155eu	13730af		
2130	2156		China China Radio International	15110eu	17790eu			
2130	2157		Czech Rep, Radio Prague Intl	11600as	15545af			
2130	2200		Guam, Adventist World Radio	11980as	15550as			
2130	2200		Hungary, Radio Budapest	3975eu				
2130	2200		Iran, VOIRI	11740as	13745as			
2130	2200		South Korea, R Korea Intl	15575eu				
2130	2200		Sweden, Radio	6065eu	9435eu	15255as		
2130	2145	tf	UK, BBC Calling Falklands	11680sa				
2130	2200		USA, Voice of America	6040me	6095me	9535af	9705as	
			9760eu	11870pa	15185as	17735as	17820as	
2130	2200	smtwhf	USA, Voice of America	6035af	7375af	7415af	11975af	
				15410af	15445af	15580af	17725af	
2130	2200		Uzbekistan, Radio Tashkent	9540eu	9545eu			
2145	2200		USA, WYFR Okeechobee FL	15120af	17845af			

2200

2200	2300		Anguilla, Caribbean Beacon	6090am				
2200	2300	vl	Australia, ABC/Alice Springs	4835do				
2200	2300	vl	Australia, ABC/Katherine	5025do				
2200	2300	vl	Australia, ABC/Tennant Creek	4910do				
2200	2300		Australia, Radio	11715pa	17795va	21740va		
2200	2300	vl	Cameroon, RTV/Yaounde	4850do				
2200	2300		Canada, CBC Northern Service	9625do				
2200	2300		Canada, CFRX Toronto ON	6070do				
2200	2300		Canada, CFVP Calgary AB	6030do				
2200	2300		Canada, CHNX Halifax NS	6130do				
2200	2300		Canada, CKZN St John's NF	6160do				
2200	2300		Canada, CKZU Vancouver BC	6160do				
2200	2230		Canada, R Canada International	5960am	9755am	13670am	15305am	
				17695am	17835as			
2200	2256		China China Radio International	9880eu				
2200	2300		Costa Rica, R for Peace Intl	15049va	25930usb			
2200	2300		Costa Rica, University Network	5030am	6150va	7375na	9725na	
				11870va	13749af			
2200	2245		Egypt, Radio Cairo	9990eu				
2200	2300	mtwhf	Eqt Guinea, Radio Africa	15185af				
2200	2300		Germany, Overcomer Ministries	7295eu				
2200	2300	vl	Ghana, Ghana BC Corp	3366do	4915do			
2200	2220	s	Greece, Voice of	9425au	15650au			
2200	2230		India, All India Radio	7150va	7410eu	9650eu	9910au	
				9950eu	11715au			
2200	2225		Iran, VOIRI	11740as	13745as			
2200	2225		Italy, RAI International	9675as	11900as	15240as		
2200	2300		Kenya, Kenya BC Corp	4885do	4915da	4935do		
2200	2300		Kiribati, Radio	9809do	9825da			
2200	2300	vl	Liberia, R Liberia International	5100do				
2200	2210	vl	Malawi, Malawi BC Corp	3380do				
2200	2300		Malaysia, Radio	7295do				
2200	2230		Mexico, R Mexico International	5985am	9705am			
2200	2300		Namibia, Namibian BC Corp	3270af	3289af			
2200	2300		New Zealand, R New Zealand Int	17675va				
2200	2300		New Zealand, ZLXA	3935do				
2200	2300	vl	Nigeria, Radio/Enugu	6025do				
2200	2300	vl	Nigeria, Radio/Ibadan	6050do				
2200	2300	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do	
2200	2300	vl	Nigeria, Radio/Lagos	3326do	4990do			
2200	2300		Palau, KHBN/Voice of Hope	9955as	9965as	9985as		
2200	2230	smtwhf	Serbia, Radio Yugoslavia	7230au				
2200	2300		Sierra Leone, Sierra Leone BS	3316do				
2200	2300	vl	Solomon Islands, SIBC	5020do	9545do			
2200	2300	irreg	Sri Lanka, Sri Lanka BC Corp	4940do				
2200	2300		Taiwan, R Taiwan International	11565eu	15600eu			
2200	2300		Turkey, Voice of	7190as	13640as			
2200	2300		UK, BBC World Service	5965as	5975na	6175na	6195va	
				7110as	9590na	9660as	11835af	
				11955as	12080pa	12095sa	15400af	
2200	2300	as	UK, Global Kitchen/Merlin	3955eu	6140eu	7325eu		
2200	2300		USA, Armed Forces Network	4278am	6458am	12689am		
2200	2300		USA, KAIJ Dallas TX	13815va				
2200	2300		USA, KTBN Salt Lake City UT	15590na				
2200	2300		USA, KWHR Naalehu HI	17510as				
2200	2230		USA, Voice of America	7215as	9705as	9770as	11760as	
				15185as	15290as	15305as	17735as	
				17820as				
2200	2230	mtwhf	USA, Voice of America	6035af	7340af	7375af	7415af	
				11975af				
2200	2300		USA, WBCQ Monticello ME	7415na				
2200	2300	mtwhf	USA, WBCQ Monticello ME	9330na				
2200	2300		USA, WEWN Birmingham AL	9385na	9975eu	13615na		
2200	2300		USA, WGTG McCaysville GA	5085va	6890am			
2200	2300		USA, WHRA Greenbush ME	7580af				
2200	2300		USA, WHRI Noblesville IN	5745na	9495sa			
2200	2300		USA, WINB Red Lion PA	13570eu				
2200	2300		USA, WJCR Upton KY	7490va	13594as			
2200	2245	a	USA, WRMI Miami FL	7385na				
2200	2300	s	USA, WRMI Miami FL	9955am				
2200	2300		USA, WRNO New Orleans LA	7395na	15420al			
2200	2300		USA, WSHB Cypress Crk SC	13770eu	15285sa			
2200	2300		USA, WTJC Newport NC	9370na				
2200	2300		USA, WWCR Nashville TN	7435na	9475na	12160na	13845na	
2200	2245		USA, WYFR Okeechobee FL	11740na	15120af	skd0300	17845af	
2200	2300	vl	Vanuatu, Radio	3945do	4960do	7260da		
2200	2210	vl	Zambia, National BC Corp	6165do	6265do			
2230	2300		Canada, R Canada International	5960na	9755na	13670na		
2230	2300		Cuba, Radio Havana	9550am				
2230	2257		Czech Rep, Radio Prague Intl	11600na	15545na			
2230	2300	vl	Papua New Guinea, NBC	9675da	11880do			
2230	2300	vl/as	Salaman Islands, SIBC	5020da				
2230	2300	vl/a	Solomon Islands, SIBC	9545da				
2230	2300		UK, BBC World Service	5965as	5975na	6175na	6195va	
				7110as	9590na	9660as	11835af	
				11955as	12080pa	12095sa	15400af	
2245	2300		India, All India Radio	7410as	9705as	9950as	11620as	
				13625as				
2245	2300	smtwhf	USA, WRMI Miami FL	9955am				
2245	2300	a	USA, WRMI Miami FL	7385na				
2245	2300		USA, WYFR Okeechobee FL	11740na				
2245	2300		Vatican City, Vatican Radio	9600as	11830as			

Frequencies

2300	0000		Anguilla, Caribbean Beacon	6090am			
2300	0000	vl	Australia, ABC/Alice Springs	4835do			
2300	0000	vl	Australia, ABC/Katherine	5025do			
2300	0000	vl	Australia, ABC/Tennant Creek	4910do			
2300	0000		Australia Radio	9660pa	12080va	17715pa	17795va
				21740va			
2300	0000		Bulgaria, Radio	9400na	11700na		
2300	0000	vl	Cameroon, RTV/Yaounde	4850do			
2300	0000		Canada, CBC Northern Service	9625do			
2300	0000		Canada, CFRX Toronto ON	6070do			
2300	0000		Canada, CFVP Calgary AB	6030do			
2300	0000		Canada, CHNX Halifax NS	6130do			
2300	0000		Canada, CKZN St John's NF	6160do			
2300	0000		Canada, CKZU Vancouver BC	6160do			
2300	2330		Canada, R Canada International	5960am	9755am	11895	an
				13670am	15305am	17695am	
2300	0000		Costa Rica, R for Peace Intl	15049va	25930usb		
2300	0000		Costa Rica, University Network	5030am	6150va	7375na	9725na
				11870va	13749af		
2300	2330		Cuba, Radio Havana	9550am			
2300	0000		Egypt, Radio Cairo	9900am			
2300	0000	a	Finland, YLE/R Finland	11985as	13785as		
2300	2345		Germany, Deutsche Welle	9815as	12055as	13610as	21790as
2300	0000	vl	Ghana, Ghana BC Corp	3366do	4915do		
2300	0000		India, All India Radio	7410as	9705as	9950as	11620as
				13625as			
2300	0000		Kenya, Kenya BC Corp	4885do	4915do	4935do	
2300	0000		Kiribati, Radio	9809do	9825do		
2300	0000	vl	Liberia, R Liberia International	5100do			
2300	0000		Malaysia, Radio	7295do			
2300	0000		Malaysia, RTM Kota Kinabalu	5980do			
2300	2330		Mexico, R Mexico International	5985am	9705am		
2300	0000		Namibia, Namibian BC Corp	3270af	3289af		
2300	2359		New Zealand, R New Zealand Int	17675va			
2300	0000		New Zealand, ZLXA	3935do			
2300	2305	vl	Nigeria, Radio/Enugu	6025da			
2300	2305	vl	Nigeria, Radio/Ibadan	6050do			
2300	2305	vl	Nigeria, Radio/Kaduna	4770do	6090do	7275do	9570do
2300	2305	vl	Nigeria, Radio/Lagos	3326do	4990do		
2300	0000		Palau, KHBN/Voice of Hope	9965as	9955as	9985as	
2300	0000	vl	Papua New Guinea, NBC	9675do	11880do		
2300	2359		Romania, R Romania International	9690eu	11775na	11830eu	15105na
				15195na			
2300	0000		Sierra Leone, Sierra Leone BS	3316da			
2300	0000	vl/as	Solomon Islands, SIBC	5020do			
2300	0000	vl/a	Solomon Islands, SIBC	9545do			
2300	0000		Sri Lanka, Sri Lanka BC Corp	4940do			
2300	0000		UK, BBC World Service	3915as	5965as	5975na	6035as
				6175na	6195as	7110as	9590na
				11945as	11955as	12095as	15280as
2300	0000	as	UK, Global Kitchen/Merlin	3955eu	6140eu	7325eu	
2300	0000		USA, Armed Forces Network	4278am	6458am	12689am	
2300	0000		USA, KAIJ Dallas TX	13815va			
2300	0000		USA, KTBN Salt Lake City UT	15590na			
2300	0000		USA, KWHR Naalehu HI	17510as			
2300	2330		USA, VOA Special English	7190as	7200as	9545as	9795as
				11925as			
2300	0000		USA, Voice of America	7215as	9770as	11760as	15185as
				15290as	15305as	17735as	17820as
2300	0000		USA, WBCQ Monticello ME	7415na			
2300	0000	mtwhf	USA, WBCQ Monticello ME	9330na			
2300	0000		USA, WEWN Birmingham AL	9385na	9975eu	13615na	
2300	0000		USA, WGTG McCaysville GA	5085va	6890am		
2300	0000		USA, WHRA Greenbush ME	7580na			
2300	0000		USA, WHRI Noblesville IN	5745na	9495sa		
2300	0000		USA, WINB Red Lion PA	13570am			
2300	0000		USA, WJCR Upton KY	7490va	13594as		
2300	0000	a	USA, WRMI Miami FL	9955am			
2300	0000		USA, WRNO New Orleans LA	7355na			
2300	0000		USA, WSHB Cypress Crk SC	13770eu	15285sa		
2300	0000		USA, WTJC Newport NC	9370na			
2300	0000	as	USA, WWBS Macon GA	11915eu			
2300	0000		USA, WWCR Nashville TN	7435na	9474na	12160na	13845na
2300	2345		USA, WYFR Okeechobee FL	11740na			
2300	0000	vl	Vanuatu, Radio	3945do	4960do	7260do	
2300	2315		Vatican City, Vatican Radio	9600as	11830as		
2330	2356		Belgium, Radio Vlaanderen Intl	15565na			
2330	0000	as	Canada, R Canada International	11895am	15305am	17695am	
2330	2359		Canada, R Canada International	5960am	9755am	13670am	
2330	0000		Kyrgyzstan, Kyrgyz Radio	4010eu			
2330	2345	vl	Libya, Voice of Africa	11815af	15415af	15435va	
2330	0000		Malaysia, RTM Sarawak	7160do			
2330	0000		Netherlands, Radio	6165na	9845na		
2330	0000		USA, VOA Special English	6060as	7190as	7200as	7225as
				7260as	9545as	9795as	11805as
				11925as	13735as	15205as	
2330	2357		Vietnam, Voice of	7145as	12019as		

Selected Programs

Sundays

2300 Canada, RCI Montreal: CBC Radio News. See S 0200.
2300 University Network via WWCR #2: Afternoon Festival (live). Dr. Scott with a live call-in show.
2300 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
2300 USA, WWCR #3 Nashville TN: Discoveries in Health (hour 1) (live). A health and herbs show from the American Freedom Network in which new treatments are discussed.
2305 USA, WWCR #1 Nashville TN: The Spoken Word of God. Alexander Scourby narrates the King James version of The New Testament.
2307 Canada, RCI Montreal: Roots and Wings. Philly Markowitz plays the rare, the beautiful and the unexpected music from the four corners of our world.
2312 Cuba, Radio Havana: The Mailbag Show. Listener letters and E-mail are reviewed and answered.
2315 USA, WWCR #1 Nashville TN: New Horizons. London Radio Service.
2330 USA, WWCR #1 Nashville TN: The Old Record Shop. See S 0630.

Monday-Friday

2300 Canada, RCI Montreal: The World at Six. CBC radio's major newscast of the day, presenting the important stories in depth and in context.
2300 University Network via WWCR #2: Communion. See S 1100.
2300 USA, WWCR #1 Nashville TN: Freedom Now (live). Irwin Schiff, a self-professed leading authority on federal income tax, talks from Las Vegas.

Mondays

2300 Cuba, Radio Havana: National News. See S 0611.
2300 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
2305 USA, WWCR #3 Nashville TN: Point of View. Martin Maddoux interviewing on current events of interest to Christians.
2306 Cuba, Radio Havana: Spotlight on the Americas. Issues and events in the hemisphere.

Tuesdays

2300 Cuba, Radio Havana: News Supplement. See S 0130.
2300 USA, WWCR #3 Nashville TN: Lyon Gold and Silver Magnet Program (live). See M 0430.
2307 Cuba, Radio Havana: Timeout. See T 0135.
2311 Cuba, Radio Havana: DXers Unlimited. See S 0136.

Wednesdays

2300 Cuba, Radio Havana: National News. See S 0611.
2300 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
2305 USA, WWCR #3 Nashville TN: Point of View. See M 2305.
2306 Cuba, Radio Havana: Timeout. See T 0135.
2311 Cuba, Radio Havana: Youth Speak Out.
2324 Cuba, Radio Havana: Music. See S 0122.

Thursdays

2300 Cuba, Radio Havana: National News. See S 0611.
2300 USA, WWCR #3 Nashville TN: Lyon Gold and Silver Magnet Program (live). See M 0430.
2306 Cuba, Radio Havana: Spotlight on the Americas. See M 2306.
2309 Cuba, Radio Havana Feature Reports. In-depth coverage of news items from other countries of the hemisphere.

Fridays

2300 University Network via WWCR #2: Communion. See S 1100.
2305 USA, WWCR #3 Nashville TN: Point of View. See M 2305.
2306 Cuba, Radio Havana: Feature Report. See S 0215.

Saturdays

2300 Canada, RCI Montreal: CBC Radio News. See S 0200.
2300 Cuba, Radio Havana: Top News Stories. A 5-minutes news summary.
2300 University Network via WWCR #2: Communion. See S 1100.
2300 USA, WWCR #1 Nashville TN: Weekly Presidential Radio Address (repeat). A repeat of Bill Clinton's weekly report to the nation.
2300 USA, WWCR #3 Nashville TN: Odyssey USA. Focus on the Family.
2305 Canada, RCI Montreal: Global Village Vignettes about music in the little corners of the world.
2306 Cuba, Radio Havana: DXers Unlimited. See S 0136.
2307 USA, WWCR #1 Nashville TN: The Republican Response. A nated Republican rebuts the President's weekly radio message.
2315 USA, WWCR #1 Nashville TN: The Blessed Word of Life. Perry L. Johnson preaches in Spanish and English from Washington, DC.
2323 Cuba, Radio Havana: Music. See S 0122.
2330 USA, WWCR #1 Nashville TN: The People's Gospel Hour. From Nova Scotia, Canada, Perry Rockwood interprets scripture for Christian life.
2330 USA, WWCR #3 Nashville TN: God Said Ministries. W.N. Otwell preaches from Texas.

Thank You ...

Additional Contributors to This Month's Shortwave Guide:

John Babbis, Silver Springs, MD; Dan Elysea/WYFR; Bob Fraser, Cohasset, MA; Glenn Hauser, Enid, OK/World of Radio, DX Report,; Hans Johnson, AZ/ Ulis Fleming, MD /*Cumbre DX/DXing With Cumbre*; Michael Murray, UK; Al Quaglieri/*NASWA Journal;* Robert Thomas, Bridgeport, CT; George Woods/ *Media Scan*; Adrian Sainsbury, R NZ Intl; BBCM; *BBC On-Air;*Harold Sellers, *DX Ontario;Hard Core DX* ; *MARE*; Radio Sweden/*Media Scan*; Usenet Newsgroups; *Worldwide DX Club*

PROPAGATION CONDITIONS, U.S.

OPTIMIZE YOUR MONITORING

Jacques d'Avignon
monitor@rac.ca

How To Use This Table

The *Monitoring Times* propagation table is set up to cover three main areas of the continental US and similar circuits are calculated for each area. If you live in Canada or along the 49th parallel, and have access to the Internet, you can check the following sites for similar tables for the Canadian and northern US users at **http://www.odxa.on.ca/rac2txt99.htm**.

In the *MT* tables and on the Canadian web site, the OWF (Optimum Working Frequency) frequency for a particular circuit is displayed. This frequency should give you the best chance, 90% of the time, to hear a station located at the other end of the circuit. If you feel adventurous, look up higher than the OWF for possible signals.

The tabulated OWF is approximately equivalent to 80% of the MUF (Maximum Usable Frequency) so you could still go up in frequency in your search for a signal. For example, if the tabulated OWF is 8.0 MHz, the MUF would be 10 MHz, so you could go lurking in the upper reaches up to 10 MHz. When you reach the MUF, your chances of hearing a good signal have now decreased to about 10%. When the solar activity is high you might find some of the MUF in the 35 to 45 MHz area; you never know what you can find "up there."

The OWF can, at times, have a calculated value of "0". This value is replaced by an asterisk (*) and the cells are shaded in the *Monitoring Times* chart and on the Web pages. When you see this, do not despair; keep on looking in the vicinity of the last frequency listed for that circuit. The reason why the OWF can have a calculated value of "0" is simply that the ALF (Absorption Frequency) on this circuit, at that particular time of day, is higher than the OWF and, in theory, communication at the OWF should be impossible. But I have been in the radio field long enough to know that theory and practice do not always agree!

As it is relatively safe to assume reciprocity in the forecasts most of the time, the *MT* circuits are labeled "TO/FROM." There are some technical arguments against this assumption, but we know that the *MT* forecasts have been used with success by overseas listeners to listen to North American broadcasts.

A "P" after the name of a circuit indicates that the signal on that particular circuit can be influenced by auroral zone disturbances while traveling over the pole.

Enjoy DXing and use the propagation charts to help you locate unusual signals.

OPTIMUM WORKING FREQUENCIES (MHz)

For the Period 15 July 2000 to 14 August 2000 Flux=192 SSN=150

Predictions prepared using ASAPS for Windows®

UTC	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
TO/FROM US WEST COAST																								
CARIBBEAN	16	17	17	16	15	14	12	12	12	11	10	10	10	12	14	16	17	18	18	19	19	18	17	16
SOUTH AMERICA	18	19	20	20	18	16	15	14	14	13	12	12	12	14	17	19	19	20	21	20	20	20	20	19
WESTERN EUROPE	13	12	12	11	11	11	13	12							15	17	17	16	16	17	17	16	15	14
EASTERN EUROPE (P)	13	12	12	13	14	15	14								14	15	15	16	16	16	16	15	14	13
NORTH AFRICA	18	17	16	15	15	16	14	13							16	17	17	18	19	19	19	18	18	18
CENTRAL AFRICA	18	17	16	16	15	16	13	13							17	19	20	21	21	21	21	21	19	18
SOUTH AFRICA	19	15	12	11	10	13	14	14							17	19	20	21	22	22	22	21	20	19
MIDDLE EAST (P)	14	14	15	18	18	17	15								15	17	19	20	20	19	18	17	16	15
CENTRALASIA (P)	17	18	18	19	19	18	17	15					11	12	14	15	16	16	16	16	15	14	14	15
INDIA (P)	19	18	18	18	19	18	17	15						11	13	16	18	19	20	20	18	16	16	16
THAILAND	20	19	18	19	20	19	18	16			12	11	11	11	12	15	17	19	20	20	18	17	17	20
AUSTRALIA	21	20	21	22	22	21	20	18	16	16	15	14	13	13	13	15	15	14				15	22	22
CHINA	18	18	18	19	19	18	18	16	14	12	12	11	11	11	12	14	16	16	16	15	15	15	16	18
JAPAN	18	17	17	17	18	17	16	14	13	12	11	11	10	10	11	13	15	14	14	14	16	17	18	18
SOUTH PACIFIC	19	19	19	20	20	18	17	15	14	14	14	12	11	11	12	12	11	14	19	19	20	20	20	19
TO/FROM US MIDWEST																								
CARIBBEAN	18	18	17	16	15	14	13	13	12	11	10	11	14	16	17	18	18	19	19	19	19	18	18	18
SOUTH AMERICA	21	22	22	20	19	18	17	17	16	14	13	14	17	20	22	22	23	24	24	23	23	23	23	22
WESTERN EUROPE	15	14	13	12	12	12	13	12					15	16	17	18	18	17	17	17	18	18	17	16
EASTERN EUROPE (P)	12	12	11	12	13	12	12						13	16	17	17	17	17	17	17	17	15	14	13
NORTH AFRICA	18	17	16	15	15	13	12							16	17	17	18	18	18	18	18	18	18	17
CENTRAL AFRICA	19	18	18	17	16	15	14	13					16	17	18	19	19	19	19	20	20	19	19	19
SOUTH AFRICA	18	14	12	11	10	12	15	14	13				16	18	20	21	22	22	22	22	21	20	19	20
MIDDLE EAST	15	15	15	18	16	14	14						15	16	17	18	18	19	19	18	18	18	17	16
CENTRAL ASIA (P)	16	18	19	18	17	15						13	14	15	16	17	18	17	17	17	16	15	14	15
INDIA	17	18	19	18	17	15							13	16	18	19	20	21	20	19	19	17	16	16
THAILAND	17	18	19	19	18	16						11	12	14	17	18	20	20	21	20	17	17	16	19
AUSTRALIA	20	20	21	21	20	19	16	15	14	14	13	12	12	13	15	16	15					15	21	20
CHINA (P)	18	18	19	19	18	16	14				*	11	12	14	16	17	17	17	16	15	15	15	17	18
JAPAN	17	17	18	18	18	16	14	13	12	11	10	10	11	12	14	15	15	14	14	15	16	17	17	18
SOUTH PACIFIC	20	21	21	21	19	17	16	15	15	14	13	12	12	13	16	14		17	21	21	21	21	21	20
TO/FROM US EAST COAST																								
CARIBBEAN	14	13	12	11	11	10	10	9	8	8	8	10	12	13	13	14	14	14	14	14	14	13	13	14
SOUTH AMERICA	20	21	20	19	19	18	18	17	15	12	12	17	21	21	22	22	22	22	21	21	21	21	21	20
WESTERN EUROPE	15	14	14	12	12	12	13	12			13	15	16	17	18	18	17	17	17	18	18	18	18	17
EASTERN EUROPE	12	12	11	11	12	13	12					14	16	17	18	17	17	17	18	18	17	16	14	13
NORTH AFRICA	17	16	15	15	14	15	13	12				15	17	19	20	20	21	21	20	20	18	17	18	18
CENTRAL AFRICA	16	16	16	15	15	16	15	14			15	17	18	19	20	20	20	20	20	20	20	20	18	16
SOUTH AFRICA	18	14	12	11	10	12	16	14	14	14	17	20	21	22	22	22	22	23	22	22	22	22	22	21
MIDDLE EAST	16	15	15	17	15	14	13					16	17	18	19	19	19	19	19	19	19	18	18	17
CENTRAL ASIA (P)	15	18	19	17	15	14						15	17	18	18	19	19	18	17	17	16	15	15	15
INDIA (P)	16	19	19	16	14							15	17	19	20	21	21	22	20	20	19	18	16	16
THAILAND (P)	19	19	19	17	*							14	16	18	20	21	21	21	21	20	18	17	16	17
AUSTRALIA	21	22	21	20	18	16	15	15	14	13	13	13	14	16	17	16	15					15	20	19
CHINA (P)	18	19	19	17	15							13	16	18	19	19	18	17	16	15	14	14	15	17
JAPAN	19	19	19	18	17	15	13	13	12	11	11	12	14	16	16	16	16	15	15	16	17	18	19	18
SOUTH PACIFIC	22	23	22	20	18	17	16	16	15	14	13	13	15	18	16	14	14	20	23	23	23	23	22	22

Unfavorable conditions: Search around the last listed frequency for activity.

(P) denotes circuit across polar auroral zone; reception may be poor during ionospheric disturbances.

John Figliozzi
jfiglio1@nycap.rr.com

Europe's Summer of the Arts

Summer is prime time for the great arts festivals of Europe. Each year since 1985, one city has been named European Capital of Culture by the Council of Ministers of the European Community. For 2000, nine have been chosen: Avignon, France; Bergen, Norway; Bologna, Italy; Brussels, Belgium; Krakow, Poland; Helsinki, Finland; Prague, Czech Republic; Reykjavik, Iceland, and Santiago de Compostela, Spain. Each of these cities will have special events throughout the summer befitting their designation.

Throughout Europe, summer also is celebrated with an abundance of music festivals. Here, in no particular order, is a calendar of just a few (some prominent, some not so) summer artistic events that you can hear about – and even in some cases attend – via your shortwave radio.

Salzburg Festival: Classical music and opera from July 23 through Aug 31.

Flanders International Festival: A multifaceted experience from international music and artists to Flemish music to three cycles of 20th century music. Held throughout Belgium until November 10.

Edinburgh International Festival: Music from each century of the second millennium is featured in ten concerts performed in buildings architecturally linked to the time of each composition and featuring an international roster of artists, from August 13 to September 2.

Three Choirs Festival: Hereford, England, is this year's host of Europe's oldest continuing festival, dating from 1715. Choral and orchestral works from August 19 to 25.

Valtice Festival: A weekend event in Prague in just its tenth year featuring wine tastings, picnics and a dinner dance with performances in the courtyard and park of Valtice Castle and the gardens and greenhouses of Chateau Lednice in southern Moravia, some 35 miles from Vienna. August 25 to 27.

Fiesta de San Fermin: This nine day event in Pamplona, Spain, which features the famous running of the bulls, also has concerts, a film festival and some wild wine-fueled partying. July 6-14.

Colmar (France) International Festival: A piano festival, paying tribute to Arturo Benedetti Michelangeli, who in 1937 not only won first prize in the Geneva piano competition, but also won a grand prix auto race. July 1-15.

Choregies d'Orange: Operas, concerts and the Berlioz "Requiem" come to one of the world's great surviving Roman antiquities, the 8600 seat Roman Theatre Antique d'Orange, (near Cedex, France) dating from AD 120 and noted for its acoustics. July 12-August 12.

Munich Opera Festival: Fans can savor 16 operas, 2 ballets, 4 lieder recitals and live concerts during this annual tribute to Mozart, Wagner, Verdi and Richard Strauss. Through July.

Montreaux Voice and Music Festival: The voice in all its forms – operas, oratorios and recitals – is the theme of this Swiss gala held August 18 through September 10.

Drottningholm Court Theater: Period operas and ballets performed at the 18th century Royal Court Opera about 30 minutes outside Stockholm. Through September 2.

Programs Focusing on Coverage of The Arts in Europe:

- **BBC World Service**, *Arts in Action** to the Americas Su 0030, 1130. Also to East Asia/Australia A 0530, 2330, S 0830; to East Africa S 1130; to Europe A 0530, S 1130; to Middle East A 0530, S 0830, 1130; to South Asia S 0830; to West Africa A 1330, Su 0830. *Outlook** to the Americas Tu-Sa 1305, 2305. Also to East Asia/Australia M-F 1205, 1705, T-A 0105; to East Africa M-F 1205, T-A 0605; to Europe M-F 1205, 1705, T-A 0705; to the Middle East M-F 1505, T-A 0605; to South Asia M-F 1305, T-A 0305, T-F 0805; to West Africa M-F 2205, T-A 0805. (In addition, extensive coverage of the annual *BBC Promenade Concerts* ("The Proms") begins in July. Consult the World Service web site at <www.bbc.co.uk/worldservice> for further information.)
- **Deutsche Welle**, *Arts on the Air** M 0115; Su 1615, 1930, 2015, 2115, 2315; 0330; Tu 0800, 1200, 1400, 1800; Th 0700, 1000, 1300, 1500, 1700.
- **Polish Radio Warsaw**, *Focus* M 1220; Th 1720, 1950.
- **Radio Budapest**, *Hungary Today* M-F 1910, 2110, 2140; T-A 0110, 0240. *Heading for Hungary* S 1910, 2110, 2140; M 0110, 0240 (once a month, week varies).
- **Radio Bulgaria**, *Arts and Artists* T 1945, 2345; W 1145, 2145; H 0245. *Bulgarian Plaza* Su 1930, 2330; M 1130, 2130; T 0230.
- **Radio France Internationale**, *Arts in France* M 1237, 1437, 1637; T 1715.
- **Radio Netherlands**, *Aural Tapestry** A 1100, 1130, 1500, 1800, 1930; S 0000, 0500, 1000, 1100, 1530, 1900; M 0030.
- **Radio Prague**, *The Arts* A 0335, 0705, 0905, 1035, 1135, 1305, 1605, 1705, 2005, 2135, 2235; S 0005, 0105, 0305.
- **Radio Romania International**, *Cultural Survey* F 0725, 1325, 1725, 2125, 2325; A 0225, 0425, 0625. *World of Culture* A 0715, 1315, 1715, 2115, 2315; S 0215, 0415, 0615.
- **Radio Slovakia International**, *Culture News* Th 0715, 1645, 1845; F 0115.
- **Radio Sweden**, *Spectrum* A 1130, 1230, 1330, 1730, 1930, 2130; S 0130, 0230, 0330.
- **Radio Ukraine International**, *Baroque* Sa 1118, 2118; Su 0018, 0318.
- **Radio Vlaanderen Internationaal**, *Around the Arts* M/H 0713, 1143; W/F 1743, 2243; H/A 0413.
- **Spanish National Radio**, *Arts in Spain* F 2035; A 0035, 0135, 0535. *Entertainment in Spain*, T 0035, 0135, 0535; M 2035.
- **Swiss Radio International**, *Swiss Scene* S 0740, 0840, 1110, 1140, 1410, 1440, 2010; M 0110, 0410, 0440.
- **Voice of Russia**, *Kaleidoscope* F 0632; A 0732, 1532; S 1432; M 1732; T 0232, 0632; W 1932. *This is Russia* S 1932; M 0232, 0532, 1532; T 1932; W 0832; H 0732; F 0532; A 0632, 1832.
- **Voice of Turkey**, *Turkish Album* A 1250, 1850, 2050, 2220; S 0320.

[**Notes**: Many of these programs are available via live streaming audio or as an on-demand audio file at the producing station's web site or from World Radio Network (WRN) at <www.wrn.org>. A * denotes that the program has a more expansive European scope. In addition, timely coverage can be had from listening to each station's regular programs highlighting domestic current events. All times and days UTC; times are approximate; information subject to change; day abbreviations identical to those in *MT*'s Shortwave Guide section.]

Credits:

I had help this month from Maryanne Kehoe, February's *Conde Nast Traveler* magazine and *The New York Times Travel Section* of March 12, 2000. Have a great summer and good listening!

AUDIO SUBCARRIER GUIDE

By Robert Smathers, roberts@nmia.com

Audio frequencies in MHz. All satellite/transponder coordinates are C-band unless otherwise noted.
DS=Discrete Stereo

Classical Music

WCPE-FM (89.7) Raleigh/Durham/Chapel Hill, NC	G5, 7	5.58/6.12 (DS)
WFMT-FM (98.7) Chicago, IL–Fine Arts	G5, 7	6.30/6.48 (DS)

Satellite Computer Services

Superguide	G5, 7	5.48

Contemporary Music

WPHZ-FM (96.9) Bremen, IN (South Bend market)	G11, 15	6.48, 7.30 (DS)

Country Music

WSM-AM (650) Nashville, TN	C4, 24	7.38/7.56 (DS)

Easy Listening Music

FCC mandated safe-harbor program easy listening music	G5, 2	6.80
United Video–easy listening music	C4, 8	5.895 (N)

Foreign Language Programming

La Cadena CNN Radio Noticias (CNN Radio News in Spanish)	G5, 17	7.56
Radio Tropical	G7, 12	7.60
SRC AM Network	E2, 1	7.38
SRC FM Network	E2, 1	5.41/5.58 (DS)

Jazz Music

KLON-FM (88.1) Long Beach, CA., ID-*Jazz-88*	G5, 2	5.58/5.76 (DS)

News and Information Programming

Broadcast News	E2, 1	5.78
Cable Radio Network	G5, 2	8.30
	G7, 6	7.30
	C1, 7	8.10
CNN Headline News	G5, 22	7.58
CNN Radio News	G5, 5	7.58
	G5, 5	6.30
	G5, 22	6.30
WCBS-AM (880) New York, NY–news	T4, 11	7.38

Religious Programming

Brother Staire Radio	G5, 6	6.48
KHCB-FM (105.7) Houston, TX	GE1, 9	7.28
KMUS-AM (1380), Muskogee, OK	G1R, 24	5.96
LDS Radio Network	C1, 6	5.58
Trinity Broadcasting radio service	G5, 3	5.58/5.78 (DS)
Truth Net G9, 2 5.80		

Shortwave Broadcasters via Satellite

C-SPAN Audio 1: Various shortwave broadcasters	C3, 7	5.20
C-SPAN Audio 2: British Broadcasting Corporation (BBC)	C3, 7	5.41
Deutsche Welle Radio 1	GE1, 22	7.38, 7.56 (DS) (German)
Deutsche Welle Radio 2	GE1, 22	7.74 (English)
Deutsche Welle Radio 7	GE1, 22	7.92 (Various Languages)
RAI Satelradio Italy (Italian)	G7, 14	7.38
WEWN–Worldwide Catholic Radio, Vandiver, AL	G1R, 11	5.40, 7.38 (English), 5.58 (Spanish)
WHRA Africa/Middle East–WHR, South Bend, IN	G11, 15	7.82
WHRI Americas–World Harvest Radio, South Bend, IN	G11, 15	7.46
WHRI Europe –World Harvest Radio, South Bend, IN	G11, 15	7.55
KWHR Asia–World Harvest Radio, South Bend, IN	G11, 15	7.64
KWHR South Pacific–WHR, South Bend, IN	G11, 15	7.73
World Radio Network: WRN1 North America	G5, 6	6.80
World Radio Network: WRN2 North America	G5, 6	6.20 (Multi-lingual)

Speciality Formats

Colorado Talking Book Network	C1,3	5.60
Weather Channel–background music	C3, 13	7.78
Wisdom Radio Network	GE1, 12	7.10
	GE1, 12	7.92
Yesterday USA–nostalgia radio	G5, 7	6.80

Talk Programming

American Freedom radio network	GE4, 19	5.80
Genesis Communicarians Radio Network	G1R, 17	5.58
Genesis Communicafions Radio Network	G9, 2	7.28
Republic Radio International	G7, 14	7.70
Talk America Radia Network #1–talk programs	GE3, 9	6.80
Talk America Radio Network #2–talk programs	GE3, 9	5.41
Talk Radio Network (TRN)	C1, 14	5.80
Truth Radio Network	G9, 2	5.40
United Broadcasting Network	C1, 2	7.50
WWTN-FM (99.7) Manchester, TN–news and talk	G5, 18	7.38, 7.56

Variety Programming

CBM-FM (88.5) Montreal,PQ Canada–variety/fine arts	E2, 1	6.12
West Virginia Public Radio	GE1, 12	7.74
WNMX-FM (106.1) "Mix 106" Waxhaw, NC	G1R, 17	7.927

FM SQUARED (FM²) AUDIO GUIDE

Galaxy 3R Transponder 3 (Ku-band)

Blank Audio Carriers	2.06
Data transmissions	.06, .62, 2.93, 3.07 and 3.15 MHz
AP Network News	3.53 MHz
In-Store audio network ads	.62, .71, .81, .88, 1.05, 1.15, 1.26, 3.25, 3.44, 3.62, 3.70, 3.80, 3.88, 3.97 and 4.20 MHz
Muzak Services	.15, .27, .39, .51, .98, 1.36, 1.48, 1.60, 1.72, 1.84, 1.96, 2.19, 2.31, 2.44, 2.56, 2.68, 2.80, 3.34, 4.08, 4.34, and 4.45 MHz

Galaxy 3R Transponder 16 (Ku-band)

Data transmissions	.06, .47, .64, 1.95, 2.18, 2.45, 2.52, 2.82, 2.92, 3.20, 3.38, 3.47, 3.73, 3.97, 4.14, and 4.24 MHz
In-Store audio networks	.15, .27, .39, .99, 1.11, 1.59, 1.71, and 1.83 MHz

Telstar 5 Transponder 28 (Ku-band)

Data Transmissions	.06, .15, .23, .30, .35, .38 .47, .65, .89, .93, .96, 1.05, 1.12, 1.22, 1.35 MHz

SATELLITE LOADING REPORT OF THE MONTH:

Panamsat Galaxy 3R at 95 degrees West longitude

C-band

1H	TVN Poy-Per-View {V2+}
2V	(none)
3H	(none)
4V	(none)
5H	(none)
6V	(none)
7H	(none)
8V	PandaAmerica Home Shopping Network
9H	(none)
10V	Horse Racing (digital video)
11H	Horse Racing (digital video)
12V	Horse Racing (digital video)
13H	Horse Racing (digital video)
14V	Horse Racing (digital video)
15H	Occasional video
16V	HBO Plus (East) {V2+}
17H	MoreMax (East) [V2+]
18V	Infomerica TV
19H	HBO Signature (East) [V2+]
20V	HBO Plus (West) [V2+]
21H	Gems Shopping Network
22V	Horse Racing (digital video)
23H	Occasional video
24V	Horse Racing (digital video)

Ku-band

Tr/Pol	Freq	Service
1H	11720	(none)
2V	11750	Data Transmissions
3H	11750	FM2 Services/Data Transmissions
4H	11780	(none)
5V	11810	Data Transmissions
6H	11810	(none)
7H	11840	DirecTV/EABC Services (digital)
8V	11870	Data Transmissions
9H	11870	Data Transmissions
10H	11900	Data Transmissions
11V	11930	MSNBC feeds
12H	11930	Occasional video
13H	11960	DirecTV/EABC Services (digital)
14V	11990	Data Transmissions
15H	11990	(none)
16H	12020	FM2 Services
17V	12050	The Racing Network (TRN) (digital)
18H	12050	Hong Kong TVB Jade Channel (videocrypt)
19H	12080	DirectPC (digital)
20V	12110	Data Transmissions
21H	12110	(none)
22H	12140	Data Transmissions
23V	12170	Data Transmissions
24H	12170	CCTV-4 China

Loral Orion Telstar 5 at 97 degrees West longitude

C-band

1V	Buena Vista syndication feeds
2H	Data Transmissions
3V	Occasional video
4H	Nebraska ETV [Digicipher]
5V	Occasional video
6H	Occasional video
7V	Occasional video
8H	ABC NewsOne Channel
9V	Fox network feeds (East) [LEITCH]
10H	Fox network feeds [LEITCH]
11V	Data Transmissions
12H	Occasional video
13V	Fox network feeds (East) [LEITCH]
14H	Occasional video
15V	Paramount feeds
16H	Paramount feeds/UPN network feed
17V	Data Transmissions
18H	Occasional video
19V	America's Collectibles Network (ACN)
20H	Occasional video
21V	ABC network feeds (West) [LEITCH]
22H	ABC network feeds (East) [LEITCH]
23V	Occasional video
24H	Occasional video

Ku-band

Tr/Pol	Freq	Service
1V	11728.5	Data Transmissions
2H	11735.0	Data Transmissions
3V	11789.5	Occasional video
4H	11796.0	(none)
5V	11836.0	Business TV
6H	11842.5	Data Transmissions
7V	11867.0	(none)
8H	11873.5	Business TV
9V	11898.0	Sky Vista DBS
10H	11904.5	First University (digital)
11V	11929.0	Occasional video
12H	11935.5	Data Transmissions
13V	11960.0	Ethnic television (digital)
14H	11966.5	Data Transmissions
15V	11991.0	Data Transmissions
16H	11997.5	Data Transmissions
17V	12022.0	Occasional video
18H	12028.5	Data Transmissions
19V	12053.0	Occasional video
20H	12059.5	Data Transmissions
21V	12084.0	Occasional video
22H	12090.5	The Filipino Channel (digital)
23V	12115.0	Ethnic television (digital)
24H	12121.5	Ethnic television (digital)
25V	12146.0	Occasional video
26H	12152.5	Ethnic television (digital)
27V	12177.0	Ethnic television (digital)
28H	12183.5	Spacecom FM2 Services

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Montoring Times NASA/Space Shuttle Mission Frequency Guide

By Bob Grove and Larry Van Horn

NASA GENERAL FREQUENCIES

Emergency Nets: 3385 3395 4604.5 6982.5 14455 (All kHz and USB)
HF air-to-ground: 3089.5 6743.5 9003.5 11192.5 15062.5 (All kHz and USB)
International Space Station-downlink frequencies:
VHF: 138-143.5 MHz (pending approval)
S-band: 2265.0
K-band: 15.003 GHz
NASA Air-to-Air: 123.050 123.125 (T-38 Interplane) 123.350 230.650 235.400 (T-38 Interplane)
NASA NCS HF net: 2360 3379 3388 5403.5 5821 5961 6106 6108 6809 9462 11801 12129 12219 13633 13744 13780 14836 14989 14908 15464 16201 16430 18744 20063 22983 23390 (All kHz and USB)
NASA Nationwide Assignments: 162.1125 162.9875 163.100 166.525 166.8375 167.0125 167.350 167.400 167.775 168.350 168.4125 168.9375 169.2125 171.5125 171.6375 172.0375 172.3375 172.9625 173.425 173.900
NASA/USAF Space Ground Link Subsystem (SGLS) (Downlink/Uplink):

Uplink	Channel	Downlink
1763.7210	Channel 01	2202.5
1767.7250	Channel 02	2207.5
1771.7290	Channel 03	2212.5
1775.7320	Channel 04	2217.5
1779.7360	Channel 05	2222.5
1783.7400	Channel 06	2227.5
1787.7440	Channel 07	2232.5
1791.7480	Channel 08	2237.5
1795.7520	Channel 09	2242.4
1799.7560	Channel 10	2247.5
1803.7600	Channel 11	2252.5
1807.7640	Channel 12	2257.5
1811.7680	Channel 13	2262.5
1815.7710	Channel 14	2267.5
1819.7750	Channel 15	2272.5
1823.7790	Channel 16	2277.5
1827.7830	Channel 17	2282.5
1831.7870	Channel 18	2287.5
1835.7910	Channel 19	2292.5
1839.7950	Channel 20	2297.5

Search and Rescue Operations: 282.8 (AM)
Solid Rocket Booster (SRB) Recovery Beacons: 240.0 242.0 (Data)
Shuttle Air to Ground:

139.300	FM voice to Mir
143.600	FM voice to Mir
145.840	Amateur SAREX downlink (FM)
243.000	Emergency only (AM)
259.700	Primary UHF (AM)
279.000	EVA channel (AM)
296.800	Secondary UHF (AM)
410.0-420.0	EVA (Unknown)
2106.4	S-band tracking
2217.5	Orbiter transmitter: PM TT&C
2250.0	Orbiter DFI transmitter: voice, data, video
2287.5	PM primary
15003.4 GHz	Ku-band telemetry

Shuttle Emergency Landing Site Net: 408.150 408.800
Shuttle Launch Support Inmarsat Nets (Reported frequencies on 15.5 West Atlantic satellite): 1535.975 1537.175 1537.975 1538.325 1538.750 (KSC Audio) 1540.375 1540.425 (KSC Audio) (All NFM)
Shuttle Launch Support UHF Military Satellite Nets: Several frequencies have been reported over the years. Check the following frequencies 261.800 261.950 263.625 (NFM)

FLORIDA

Brevard County Public Safety Trunk System This 800 MHz EDACS trunking system does have units on it from NASA and other government agencies/military services in the area of KSC/CCAS. The best information available on this trunk system I have found to date is on the East Central Florida Scanner Page maintained by John Gerstner at URL: **http://members.aol.com/_ht_a/mmahl1/scanner/bcso.htm.**

Canaveral National Seashore (National Park Service)

*164.750/164.250 (KID 767-New Smyrna Beach Ranger Station to Oak Hill repeater)
*164.750/164.250 (KID 768-Turtle Mound Ranger Station to Oak Hill repeater)
*164.750/164.250 (KID 717-Wilson Park Headquarters to Oak Hill repeater)
*163.125 *164.625 *164.750 (KL4614-Simplex)
Loggerhead Turtle Tracking System (National Park Service, very low power): 164.4375, 164.4625, 164.4875 164.5125, 164.5375, 164.5625, 164.5875, 164.6125, 164.6375, 164.6625, 164.6875, 164.7125.

Cape Canaveral Air Station, Florida

Air Force Office of Special Investigation (OSI): *138.075/139.675 138.175 141.525
Air Rescue Support: 138.450 "DoD Cape and Jolly/King aircraft" (AM)
Base Operations: *164.500 (ETR Net Y-"Base Ops" also Environmental Health Base)
Cape Tower (Skid Strip): *118.625/393.0 126.200 (AM)
Cape Control: *133.800/264.800 (AM)
CML/OFS: *142.125
Coast Guard maritime VHF frequencies:
*156.600 (Channel 12-CG Port Ops)
*156.800 (Channel 16-Maritime Distrass, Safety and Calling)
*157.050 (Channel 21)
*157.075 (Channel 81-CG Range Control, launch danger zone broadcast)
*157.100 (Channel 22-NTM, launch danger zone broadcast)
*157.150 (Channel 23-CG working, Port Canaveral-clear and DES)
*157.175 (Channel 83-CG Aux maritime surveillance)
Command Post: 165.1125 "Cape Comms"
Data Signals: *148.650 *1030 (IFF/SIF pulse every 14 sec.)
Eastern Test Range--Air-to-Ground Support (Aerial Refueling Jolly aircraft): 253.6 (AM)
Eastern Test Range--Command Destruct: *416.5 (data only)
Eastern Test Range--FTS Command Alert: *168.000 (tones)
Eastern Test Range--Instrumentation Net: *148.485 (ETR Net G-Photo/Timing/Countdown status reports - " Photo Control/Camera Ops/Timing Shop")
Eastern Test Range--Launch Support Operations: 163.4375/165.0625 (ETR Net L) *407.450
Eastern Test Range--Test Range Safety: *46.650 125.900 (Variety working Relay 1) 141.300/294.6 (Cape Leader simulcast or autocat repeater)
Eastern Test Range--Air/Ground Test Range Support: 229.0 270.0 (AM)
Environmental Health: *164.500 (ETR Net Y also see Base Ops above)
FACSFAC Jacksonville (Navy) Warning Area Coordination Net: *120.950 133.950 134.650 135.825 *267.5 270.6 *284.5 307.2 *349.9 369.9 385.1 (AM)
FCA Net: 163.5875 (ETR Net H)
Harbor common: 2716 kHz (USB)
Launch Support (weather alerts, etc) 163.5125 (ETR Net B including Cape Police/Whiskey Control)
Low Enforcement: 164.200 (Channel 2) *165.0875/163.000 (Channel/ETR Net Z Repeater DES/clear voice-Cape Security/Police) *170.125/171.975 (Channel 5/Repeater DES/Clear voice-"Cape Security")
Marine Distress/Safety (NMA 10-US Coast Guard): 156.800 (Marine Channel 16)
Paging System: 165.0125 (ETR Net S)
Range Fire Net: 163.5625 (ETR Net F)
Search and Rescue: 282.8 (AM) Autocat relay heard on 349.6
Security Alarm Maintenance: *407.225
Space Ground Link Subsystem (SGLS)-See listing in NASA General Listings Above
Spoce Shuttle Range Support: *294.6 AM)
SRB Recovery Ship Eastern Test Range HF Radiotelephone Net: 2716 2356 2622 2638 2715 2763 2799 2820 2836 3187 3365 5810 kHz (USB)
SRB Recovery Ship Eastern Test Range VHF Radiotelephone Net:
156.025 Marine Channel 60
156.050 Marine Channel 01
156.100 Marine Channel 02
156.125 Marine Channel 62
156.150 Marine Channel 03
156.175 Marine Channel 63
156.200 Marine Channel 04
156.225 Marine Channel 64
156.250 Marine Channel 05
156.275 Marine Channel 65A
156.300 Marine Channel 06
156.325 Marine Channel 66A
156.350 Marine Channel 07A
156.375 Marine Channel 67
156.400 Marine Channel 08
156.425 Marine Channel 68
156.450 Marine Channel 09
156.475 Marine Channel 69
156.500 Marine Channel 10
156.525 Marine Channel 70
156.550 Marine Channel 11
156.575 Marine Channel 71
156.600 Marine Channel 12
156.625 Marine Channel 72
156.650 Marine Channel 13
156.675 Marine Channel 73
156.700 Marine Channel 14
156.725 Marine Channel 74
156.750 Marine Channel 15
156.850 Marine Channel 17
156.875 Marine Channel 77
156.900 Marine Channel 18A
156.925 Marine Channel 78A
156.950 Marine Channel 19A
156.975 Marine Channel 79A
157.000 Marine Channel 20
157.025 Marine Channel 80A
SRB UHF Locator Beacons: 240.0 242.0
TV Operations Net for Eastern Test Range Launches: *148.035
Utilities: *150.195 (ETR Net C-"Cape Support") *150.250(ETR Net E-"Ready Base")
Weather Balloons (Rawinsonde): *403.0 (Data; pulse tones) *1680 (Rawinsonde Weather Balloon, pulse every 4, 10 sec.)

Kennedy Space Center, Florida

Late Breaking News: KSC is now testing its new Motorola 400 MHz Astro Digital Trunking System. Expect major changes to this list in the future as users are placed on this system. At the present time there is no scanner on the market which will successfully

decode a Motorola Astro Digital System nor is any expected to market in the near future.

Base Frequency 406.0 MHz, offset 12.5 kHz
406.6375 (Control) 406.8375 407.8375 408.0375 408.4375 408.6375 409.025
Other control channels noted: 406.2375 406.375 409.6375
Known Talk Groups:
48 Fire Department (simulcast 173.5625)
4432 Security (simulcast 173.6875)
Administration (Loan Pool): *173.5375 (NASA Net 111)
Air Rescue Support: 138.450 "DoD Cape" (AM)
Air Traffic Control Radar: *1250.0 (erratic pulses)
Air Traffic Control Radar Beacon System (ATCRB): *1030.0 (Pulse every 14 sec.) and 1090.0
Base Communications Net: *170.150 (NASA Net 107)
Civil Air Patrol: *148.150 (Repeater output and simplex)/143.900 (Repeater input) 127.3 Hz PL
Civil Engineers/Parking Control/Utilities Maintenance Net: *171.000 (NASA Net 101) [Bravo Control/Eagle Control/High Voltage Control]
Crane Operations: *407.100 *409.525 409.775
Crane Telecommand: 408.49375 408.96875
Crawler Transport System: *916.0 (Pulses every 3, 3, 8 sec.)929.0 939.000
Department of Energy Support Net: 167.925
Fire/Rescue/Crash: *173.5625 (NASA Net 116/channel 1) *173.7875 (NASA Net 216-tactical channel 2)
Flight Service Station: *123.600 Melbourne FSS (AM)
Fuels/General Maintenance Net: *171.150 (NASA Net 201)
Helicopter control: 284.000 (AM)
Industrial Area Pool Frequencies: 412.825 (UHF-1)
412.950 (UHF-2)
413.025 (UHF-3)
413.150 (UHF-4)
*413.250 (UHF-5)
413.375 (UHF-6)
413.525 (UHF-7)
413.550 (UHF-8)
Installation Safety: *173.4625 (NASA Net 205)
Launch Support Operations/Refueling: *162.6125 (NASA Net 104)
Launch Pad Safety: *173.6625 (NASA Net 105)
Marine Operations/Transportation: 162.0125 (NASA Net 306)
Measurements/Safety: *165.1875 (NASA Net 102)
Medical Net: *173.4375 (NASA Net 117) UHF Medical Net operates out of Patrick AFB
Merritt Island Non-Directional Aeronautical Beacon (NDB) COI - 247 kHz
Miscellaneous NASA Net: *173.6375
Microwave Scan Beam Landing System (MSBLS) testing: *165.6125 (NASA Net 202)
NASA Weather Instrumentation Net (Data): *409.925 413.050
Orbiter Operations/Shuttle Support: *165.4125 (NASA Net 110)
Paging (voice/digital): *170.350 (NASA Net 308)
Public Affairs/Hurricane Operations: *163.5375 (NASA Net 108)
Public Affairs Media coordination/STS TV Coordination Net: *171.2625 (NASA Net 408)
Rail transportation: 413.125
Remote camera control (data signal provides camera status to control facility): 407.575 412.850 *932.00625 (Pulse every 3.8 sec.) 941.00625 [Multipoint-to-point operations]
Sandia Labs Simplex Support Frequency (DOE): 167.850 *168.450 (Tone)
Safety Net: 173.8625
Satellite/Payload Maintenance: 413.325
Search and Rescue: 282.8 (AM)
Security: *173.175 (NASA Net 203/Tactical 2-"Control") *173.6875 (NASA Net 103-Law Enforcement/Patrol-"Control")
Shuttle Landing Facility
121.5 (Civilian Guard/Emergency)
243.0 (Military Guard/Emergency)
121.750 (Ground Control)
259.7 (Orbiter to ground)
279.0 (Orbiter to ground/EVA)
296.8 (Orbiter to ground)
128.550/284.0(Tower-Local/Helicopter Control)
123.6 (Civilian Traffic Advisory)
134.950/239.725 (Daytona Approach/Departure Control) (All AM mode)
Shuttle Launch Air Support: *126.65
Shuttle Rail and Special Trucking Net: *170.175 (NASA Net 206)
Solid Rocket Booster (SRB) Recovery Beacons: 240.0 242.0 (Data)
Space Shuttle Ground Support Nets:
407.325 (UHF-1)
*407.475 (UHF-2)
408.150 (UHF-3)
408.175 (UHF-4)
408.800 (UHF-5)
409.050 (UHF-6)
409.125 (UHF-7)
409.175 (UHF-8)
Supply/Vehicle Maintenance: *150.325 (paired with 173.4875) *170.400 (NASA Net 106)
TACAN: 1146.0 (Titusville-TTS Channel 59Y)
Traveler Information Service (TIS): 1320 kHz (AM-10 watts)
U.S. Customs Service: *165.2375/166.4375 (Repeater output-talk around/input) 166.4875 (Simplex)
VAB to crawler transport duplex channels: 407.600 and 412.975 (Crawler No 1) 408.025 and 413.825 (Crawler No 2)
VAB crane operation: 410.1375 *410.8625 (Data)
Weather instrumentation (telemetry) net: *409.925 *413.050
Wind telemetry system: 418.075
Wireless mikes: 169.505 170.245 171.045 171.905

Shuttle Launch Nets/Frequencies

Net Frequency Usage
101 171.0000 Utility Management/Civil Engineers/Parking Control
102 165.1875 Measurements/Safety
103 173.6875 Security (Low Enforcement/Patrol)
104 162.6125 Launch Support Operations
105 173.6625 Launch Pad Safety
106 170.4000 Supply
107 170.1500 Operations
108 163.5375 Paging/PAO/Hurricane Operations
110 165.4125 Orbiter Operations
111 173.5375 Administration: Loan Pool
116 173.5625 Fire/Rescue Dispatch
117 173.4375 Medical Net
201 171.1500 Maintenance
202 165.6125 MSBLS/Telemetry
203 173.1750 Security (Tactical 2)
205 173.4625 Installation Safety
206 170.1750 Base transportation/Railroad Operations
216 173.7875 Fire Rescue (Tactical)
306 162.0125 Marine Operations/Transportation
308 170.3500 Base Paging (Voice)
408 171.2625 Camera Recording Coordination Net

Malabar, Florida

Air Force emergency hurricane net: 3365 4900 5350 7412 10305 (All kHz)
Air Force Maintenance Control: 149.500 (Also at CCAFS)
Eastern Test Range clearance function: 2638 kHz (USB)
Eastern Test Range Communications to Ascension/Antigua: *6937 7833 9043 9132 10310 11104 11407 11414 11548 11622 13878.0 13986.1 14559.5 14896 14937 15610 17490 17668 18196 18237 18355 18769 19304 20189 20195 23413 23581 24240 24760 27720 27870 (All kHz)
Eastern Test Range Control (Cape Radio): 2622 3041 5810 7672 7765 *10780 11615.5 13878 20195 20390 (All kHz)
Federal Aviation Administration (FAA) Net: 172.850 (repeater output/169.250 repeater input) 166.175 172.175
Harbor common: 2716 kHz (USB)
Navy Atlantic aircraft: 3120 4828 5718 6693 6708 6723 9006 11205 11252 13227 13237 15021 15051 15057 15067 18009 (All kHz and USB)
Navy Atlantic ships: 4521 4766 4856.5 5246 6897 7461 7676 9043 (All kHz and USB)
Navy Atlantic ships/aircraft: 2836.5 kHz (USB)
Navy Surface Radar: *1250 MHz
Solid rocket boosters recovery vessels: 2356 2622 2639 (Inter-ship ops) 2716 (Harbor Ops) 2764 2800 2820 2837 3187 3365 5180 5190 5810 (All kHz) (plus various VHF marine channels)
Space shuttle support: 5187 kHz (USB)

Melbourne, Florida (Miscellaneous)

Data: *908.000 (Pulse every 1, 3, 5 sec.)
FAA: *269.300 *348.700 *379.250 *998.000 (Pulse every 14 sec.)
FAA DME: 998.0
FBI: *167.7875 (Repeater output)
National Weather Service broadcasts: 162.550
U.S. Air Force: *141.850 (Unmodulated carrier)

Merritt Island National Wildlife Refuge

164.650/163.150 US Fish and Wildlife Repeater
164 650 US Fish and Wildlife Simplex

Patrick AFB, Florida

920th Rescue Group Operations: 255.5 311.0 (King/Jolly-ARs) 321.0 "Rescue Ops"
920th Rescue Group Maintenance: *149.300/148.100 148.175 163.5875 164.175
920th Rescue Group Pararescue Training: 413.300
920th Rescue Group SAR Contingency/Training: 236.0 251.9 (Judy Drop Zone)
Administrative (Navy): 138.375
Air Force Military Affiliate Radio System (MARS): 142.150 *143.450 (Repeater output)
Air Force Office of Special Investigations: 138.075/141.525 138.175/141.525 407.400 413.350 413.475
Air Force Reserve training: 138.275 138.475 (AM)
Air National Guard administration: 408.000 408.050
Air National Guard maintenance: 141.625
Approach/Departure Control: *132.65/281.425 *134.95/239.725 (AM)
ARIA Aircraft Radar: 1441.5
ATC Approach Radar: *1265.0 *1345.0 (wideband sweep pulse)
Automatic Terminal Information Service: *119.175/273.5 (AM)
Civil Engineers: *171.3875 173.4125 173.5125
Clearance Delivery: *118.400/289.400 (AM)
Command Channel: 407.525 413.225 413.400
Commanders Net: *149.535 148.065
Command Post: 311.0 321.0 (AM)
Communications/Navaid Repair: 413.000
Consolidated Command Post (call sign Maycap): 138.3/383.0 (AM)
Contingency (Eastern Test Range): 141.725
Control Tower: *133.750/348.400 127.100 132.600 269.200 372.800 378.800 (AM)
Eastern Test Range Control: 46.850 49.850 324.7 (AM) 340.8 (AM) 407.300 413.100
FAA flight check: 135.850 (AM) Flight Surgeon Control: 413.875/??
Fire: 172.300 (Tactical 2-Simplex) *164.700/173.5875 (Tactical 1-Dispatch)
Fire Alarm: 138.925 (data)
Fuel Farm: *165.1625
Geodetic Survey Detachment 4: 141.475/143.075 142.475
Ground Control: *124.350/335.800 (AM)
ILS Glide Slope: 330.8 (Rwy 20) 331.4 (Rwy 2)
Launch Operations (ETR): 266.2 308.95 320.050 (AM) 413.500
Marine Channels: 156.300 (Inter-ship) 156.575 (Boat Safety) 156.800
Medical: 173.4375 also UHF MED 1-10 channel pairs (462.950/468.950-463.175/468.175)
Motor Pool/Taxi: *165.1375
NASA ER-2 Operations: 138.025 290.800 328.025 378.800
Navaid Maintenance: 407.375
NORAD Air Defense Air-to-Ground: 148.125 282.400 364.200 (AM)
Paging: 142.675 931.8375 (digital, leased)
Pilot-to-Dispatcher (PTD): *122.850/372.200 (AM)
Radar (IFF): 1030.0
Ramp Control/Base Operations: *173.125
Regional Approach Control: *290.8 297.2 358.3 369.2 372.8 378.8 (AM)
Search and Rescue: 236.0 251.9 252.8 (AM)
Security: *163.4875 (Tactical channel 2) *173.025 (Tactical channel 1) 407.425
Security (AFTAC): *413.275
Supply and Transportation: *149.265
TACCS training: *412.875
Training: 138.400 139.650 139.700 141.600 142.300 143.800 148.050
Training Operations: 225.350 316.275 351.2 *363.9 383.2 385.7 395.1 (All AM)
Weather (Metro): 344.6
Weather Balloon Telemetry: 1680.0
Wireless Mike: 170.305

NOTE: The following list of NASA and associated frequencies is the most accurate and up to date in publication. Distribution of this document is prohibited on the internet/packet radio/email groups in any form unless approved by the copyright holders. This is an excerpt from the comprehensive listing posted at **www.grove-ent.com/nasa.html**

Ken Reitz, KS4ZR
ks4zr@firstva.com

Tuning In SCPC Radio Broadcasts

Those familiar with C-band satellite TV systems know all about the many audio subcarriers which are found on various channels throughout the C-band universe. Less known, but certainly as interesting, are the very narrow band audio services known as Single Channel Per Carrier or SCPC.

These transmissions are characterized by their FM signals which are sent on a particular frequency on a transponder of a given satellite by way of its own carrier. Regular audio subcarrier transmissions are sent up to the satellite on the whole carrier which can include the video and up to a dozen subcarriers. The point here is that all activity on the transponder is uplinked from the same location. All the SCPC carriers on the same transponder can originate from dozens of different locations. This is one of the things that makes it different from the audio subcarriers tunable on most satellite TV receivers.

Universal's SCPC-200 receiver, a stand-alone SCPC receiver which features built-in companding, 50 channel memory, tuning LEDs, line or 8 ohm speaker output. (Courtesy Universal Electronics, Inc.)

Another thing that's different is the much narrower bandwidth it occupies. While only a few subcarriers can ride the video carrier of a satellite channel, dozens of SCPC signals can be on a transponder at a time. There are other differences as well, but one of the biggest is cost. SCPC transmissions are very cheap compared to audio subcarrier rates. Incidently, if the service wants to up link a stereo signal, two separate SCPC carriers have to be sent, one carrying the information for the left channel and the other for the right.

❖ Who Goes There?

For a complete list of current SCPC services check out June *MT* pages 72-73 under the "Satellite Radio Guide." The Single Channel Per Carrier (SCPC) Services listing appears in even months and is long and varied. From shortwave's *Voice of Free China* to *Motor Racing Network* there are nearly three dozen on Galaxy 4R channel 3 alone. You'll also notice quite a few radio stations, many of them among the oldest broadcasters in the country. While many are here year round many others are only on the satellite during sporting events for which they are the flagship station. Depending on the season and sport, there may be considerably more services on board than listed. On other satellites there are more special interest transmissions, as seen with the in-store services on SBS 5 or NASA space shuttle audio which is heard only during missions.

Anik E2 is home to quite a few SCPC services in English, French and native Inuit languages. These transmissions originate in some of the more far flung reaches of Canada including the Yukon Territory and programming includes music and local news as well as news from CBC's National News Service.

Transmissions on C5 channel 3 include many state news and sports networks mostly from the West and Midwest. During the day it's livestock and agriculture news and at night, depending on the season, you'll hear college football or basketball. C5 is the westernmost satellite which can be seen from most of North America, but, at 139°W, it's a difficult catch from the East Coast. In addition, there's no video programming which can be seen from the Continental U.S. so just locating the satellite may be difficult for some. Many dealers don't even bother programming this bird into the receiver.

Up until just a few years ago there were considerably more SCPC services available as all the National Public Radio channels were on G4. Like many other radio network services, NPR switched to a digital SCPC transmission mode. These require special digital SCPC receivers which are expensive and not widely available.

SCPC Audio Services (C/Ku-band)

Satellite	Location	Type of Service
C5	139°W	Numerous state news and sports
SBS5 (Ku)	123°W	In-store network
Anik E	111.1°W	In-store network
Solidaridad 1 (Ku)	109.2°W	News, music (Spanish)
Anik E2	107.32°W	English, French, Inuit languages
G4	99°W	Numerous state news and sports
GE-2	85°W	Space Shuttle audio during missions

❖ How To Tune In

There are several ways to tune into SCPC signals. One is to buy a receiver such as the Universal SCPC-200 which can be used either with your current receiver or as a stand-alone receiver with its own dish. Another way is to buy a Uniden SQ590 which is a full function C/Ku-band satellite receiver which also happens to have an SCPC tuning module on-board. A third way is to use an older satellite receiver which has a 70 MHz output on the back and incorporate a TV band radio to do the tuning. Each method has its advantages and disadvantages so let's take a look at all three.

The **Universal SCPC-200** has all the advantages, since it has been designed and built for the SCPC industry. It features 50 channel memory, 10 kHz tuning steps, built-in automatic companding, and a way to write the service name with the memory channel. The sensitivity and stability of this receiver are extraordinary.

One of the big advantages is ease of operation. The SCPC 200 can be hooked up to your current receiver via a 950-1450 pass through connection so that a splitter is not necessary. Simply use your C-band receiver to turn the dish to the satellite on which you want to listen to SCPC signals, turn on the SCPC 200 (with its output connected to a speaker or stereo system) and start tuning the transponders for signals. If you've already added the services to memory then simply scroll through the memory bank and select the service you wish to listen to. If the receiver is on the right satellite and correct polarity the service will be where the memory indicates.

The **Uniden SQ590** is a satellite receiver no

longer in production, yet still quite available. It's no contradiction: Skyvision has purchased the remaining factory sealed SQ590s from Uniden and has made them available from their mail order TVRO service.

In addition to being a full featured C/Ku-band satellite receiver with stereo audio, remote control and a host of special features such as picture-in-picture, video scan, VCII module ready, and on-board StarSight on-screen TV guide. But, the thing that sets this unit apart from any other satellite receiver made is the on-board SCPC module. For a complete review of this receiver see the September 1999 issue of *MT*, pages 66 and 67.

The third method is to use an older **satellite receiver which has a 70 MHz loop on the back** of the receiver. These loops were common in receivers from the 80s and early 90s but were left off most receivers in the mid to late 90s. Originally intended as accessory loops to add terrestrial interference filters and the like, the loops also made it possible to tune SCPC signals by simply attaching a TV band radio to the loop and tuning the lower segment of the TV band on the radio.

The reason this works is that the output of the loop contains the frequencies on the entire band occupied by satellite channels 1 through 24. Originally downlinked from the bird in the 3-4 GHz band the signals are converted to 950-1450 MHz at the down converter at the dish and sent to the receiver on coax. A secondary IF (intermediate frequency) of 70 MHz is made available at the loop on the back of these receivers which gives the listener access to the FM SCPC signals which are tuned on the TV band radio which covers the 70 MHz region.

To hook up the TV band radio take the output of the loop and feed it into a TV band splitter; take one of the outputs and feed it (with coax) to the antenna of the TV band radio; take another piece of coax and put it on the other leg of the splitter and feed it back into the loop. Now, with the satellite receiver turned on and tuned to a channel on a satellite which carries SCPC signals, tune around the VHF portion of the TV band radio and you'll hear the SCPC signals.

This system of tuning SCPC has a few drawbacks. It does not allow tuning of all signals which are on a given transponder; only the most powerful will be heard and there will be little or no space in between signals. Still, it's a cheap and easy way to get into this type of listening.

One of the advantages to the Universal SCPC 200 is that the output from the receiver can power an LNB which means that it's possible to use the system as a stand-alone SCPC system with a fixed dish and LNBF feeding the SCPC 200. This means that your family can use the big dish for their satellite programming while you listen to sports on SCPC. I've used several SCPC receivers and arrangement with a dish as small as 4.5-ft. with excellent results.

Of course, not all SCPC signals are up linked with the same power, bandwidth and companding characteristics, so the bigger the dish the better the signals. Still, it's fun to have a dish set up just for listening to the radio.

Sources for SCPC receivers

A thorough treatment of SCPC reception appeared in the March 1999 issue of *MT* (pages 20-25) entitled "Tuning In To Radio Via Satellite." A number of the sources listed at the end of the piece are out of date.

The SCPC-200 is available from Universal Electronics, Inc. 4515 Little Savannah Road P.O. Box 2648 Cullowhee, NC 28723-2648. Phone: 800-241-8171 (Orders) 828-293-2222 (Tech). Cost: $399 plus shipping and handling.

The Uniden SQ590 is available from Skyvision 1010 Frontier Drive Fergus Falls, MN 56537 Phone: 800-543-3025. Web site: **www.skyvision.com**. Cost: $500 plus shipping and handling, with the StarSight Guide module $530 plus S&H. This unit is often discounted.

Older receivers with 70 MHz loops can be found at hamfests or at your local C-band satellite dealer. Expect to pay $50-$100 for one in working order.

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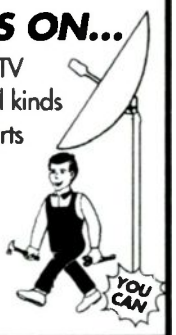

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VIEW FROM ABOVE

WATCHING THE WEATHER SATELLITES

Lawrence Harris
Lawrence@itchycoo-park.freeserve.co.uk
http://www.itchycoo-park.freeserve.co.uk/wxsats.html

The Launch of GOES-L

I found myself counting the days to the launch of GOES-L on May 3, feeling the tension rise when the possibility of a postponement due to Shuttle launch requirements was raised. Fortunately all went well and launch went ahead during the launch window.

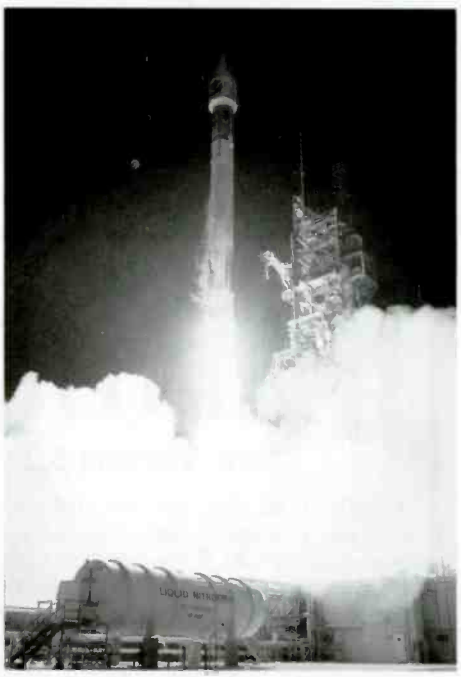
The GOES-L satellite was transported to Astrotech in Titusville, Florida, for final testing at Space Systems Loral. After moving into a building at Astrotech, its imaging system, instrumentation, communications and power systems were tested. The solar panels were tested by illumination, in order to confirm the circuitry was operating properly. One month before launch, GOES-L was transported to the Cape aboard the C-5 air cargo plane at Cape Canaveral Air Station.

GOES-L was launched aboard a Lockheed Martin Atlas II rocket, the fourth of a new advanced series of geostationary weather satellites for the National Oceanic and Atmospheric Administration (NOAA). It is a three-axis, inertially stabilized spacecraft that will provide high resolution pictures and perform atmospheric sounding at the same time. The satellite is now in the on-orbit checkout phase, and will later provide backup capabilities for the existing, aging operational satellites. In orbit, the satellite is renamed GOES-11, joining GOES-8, GOES-9 and GOES-10 as part of the WXSAT constellation.

GOES-L at Astrotech – image courtesy NASA

Figure 1 shows the GOES-L weather satellite at Astrotech, sitting on a work stand, ready to be encapsulated for transfer to Launch Pad 36A, at Cape Canaveral, Florida.

Launch of the Atlas II/Centaur rocket carrying the NASA/NOAA weather satellite GOES-L occurred at 3:07 a.m. EDT. The primary objective of the satellite is to provide full capability in on-orbit storage, in order to assure NOAA continuity in services from a two-satellite constellation. Launch services were provided by the 45th Space Wing. It will complete its 90-day checkout in time for availability during the 2000 hurricane season – should that be necessary.



Launch of GOES-L – image courtesy NASA

❖ Operational Duties

Some sections of the media appear to have misunderstood the actual function of GOES-L – describing it as becoming an operational satellite. Although readiness to provide images during this year's hurricane season is the goal, it is not planned to be used in this manner. GOES-8 and GOES-10 are the operational satellites and are expected to continue to provide routine imaging during the season. Only if one satellite fails would GOES-11 (as it will be called by then) be brought into active service.

The web page http://www.met.fsu.edu/explores/GOESL/assembly.html provides several pictures of the preparation for launch of GOES-L.

❖ Volcano eruption predictions from GOES

If images from GOES are studied carefully, even the non-meteorologically trained observer (such as me!) can see that they contain a wealth of information. Visible-light images show the current positions of all weather systems throughout the Pacific ocean (in the case of GOES-10) and across continental USA (from GOES-8). Infrared (thermal) images, however, hold the clue to much more useful information. During a recent study of information provided by the Hawaii university web server, I was fascinated to read about their computing facility that monitors GOES images.

University of Hawaii scientists are using GOES infrared images to look for signs of impending volcanic eruptions. On May 20, 1998, the Guatemalan volcano Pacaya erupted an ash cloud that blanketed Guatemala City and the local airport, some 19 miles away. Volcanologist Luke Flynn and his team of scientists were monitoring GOES thermal images and noticed that seven days before the eruption, the volcano started to heat up. GOES infrared images revealed the temperature rise, and an automated computer system at the university acted as an eruption alarm by identifying any "hot spots" in the satellite data.

GOES images are transmitted to ground stations every 30 minutes, enabling the study of volcanoes and other hot spots such as forest fires. The data is therefore of great benefit to hazard mitigation agencies. The U.S. Geological Survey's Hawaii Volcano Observatory uses the University of Hawaii Hot Spot Image web site to follow eruptions on Kilauea and Mauna Loa:
http://virtual1.pgd.hawaii.edu/goes/hawaii/latest.shtml
Real time imagery for continental U.S. is available at:
http://www.cira.colostate.edu/ramm/goes39/cover.htm

❖ Fire monitoring

National Oceanic and Atmospheric Administration (NOAA) scientists assist fire fighting efforts in drought stricken Mexico and Florida when required. Obscured by dense smoke in Florida, and hampered by the terrain and the need to cover large areas in Mexico, GOES data has been used to locate the active fire cores and aid in fire suppression activity, saving lives and property.

GOES-8 monitors remote areas of the Amazon Rainforest, and the whole of South America, observing thousands of fires that burn every day

during the dry season. Elaine Prins, a NOAA research Meteorologist at the University of Wisconsin-Madison uses the WXSAT as a fire alarm to tell scientists and government agencies where, how big, and how hot fires are burning. When GOES detects an area heating up, information is sent directly via the Internet every three hours. In South America, most fires are caused by humans; in North America, lightning is usually responsible. More information on the GOES Biomass Burning Monitoring Program is described at: **http://cimss.ssec.wisc.edu/goes/burn/abba.html**

❖ Operational WXSATs

I did not notice the date on which Resurs 01-N4 transmissions became degraded, but during early May, the resulting picture quality was considerably reduced. Meteor 3-5 however, is still providing quite reasonable quality images – see figure 3 – despite its age. In this image, the satellite is passing north-bound from north-Africa, across France and into Scandinavia. A couple of points about this image: firstly it has been considerably contrast enhanced. The original image was set correctly for reception – that is, a full dynamic range from black-to-white was set up.

Both Resurs and Meteor satellites produce image data using sensors that are more responsive to clouds and snow scenes – leaving land gray levels less emphasized. Using contrast expansion to enhance the darker levels brings out the true detail otherwise "hidden" in the image. The result is that higher resolution land detail becomes visible in Meteor and Resurs images after contrast adjustment. NOAA WXSAT APT includes two spectral images within the same line-scan time (half-second) hence the resolution difference.

Meteor 3-5 1113UTC May 7, 2000

It is interesting to note that the original (raw) image occupied 6.8 Mb in bitmap (BMP) format. By saving in JPG format (a compression factor of 20 was selected) the file size was reduced to 554 kb, with little, if any, loss of resolution.

❖ NOAA-12 and NOAA-15

For several months, APT from NOAA-12 has been switched off. This was because the footprints of the two WXSATs were overlapping. As pointed out by a correspondent to the *'wxsat-l'* mailing list, the two footprints have now separated. Although originally scheduled for reactivation in September, switch-on of the APT was brought forward to May 17, 2000.

❖ Okean-O – Resurrection?

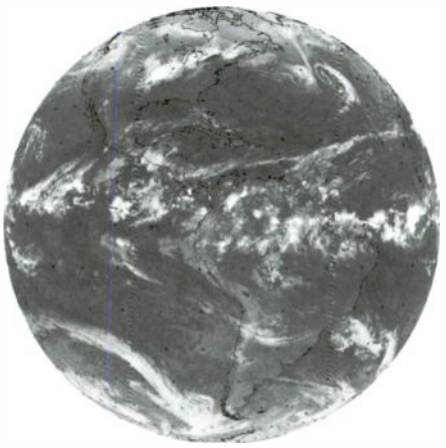
This oceanographic satellite was reported "dead" some months ago, but a message from Peter Wakelin on the *wxsat-l* WXSAT mailing list was the first of several reporting a transmission on May 7. Transmissions usually occur over Europe and last only a few minutes.

A few years ago, **Alex Ivanov** contacted the WXSAT mailing list (on the Internet) and provided some information about the Okean and Sich satellites. He works with both PLANETA and RD Center SCAN (a private firm producing APT/HRPT/WEFAX ground stations). He confirmed that short (radar) transmission intervals were due to system design features. "MSUS permanent operation time must not exceed 30 minutes, with the following pause not less than 70 minutes. Side-Looking-Radar permanent operation time must not exceed 15 min with the following pause not less than 30 minutes ...." and so on. I presume that in this context, the word 'permanent' means 'continuous.'

The MSU-SK unit is a multi-spectral, medium-resolution, scanning radiometer. There are two of these – a forward-looking scanner, and a backwards-looking scanner. Data from the radiometers is transmitted on the 8.2 GHz downlink.

Alex commented that the satellites were designed for internal use in USSR Meteorological service (ice cover in polar regions being the main scope). PLANETA deputy director Dr. Zhupanov had told Alex that there were "few transmissions over North America in a framework of demonstrative joint projects in the past [though] something like that may happen in the future."

Some transmissions include radar from the RLSBO – a side-looking radar. There are two units – RLSBO (R) with right-side looking and RLSBO (L) with left-side looking radar. The operating wavelength is 3.1 cm, producing a swath width of 455 km. This instrument allows the whole of earth's surface to be mapped by radar. It is "power hungry," so radar scans have limited continuous operation time, as confirmed by Alex Ivanov's comment. This is the radar picture that we sometimes see in multi-spectral images from Okean-O.



GOES-8 infrared image May 9, 2000. Infrared images permit continuous monitoring for the detection of thermal changes.

Frequencies

NOAA-14 transmits APT on 137.62 MHz
NOAA-15 transmits APT on 137.50 MHz
NOAAs transmit beacon data on 137.77 or 136.77 MHz
Meteor 3-5 may transmit APT on 137.30 MHz when in sunlight
Resurs 1-4 transmits APT on 137.85 MHz
Okean-O, Okean-4 and Sich-1 sometimes transmit APT briefly on 137.40 MHz
GOES-8 and GOES-10 use 1691 MHz for WEFAX

NOTICE: It is unlawful to buy cellular-capable scanners in the United States made after 1993, or modified for cellular coverage, unless you are an authorized government agency, cellular service provider, or engineering/service company engaged in cellular technology.

Full 800 MHz Scanners
AOR AR-8200(unblocked)
Wideband Portable receiver
- 0.5 to 2040 MHz continuous.
- NFM, WFM, NAM, WAM, USB, LSB & CW
- Alphanumeric memory indentification
$699US - Spectrum scan - Computer control
- Flexible dynamic memory bank layout
- Optional CTCSS & Extra memory boards
ALINCO DJ-X10(unblocked)
Wideband Portable receiver
- 0.1 to 2000 MHz continuous.
- NFM, WFM, AM, USB, LSB & CW
- Alphanumeric memory indentification
$499US - Channel scope - 1200 memory channels
- Superb sensitivity, Clear sound
- Various scanning modes - Menu system
ICOM PCR-100-08
Wideband receiver for PC
- PCR-100 can be used with your Desktop or Portable PC
- 0.1 to 1300 MHz continuous.
$229US - Modes AM, FM & WFM - Built-in tone squelch
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Radioworld
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FAX :(416) 667-9995 Website Address:
sales@radioworld.ca http://www.radioworld.ca
4335 Steeles Ave. W., Toronto, ON Canada M3N 1V7

Larry Van Horn, N5FPW
email: larry@grove-ent.com

Postal Inspection Service Profile

As one of our country's oldest federal law enforcement agencies, founded by Benjamin Franklin, the United States Postal Inspection Service has a long, proud and successful history of fighting criminals who attack our nation's postal system and misuse it to defraud, endanger or otherwise threaten the American public. Congress empowered the Postal Service "to investigate postal offenses and civil matters relating to the Postal Service."

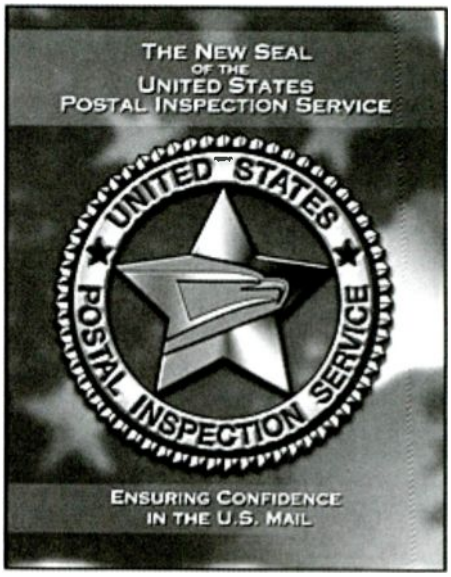
As fact-finding and investigative agents, Postal Inspectors are federal officers who carry firearms, make arrests and serve federal search warrants and subpoenas. Inspectors work closely with U.S. Attorneys, other law enforcement agencies and local prosecutors to investigate postal cases and prepare them for court. There are approximately 2,200 Postal Inspectors stationed throughout the United States, and they enforce over 200 federal laws covering investigations of crimes that adversely affect or fraudulently use the U.S. Mail and postal system.

To assist in carrying out its responsibilities, the Postal Inspection Service maintains a Security Force staffed by 1,400 uniformed Postal Police Officers who are assigned to major postal facilities throughout the country. The officers provide perimeter security, escort high-value mail shipments and perform other important protective functions.

Basic training for Postal Inspectors, refresher courses and specialized courses are conducted at the Postal Service's William F. Bolger Center for Leadership Development in Potomac, Maryland. The training academy has on-site dormitory, dining, classroom, fitness and firearms facilities. All Inspectors undergo 14 weeks of basic training, which covers investigative techniques, defensive tactics, firearms, legal matters, search and seizure, arrest techniques, court procedures, postal operations and a detailed study of the federal laws over which the Postal Inspection Service has jurisdiction. Postal Police Officers undergo a basic training course at the Federal Law Enforcement Training Center at Glynco, Georgia.

The Postal Inspection Service operates five forensic crime laboratories, strategically located in cities across the country. The labs are staffed with forensic scientists and technical specialists, who assist Inspectors in analyzing evidentiary material needed for identifying and tracing criminal suspects and in providing expert testimony for cases brought to trial.

The Inspection Service's 900 professional and technical employees, who include forensic specialists, program analysts, financial analysts and others, play a vital role in supporting the audit, criminal investigation and security functions of the Postal Inspection Service. They perform a wide variety of tasks, including developing and maintaining management systems, providing forensic examinations of evidence, developing, procuring and deploying electronic security and surveillance equipment, publishing policy handbooks and consumer awareness guides and brochures, supplying photography and video services and providing direct contact with Congress and the public.



The National Headquarters offices of the Postal Inspection Service are organized into functional groups that report to Deputy Chief Inspectors for Business Investigations, Criminal Investigations, Administration, and Professional Standards & Resource Development. The Postal Inspection Service has 18 field divisions, which report directly to two Deputy Chief Inspectors for field operations. Field offices are supported by five Inspection Service Operations Support Groups.

The Postal Inspection Service's national information technology infrastructure features distributed processing and cluster technology, and supports over 4,500 users at more than 220 sites nationwide. Postal Inspection Service offices are linked nationally via a dedicated frame-relay network with on-line connections to the Postal Service, the National Law Enforcement Telecommunications System, the National Crime Information Center and the Internet.

The service also operates an extensive UHF communications network. While the Service's old VHF allocations still have some activity, most of the communications have moved to the UHF spectrum. The profile below is a complete breakdown on the US Postal Inspector Service communications network.

U.S. Postal Inspector Service Radio Networks

40.070	Nationwide (Simplex)
169.850	Nationwide (Simplex and repeater output)
169.850/169.000	Nationwide
169.850/170.600	Nationwide
170.175	Nationwide (Simplex)

Miscellaneous VHF Allocations:

162.225, 163.375, 169.100, 169.1125, 169.175, 169.225, 169.375, 169.600, 169.650/168.275, 169.850/169.275, 169.850/170.125, 169.850/170.175, 170.125, 170.400, 170.575 171.2625, 171.3875

414.750/407.775	Nationwide
415.050/407.725	Nationwide
418.300/416.775	Nationwide (Postal Security Police)

Miscellaneous UHF Allocations:

407.275, 408.000, 408.025, 408.050, 408.100, 408.125, 408.475, 408.525, 408.575, 409.025, 409.075, 409.200, 409.225, 409.275, 409.375, 409.550, 410.000, 410.025, 410.200, 411.400, 411.500, 411.575, 411.650, 413. 575, 413.600, 413.700, 413.800, 414.450, 414.725, 414.975, 415.150, 415.225, 415.350, 415.400, 415.450, 415.475, 415.500, 415.550, 415.575, 415.775, 415.825, 415.950, 416.075, 416.100, 416.225, 416.425, 416.850, 416.950, 416.975, 417.650, 417.775, 418.100, 418.350, 419.650

Reported USPS Postal Inspectors trunk system

New York City *(additional information requested):*
406.350/415.150 407.150/415.950 407.550/415.550
408.150/416.750 409.550/418.350

Inspector Service Offices

Anchorage, AK	KCM 218/219
Phoenix, AZ	KPS 809
Los Angeles, CA	KHA 269/270/271/272/279/280/KPS 478
San Diego, CA	KHA 275/276/KPS 718
San Francisco, CA	KHA 273/274/KPS 477
San Jose, CA	KHA 281/282
Denver, CO	KPS 714/805
Washington, DC	KHA 246/247
Jacksonville. FL	KPS 796
Miami, FL	KHA 260/261
Tampa, FL	KPS 798
West Palm Beach, FL	KPS 759
Atlanta, GA	KHA 262
Honolulu, HI	KCM 220/221/KPS 998
Des Maines, IA	KPS 793
Boise, ID	KPS 711
Chicago, IL	KHA 252/253
Rockford, IL	KPS 758
Springfield, IL	KPS 818
Gary, IN	KPS 800
Indianapolis, IN	KPS 812
South Bend, IN	KPS 894
Kansas City, KS	KPS 794
Lexington, KY	KPS 811/940
Louisville, KY	KPS 816
New Orleans, LA	KHA 266/267
Boston, MA	KHA 242/243
Baltimore, MD	KHA 248/249
Ann Arbor, MI	KPS 854
Detroit, MI	KHA 254/255
Grand Rapids, MI	KPS 772
Saint Louis, MO	KHA 258/259
Gulfport, MS	KPS 853
Raleigh, NC	KPS 803
Newark, NJ	KHA 240/241
Albany, NY	KPS 795
Buffalo, NY	KPS 801/847
New York City, NY	KHA 238/239/KPS 749-750-751-753
Cincinnati, OH	KPS 788
Cleveland, OH	KHA 256/257
Columbus, OH	KPS 810
Dayton, OH	KPS 924
Oklahoma City, OK	KPS 800
Portland, OR	KPS 808
Philadelphia, PA	KHA 244/245
Pittsburgh, PA	KHA 250/251
Reading, PA	KPS 804
Ponce, PR	KPS 225/226
San Juan, PR	KCM 222/223
Columbia, SC	KPS 806
Memphis, TN	KPS 797
Nashville, TN	KPS 807
Dallas, TX	KPS 841
Fort Worth, TX	KPS 717
Houston, TX	KHA 264/265
Salt Lake City, UT	KPS 701
Apple Orchard, VA	KPS 777
Norfolk, VA	KPS 799
Richmond, VA	KPS 817
St. Croix, VI	KPS 793
Seattle, WA	KHA 277/278

VHF Low Band

In Table One we start our exploration of the VHF low band government frequency bands by profiling the 29.9-30.550 and 32-33 MHz spectrum slices. This portion of the spectrum has a lot of long distance skip action on it these days due to higher sunspot counts.

And that's it for this month's *Fed File*. Until next month, 73 and good hunting.

TABLE ONE: FEDERAL FREQUENCY ALLOCATIONS: 29.9-30.550/32-33 MHZ

29.900	Air Force, Army (Nationwide), Navy
30.000	Navy
30.010	Fish and Wildlife Service, Interior Department (Nationwide), National Park Service
30.020	Fish and Wildlife Service, National Park Service
30.025	Air Force, Army
30.030	Fish and Wildlife Service, Geologic Survey, Interior Department (Nationwide)
30.040	Fish and Wildlife Service, National Park Service
30.050	Air Force, Army, Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service, Navy
30.060	Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service
30.070	Fish and Wildlife Service, Interior Department (Nationwide), National Gallery of Art, National Marine Fisheries Service, National Park Service, Smithsonian Institute
30.075	Air Force, Army
30.090	Army (Nationwide)
30.100	Air Force, Army (Nationwide), Navy
30.110	Army (Nationwide)
30.120	Army
30.125	Army
30.150	Air Force, Army, Navy (HMX-1 Squadron Common-Nationwide)
30.170	Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service
30.175	Air Force, Army
30.180	Army, Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service, Veterans Administration
30.190	Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service, Veterans Administration
30.200	Air Force, Army, Fish and Wildlife Service, Interior Department (Nationwide), National Park Service, Navy
30.210	Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service
30.220	Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service
30.225	Air Force, Army
30.230	Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service
30.240	Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service
30.250	Air Force, Army, Fish and Wildlife Service, Interior Department (Nationwide), National Marine Fisheries Service, National Park Service, Navy
30.260	Fish and Wildlife Service, National Park Service
30.270	Army, Fish and Wildlife Service, Interior Department (Nationwide), National Park Service
30.275	Air Force, Army (Nationwide)
30.290	Army (Nationwide), Navy
30.300	Air Force, Army (Nationwide), Navy
30.310	Army (Nationwide)
30.325	Army
30.330	Coast Guard (Nationwide)
30.350	Air Force, Army, Energy Department (Nationwide), Navy
30.370	Energy Department (Nationwide), Veterans Administration
30.380	Air Force
30.390	Energy Department
30.400	Air Force, Army, Navy
30.410	Coast Guard (Nationwide)
30.420	Center for Disease Control, Energy Department
30.425	Army
30.430	Coast Guard (Nationwide), Department of Education (Nationwide), Health and Human Services (Nationwide)
30.450	Air Force, Army, Navy
30.470	Navy
30.475	Army
30.490	Army (Nationwide)
30.500	Air Force, Army (Nationwide), Navy
30.510	Air Force, Army (Nationwide)
30.525	Army
30.530	Navy
30.550	Air Force, Army (Nationwide), Navy
32.000	Air Force
32.010	Energy Department (Nationwide), Interior Department (Nationwide)
32.020	Energy Department
30.250	Air Force, Army
32.030	Interior Department (Notionwide)
32.050	Air Force, Army, Navy
32.060	Navy
32.070	Navy
32.075	Army
32.090	Army (Nationwide)
32.100	Air Force, Army (Nationwide), Navy
32.110	Army (Nationwide)
32.125	Army
32.130	Coast Guard (Nationwide), Transportation Department (Nationwide)
32.150	Navy
32.190	Agriculture Department (Nationwide)
32.200	Air Force, Army, Navy
32.210	Coast Guard (Nationwide), Transportation Department, Treasury Department (Nationwide)
32.225	Army
32.230	WHCA (Nationwide-Alpha)
32.250	Air Force, Agriculture Department (Nationwide), International Boundary Commission, Navy
32.270	Agriculture Department (Nationwide)
32.275	Army
32.290	Army (Nationwide)
32.300	Air Force, Army (Nationwide), Navy, Veterans Administration
32.310	Army (Nationwide)
32.321	Energy Department
32.325	Air Force, Army
32.330	Air Force (Nationwide)
32.350	Air Force (Nationwide), Agriculture Department
32.370	Air Force (Nationwide)
32.375	Air Force, Army
32.390	Agriculture Department (Nationwide)
32.400	Air Force, Corps of Engineers (Nationwide), Navy
32.410	Navy
32.425	Army
32.430	Air Force
32.450	Air Force, Navy
32.460	Navy
32.470	Navy
32.475	Army
32.490	Army (Nationwide)
32.500	Air Force, Army (Nationwide), Navy
32.510	Army (Nationwide)
32.525	Army
32.530	Agriculture Department (Nationwide), Army
32.550	Agriculture Department (Nationwide), Army, Navy
32.570	Agriculture Department (Nationwide)
32.575	Army
32.590	Agriculture Department (Nationwide)
32.600	Army, Navy
32.610	Agriculture Department (Nationwide), Navy
32.625	Army
32.630	Agriculture Department (Nationwide)
32.650	Air Force (Nationwide), Army, Navy
32.660	Army
32.675	Air Force (Nationwide), Army
32.690	Air Force (Nationwide)
32.700	Army (Nationwide), Navy
32.730	Energy Department, National Park Service
32.750	Agriculture Department (Nationwide), Army, Navy
32.770	Agriculture Department (Nationwide)
32.775	Army
32.790	Agriculture Department (Nationwide)
32.800	Air Force, Navy
32.810	Agriculture Department (Nationwide)
32.825	Army
32.830	Agriculture Department (Nationwide)
32.850	Air Force, Army, Navy
32.860	Army
32.870	Army
32.875	Army
32.880	Army
32.890	Army (Nationwide)
32.900	Air Force, Army (Nationwide), Navy
32.910	Army (Nationwide)
32.925	Army
32.930	Interior Department (Nationwide)
32.940	Army
32.950	Air Force,, Army, Interior Department (Nationwide), Navy
32.970	Interior Department (Nationwide)
32.975	Army
32.990	Energy Department (Nationwide), Interior (Nationwide)

Dan Veeneman
email: dan@signalharbor.com

Readers Track the Trunks

One of the most difficult challenges facing a trunked radio scanner listener is getting accurate information about system frequencies and talkgroups. Since few public safety agencies openly publish their complete system layout, it becomes a matter of trial and error to get everything right.

The Internet has become an important tool in distributing the details of trunked radio systems, through both the world wide web and electronic mail. This month we'll open the mailbag and report on the updates and new information readers have sent in. Please feel free to send me frequency lists and talkgroups of the systems you monitor and I'll share it with *Monitoring Times* readers here in print and on my webpages.

Evansville, Indiana

Chris Dees writes:

The Evansville, Indiana information in the LTR Trunking article needs to be updated. AMR Ambulance was using the 800 MHz system, but has switched to Mobex Midwest. Here's the updated information, straight from AMR and Mobex. I'm using a PRO-92 with no problems on LTR.

Mobex Midwest Communications
Location: Evansville, Indiana
Type: LTR
Frequencies: 863.4625, 864.4625, and 865.4625
Used By American Medical Response Ambulance Service (AMR)

AMR Talkgroups:

102010	Dispatch A (Medics)
102011	Deaconess Hospital Patch
106010	Dispatch W (Wheelchair Vans)
106011	St. Mary's Hospital Patch
110010	Administrative/Tactical
110011	Welborn Hospital

Also, Logan County, Kentucky, is utilizing a Kenwood LTR system for its Emergency Operations Center (EOC):

Logan County EOC
Location: Russellville, Kentucky
Frequencies: 453.1875, 453.3250, 453.3625, 453.6125, 453.8000, 453.8375, 453.9250

Talkgroups:

001050	Logan County Sheriff Dispatch
001051	Logan County Sheriff Channel 2 (called "SO2")
001052	Logan County Court Security
001054	Russellville Police Dispatch
001058	Logan County Mutual Aid Channel
001059	Logan County Fire Channel 1
001060	Logan County Fire Channel 2 (?)
001061	Logan County Rescue Squad
001062	Logan County Detention Center

Bob Schapker also wrote in about Evansville, providing somewhat different information:

There are actually two ambulance services using Mobilenet. The first is AMR, the largest private ambulance provider in the US, and the other is ASAP Ambulance, a small private ambulance provider.

AMR has recently changed to 856.4625, 857.4625, and 858.4625 and interestingly the main channel they use is 820.4625. ASAP Ambulance uses the LTR system but they have recently returned to using 155.295 MHz with 100 kHz tone as the primary ambulance channel due to poor coverage in the metro Evansville area. The coverage issue is also the reason for AMR's switch with a single tower on the far west side of Evansville, since coverage on the more populated east side was spotty. Scanner listeners looking for Evansville Ambulance should try 820.4625 MHz since AMR has the city and county contract for E-911 coverage.

Headquartered in Aurora, Colorado, American Medical Response (AMR) is the largest provider of emergency and non-emergency ambulance services in the U.S. AMR operates in 36 states and employs more than 20,000 people in 265 operating sites, transporting over 4 million persons per year in a fleet of more than 4,000 vehicles.

Albuquerque, New Mexico

Bill Tobin wrote in with a number of detailed messages covering three EDACS systems currently operating in Albuquerque, New Mexico:

City of Albuquerque (ABQ) EDACS system WNSS410 in correct Logical Channel Number order:

LCN	Frequency	LCN	Frequency
1	856.2625	8	858.4625
2	857.2625	9	859.4625
3	858.2625	10	860.4625
4	859.2625	11	856.4875
5	860.2625	12	856.7125
6	856.4625	13	857.7125
7	857.4625	14	858.7125
		15	860.9875

The Control Channel is channel 1.

Decimal	AFS	User
0272	02-020	
0273	02-021	ABQ city garbage pickup
0274	02-022	
0275	02-023	unknown yet what this is
0276	02-024	ABQ city garbage pickup
0277	02-025	
0278	02-026	ABQ city litter removal
0279	02-027	ABQ city garbage pickup
0280	02-030	ABQ city garbage pickup
0281	02-031	ABQ city garbage pickup
0282	02-032	unknown yet what this is
0286	02-036	tire shop; construction foreman
0287	02-037	guardroil repair
0288	02-040	
0289	02-041	Sun Tran Dispatcher broadcasts to busses
0290	02-042	Convention Center security
0291	02-043	Sun Tran Bus company operations
0292	02-044	Sun Van handicap van service
0293	02-045	
0294	02-046	Sun Tran bus maintenance
0295	02-047	Sun Van dispatcher broadcasts to handicap vans
0304	02-060	
0305	02-061	ABQ water department
0306	02-062	ABQ water department
0307	02-063	ABQ water department well maintenance crews
0308	02-064	ABQ water department, customer service, sewer
0309	02-065	ABQ water department

Notes: Sun Tran bus to dispatcher conversations cannot be tracked in trunked mode. These conversations occur in conventional simplex mode on a channel that is not currently in use. The busses never talk to each other directly; all conversations go through the dispatcher.

The ABQ water department conversations are confined to LCN's 11 to 15, while all of the other talk groups are on LCN's 2 to 10.

LCN	WPMX854	WPMU757
1	866.250	866.225
2	866.5625	866.4750
3	866.7625	866.7375
4	866.975	866.95
5	867.25	867.2
6	867.600	867.475
7	867.975	867.7125
8	868.2625	867.95
9	868.5000	868.2375
10	868.75	
11	866.1125	
12	866.45	
13	866.7125	
14	867.0625	
15	867.45	

The same talk groups show up on both of the WPMU757 and WPMX854 systems, with

the traffic load shared about equally between the two systems. If one system fails, the other system will pick up the entire traffic load.

This new ABQ 800 MHz system is replacing the old VHF police and fire channels. All of the VHF police channels, except the west substation frequency 154.815 MHz, are now dead and on the new system.

Some of the old VHF City of ABQ and Bernalillo county fire frequencies are now also dead. The main city of Albuquerque fire frequencies are still operating in parallel with the 800 MHz system.

In other words, transmissions heard on the VHF frequencies on one scanner are also simultaneously heard on the 800 MHz system on the other scanner. This 800 MHz system is new, with transition from the old system to the new system still ongoing.

The bad news is that the new 800 MHz system is mostly digital radio. So, when someone is talking into their radio, all that is heard on my scanner are data bursts. The talk group number shows up on the display during the data bursts. Every once in awhile, though, voice is heard on the 800 MHz system. It does have voice capability. Sometimes the mobile is in digital mode, and the dispatcher is on voice mode during the same conversation. Why the transmissions are mostly digital with an occasional voice is unknown.

A police officer who visited our apartment house to give a presentation on crime prevention was very pleased with the new communications system.

The following talk groups were found. The data is very general because details cannot be identified when the transmissions are mostly digital.

Decimal	AFS	User
0528	04-020	
0529	04-021	police
0530	04-022	police
0531	04-023	police
0532	04-024	police
0533	04-025	police
0534	04-026	police
0552	04-050	data heard; unknown what this group is
0553	04-051	data heard; unknown what this group is
0554	04-052	data heard; unknown what this group is
0558	04-056	data heard; unknown what this group is
0784	06-020	
0785	06-021	ABQ police NCIC data
0786	06-022	ABQ police
0788	06-024	ABQ police
0790	06-026	ABQ police
0792	06-030	police
0794	06-032	police
0795	06-033	CID tactical
1040	08-020	
1041	08-021	ABQ fire department west and southeast
1056	08-040	
1057	08-041	ABQ and Bernalillo county fire department
1060	08-044	ABQ fire department
1280	10-000	
1281	10-001	ABQ fire department northeast
1296	10-020	
1297	10-021	data heard; unknown what this group is
1312	10-040	
1313	10-041	data heard; unknown what this group is
1314	10-042	data heard; unknown what this group is

On the other new Albuquerque EDACS systems, I found the talk group numbers of the city fire tactical channels. They are:

Channel	Talkgroup	AFS
TAC 1	1121	08-121
TAC 2	1122	08-122
TAC 3	1123	08-123
TAC 4	1124	08-124
TAC 5	1125	08-125

And it turns out that these are digital. So, when the fire trucks arrive at the fire and switch to a TAC channel, all I hear on my scanner are bursts of data static. This is really amazing—the firemen are within feet of each other, and yet communicate with bursts of data! It used to be interesting listening to the old VHF tactical frequency; during the fire, I could hear all of the details of how the fire was being attacked. Now all I can hear is bursts of data.

Rochester Update

David Stark, NF2G, wrote to inform me of his scanning pages on the web at **http://www.nf2g.com/scannist/index.html**. His New York trunking pages in particular are extensive and very helpful. The site is regularly updated and lists frequencies and talkgroups that aren't published anywhere else.

He also mentions: "With reference to your description of LTR behavior, particularly transmission trunking, you should know that I have never observed transmission trunking on any of the Rochester systems on 800 or 400 MHz. That might be due to the relatively light traffic loading on these systems most of the time. Users nearly always appear on their "home" channel and tend to stay there for the duration of most conversations. As these systems get busier and more customers are added, that could change."

Disneyland Update

Claude Cartee sent in the addresses of several websites containing additional information about the radio systems used at Disneyland:
http://disney_scanning.home.att.net
http://members.aol.com/alweho/docs/scan.htm
http://members.aol.com/alweho/docs/contents.htm

He also reminded me that there is a Usenet newsgroup, alt.disney, which occasionally has postings from scanner enthusiasts who visit the park. Using the Usenet archive service at **http://www.deja.com/usenet** will yield some interesting postings from the past.

Austin, Texas

The city of Austin, Texas, took a step forward in May when it announced a decision replace their 18-year old radio network with a new radio system from Motorola. If negotiations are successful and the City Council approves, the new $70 million system could be in operation within two years.

Motorola would install about 10,000 new radios in buildings and vehicles belonging to various Austin and Travis County agencies, which are expected to use nearly 90 percent of the system's capacity. State agencies and organizations will also make use of the system, including the Department of Public Safety, Department of Transportation, the University of Texas, the Texas House of Representatives and the Texas Legislative Council.

Although Williamson County, located north of Austin, recently installed a similar system from Motorola, the Interstate 35 corridor is home to a number of Ericsson users including the cities of San Antonio and San Marcos, Bexar County, the Lower Colorado River Authority and Bell County.

That's all for this month. I've started to build a new website for strictly radio-related issues, including trunked system information. You can check it out at **http://www.signalharbor.com**, or follow the link on my original page at **http://www.decodesystems.com**. I can be reached by e-mail at either dan@decodesystems.com or dan@signalharbor.com. Until next month, happy monitoring!

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FAX: 509-966-6388

Larry Van Horn, N5FPW
email: larry@grove-ent.com

Amateur Satellite Bandplans

In this month's *Service Search* column we will take an in-depth look at all of the current amateur satellite frequencies in use and future satellites frequency bandplans. Many thanks to the crew from the AMSAT website/weekly bulletin (**http:/www.amsat.org**) for the background on each bird.

AMSAT Phase 3D
Status: Awaiting an Arianespace Ariane 5 launch in Kourou, French Guyana

Uplink	*Digital*	*Analog*
15m	None	21.210-21.250
12m	None	24.920-24.960
2m	145.800-145.840	145.840-145.990
70cm	435.300-435.550	435.550-435.800
23cm (1)	1269.000-1269.250	1269.250-1269.500
23cm (2)	1268.075-1268.325	1268.325-1268.575
13cm (1)	2400.100-2400.350	2400.350-2400.600
13cm (2)	2446.200-2446.450	2446.450-2446.700
6cm	5668.300-5668.550	5668.550-5668.800

Downlink	*Digital*	*Analog*
2m	145.955-145.990	145.805-145.955
70cm	435.900-436.200	435.475-435.725
13cm (1)	2400.650-2400.950	2400.225-2400.475
13cm (2)	2401.650-2401.950	2401.225-2401.475
3cm	10451.450-10451.750	10451.025-10451.275
1.5cm	24048.450-24048.750	24048.025-24048.275

Beacons	*General Beacon (GB)*	*Middle Beacon (MB)*	*Engineering Beacon (EB)*
2m	None	145.880	None
70cm	435.450	435.600	435.850
13cm (1)	2400.200	2400.350	400.600
13cm (2)	2401.200	2401.350	2401.600
3cm	10451.000	10451.150	10451.400
1.5cm	24048.000	24048.150	24048.400

Notes:
1. All Receivers are inverting.
2. Telemetry Beacons are for command purposes and are modulated in 400 Bit/s BPSK, AMSAT format.

MIR Space Station
86-017A/16609 Status: Operational.
145.985 MHz simplex FM voice and SSTV (Robot 36 mode)

Radio Sputnik-13 (RS-13/Cosmos 2123)
91-007A/21089 Status: Operational, in mode-KA with a 10-meter downlink and a 15-meter and 2-meter uplink. Beacon 29.504 MHz
Uplinks 21.260 to 21.300 MHz CW/SSB and 145.960 to 146.000 MHz CW/SSB Downlinks 29.460 to 29.500 MHz CW/SSB and 145.960 to 146.000 MHz CW/SSB
Robot Uplink 21.140 MHz, Downlink 29.458 MHz
More information about RS-12 and RS-13 can be found on AC5DK's RS-12/13 satellite operators page at **http://www.qsl.net/ac5dk/rs1213/rs1213.html**

Radio Sputnik-15 (RS-15/Radio Rosto)
94-085A/23439 Status: Semi-operational, Mode A (2m uplink, 10m downlink). Beacon 29.352 MHz (intermittent)
Uplink 145.858 to 145.898 MHz CW/SSB and downlink 29.354 to 29.394 MHz CW/SSB
SSB meeting frequency 29.380 MHz (unofficial). Dave, WB6LLO, has operating information for both RS-15 and RS-13 on his personal web site. In addition to satellite data, antenna information for mode A operation is also featured. The WB6LLO web site URL is **http://home.san.rr.com/doguimont/uploads**.

Amsat Oscar 10 (AO-10/Phase 3B)
83-058B/14129 Status: Semi-operational, Beacon: 145.810 MHz (unmodulated carrier)
Uplink: 435.030 to 435.180 MHz CW/LSB and downlink 145.975 to 145.825 MHz CW/USB
Stacey Mills, W4SM, has more information about the satellite at **http://www.cstone.net/~w4sm/AO-10.html**

Amrad Oscar-27 (AO-27/Eyesat 1/A)
93-061G/22829 Status: Operational
Uplink 145.850 MHz FM and downlink 436.792 MHz FM
An AO-27 question-and-answer page is available on the AMSAT-NA web site at **http://www.amsat.org/amsat/intro/ao27faq.html**

UoSAT Oscar-14 (UO-14/UoSAT 3)
90-005B/20437 Status: Operational
Uplink 145.975 MHz FM and downlink 435.070 MHz FM
Tim, KG8OC, has updated the Michigan AMSAT Information Site with UO-14 information at **http://www.qsl.net/kg8oc**

SunSat (SO-35)
99-008C/25636 Status: Operational
Uplink 436.291 MHz CW/LSB and downlink 145.825 MHz CW/LSB
The SunSat package includes 1200 and 9600 baud digital store-and-forward capability and a voice 'parrot' repeater system that will be used primarily for educational demonstrations. The satellite has two VHF and two UHF transmit-receive systems. For more information on SunSat visit **http://sunsat.ee.sun.ac.za**

Fuji Oscar 20 (JAS-1b/Fuji 2/FO-20)
90-013C/20480 Status: Operational
Uplink 145.900 to 146.000 MHz CW/LSB and downlink 435.800 to 435.900 MHz CW/USB
FO-20 is in mode JA continuously.

Fuji Oscar 29 (JAS-2/FO-29/Fuji 3)
96-046B/24278 Voice/CW Mode JA Status: Operational, rotated with digital mode and digi-talker.
Uplink 145.900 to 146.000 MHz CW/LSB and downlink 435.800 to 435.900 MHz CW/USB
Digital Mode JD Status: Operational, rotated with analog mode and digi-talker.
Uplink 145.850, 145.870, 145.910 MHz FM and downlink 435.910 MHz FM 9600 baud BPSK

KitSat Oscar 25 (KitSat 2/B/KO-25)
93-061C/22828 Status: Operational
Uplink 145.980 MHz FM and downlink 436.500 MHz FM, 9600 Baud FSK

UoSAT Oscar 22 (UoSAT F/UoSAT 5/UO-22)
91-050B/21575 Status: Operational
Uplink 145.900 or 145.975 MHz FM and downlink 435.120 MHz FM 9600 Baud FSK
More information on the satellite is available at **http://www.sstl.co.uk**

UoSAT Oscar 11 (UoSAT-B/UoSAT 2/UO-11)
84-21B/14781 Status: Operational
Downlink 145.825 MHz FM, 1200 baud PSK and Beacon 2401.500 MHz
More information on OSCAR-11 is available at **http://www.users.zetnet.co.uk/clivew/**

LuSat Oscar-19 (Microsat-D/LU-19)
90-005G/20442 Status: Currently semi-operational.
Uplink 145.840, 145.860, 145.880, 145.900 MHz 1200 bps Manchester FSK and downlink 437.125 MHz SSB, 1200 bps RC-BPSK. The CW beacon is sending eight telemetry channels and one status channel. Currently, no BBS service is available. The digipeater is active.
General information and telemetry samples can be found at **http://www.ctv.es/USERS/ea1bcu/lo19.htm**

Amsat-Oscar 16 (Pacsat/AO-16)
90-005D/20439 Status: Semi-operational. Beacon 2401.1428 MHz.
Uplink 145.900, 145.920, 145.940, 145.860 MHz FM, 1200 bps Manchester FSK and downlink 437.0513 MHz SSB, 1200 bps RC-BPSK 1200 Baud PSK. A new WOD collection of current graphics (dated 02/26/2000) can be found at **http://www.ctv.es/USERS/ea1bcu**

TMSAT-1 (TO-31)
98-043C/25396 Status: Operational
Uplink 145.925 MHz 9600 baud FSK and downlink 436.925 MHz 9600 baud FSK

UoSAT-12 (UO-36)
99-021A/25693 Status: Operational
Uplink 145.960 MHz, 9600 baud FSK and downlink 437.025, 437.400 MHz, 9600 baud FSK
Further information on UO-36 is available from **http://www.sstl.co.uk/**

ItamSat Oscar 26 (IO-26)
93-061F/22826 Status: Semi-operational. Digipeater function is on.
Uplink 145.875, 145.900, 145.925, 145.950 MHz FM and downlink 435.822 MHz SSB, 1200 Baud PSK

PLANE TALK

MAKING SENSE OF CIVILIAN AERONAUTICAL COMMUNICATIONS

Jean Baker, KIN9DD
jeanieandbob@earthlink.net

A Visit to Minneapolis ARTCC

Welcome aboard and fasten your seatbelts! In May 2000, we featured some frequencies from ZMP - the Minneapolis ARTCC (Air Route Traffic Control Center). In response to many requests, we're going to pay a more comprehensive visit to the Center to learn something of their operations and feature the rest of the frequencies. Thanks to Bob Tatosian, Controller, for contributing frequencies and other material, as well as permission to utilize information from ZMP's website and from his book *Five Miles and a Thousand Feet.*

While some of the information presented may be a bit elementary for those of you who are experienced aero comms monitors, bear with us so newcomers to our hobby can also learn about how aero communications are handled!

The Minneapolis ARTCC covers 300,000 square miles, encompassing all or parts of nine states (Minnesota, North Dakota, South Dakota, Nebraska; Kansas, Missouri, Iowa, Wisconsin, and Michigan) and three Canadian provinces. The airspace extends from AuSable, Michigan, west to the North Dakota/Montana border; International Falls, Minnesota, south to Kearney, Nebraska. In 1999, there were 2,124,770 operations! There are 280 Full Performance Level Controllers; 20 Developmentals (controllers in training).

Twelve radar sites feed the ZMP host computer and there are 168 total VHF/UHF frequencies. In addition to the frequencies given in the May issue, Table 1 lists additional ZMP frequencies and their Remote Communication Air/Ground (RCAG) sites.

The major airports in ZMP airspace include Minneapolis/St. Paul (MSP); Des Moines (DSM); Omaha (OMA); Lincoln (LNK); and Green Bay (GRB). Minneapolis/St. Paul International (MSP) Airport. The MSP terminal area has four STAR (Eau Clair4; KASPR1; SKETR2; and GOPHER 3), and nine Preferential Departure Routes (PDRs).

❖ Airspace Control at Minneapolis

Minneapolis Center's airspace is split up into smaller, manageable pieces of airspace called "sectors," of which there are 38. Sectors have vertical as well as horizontal boundaries. A few sectors extend from the ground up, but most areas are stratified, with the lowest sectors defined from the ground through 23,000 feet, with another sector above from 24,000 and up. In some cases, a third sector may be defined for 37,000 feet and up.

One or two controllers are directly responsible for separating the aircraft within their sector. Each sector has a unique radio frequency which the controller uses to communicate with pilots. As aircraft transition from one sector to another, they are instructed to change to the frequency of the next sector.

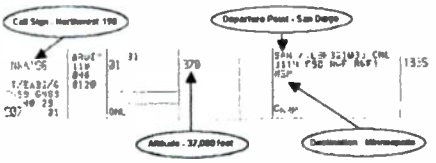
A PVD (Plan View Display) displays the radar data, allowing controllers to see the aircraft within their airspace. The PVD consists of various lines, letters, numbers and symbols to aid the controllers. The sector boundaries show the lateral limits of the sectors. Circles denote the location of ground-based navigation stations. Lines extend outward from these navigation stations showing the location of airways. Aircraft are represented as slashes.

Each aircraft has a data block associated with it that conveys essential information. The first line shows the aircraft's call sign. The next line shows its altitude. If there are two numbers on the second line, the aircraft is either climbing or descending. The first number shows the assigned altitude and the second number shows the aircraft's actual altitude. An arrow indicates if the aircraft is climbing or descending.

The third line of the data block contains two primary pieces of information. The first three numbers show the aircraft's Computer ID number (CID). The controller uses this number frequently to update information associated with this aircraft. If the controller needs to change some information about the aircraft, he/she can use this CID rather than a more lengthy call sign.

The other numbers on the third line show the aircraft's speed across the ground. The controller has the option to use what is called a vector line. This line projects where the aircraft will be within a specified number of minutes, assuming the aircraft doesn't make any turns. This is a helpful tool to determine if crossing aircraft will pass safely or if they will conflict with each other. In addition to vector lines, the controller can also display a route line for any given aircraft. This will tell the controller where a particular aircraft will be in specified number of minutes as well as how the aircraft will get there.

Another tool available to controllers are flight progress strips. These strips are printed 20 minutes prior to an aircraft reaching a sector. A flight progress strip tells the controller everything needed to control that aircraft. The information includes the call sign of the aircraft, the aircraft type, its altitude, routing, as well as when the aircraft will be at a specified position. If the flight progress strips of each aircraft approaching a sector are arranged properly, it is possible to determine potential conflicts long before the aircraft are even visible on the PVD. In areas where radar coverage is not available, this is the sole means of separating aircraft.



Visit Bob at his website: **www.fivemiles.com**
His book *Five Miles and a Thousand Feet* is still available; reserve your copy today!

Some ATC Terminology

STAR	Standard Terminal Arrival Route
SID	Standard Instrument Departure
PAR	(en-route definition) Preferential Arrival Route
PDR	Preferred Departure Route
NRP	National Route Program
BUEC	Back Up Enroute Communications
Airspace Classification:	
Class A	Airliners
Class B	Big Airports
Class C	Nobody remembers!
Class D	Dink Airports
Class E	Everything else

TABLE 1: MINNEAPOLIS ARTCC

VHF/UHF frequencies - RCAG Sites	
118.050/282.200	Saginaw, MI
118.050	Brainerd, MN
118.850	Waukon, IA
119.100/290.200	Sawyer, MI
119.600/290.400	Omaha, NE
120.850/322.350	White Cloud, MI
120.600/371.900	Aberdeen, SD
120.900	International Falls, MN
121.050	Princeton, MN
121.250/322.500	Iron Mountain, MI
124.100/288.100	Sioux City, IA
124.400/317.700	Central, WI
125.100/269.100	Pierre, SD
125.300/353.900	Eau Claire, WI
125.500/323.100	Darwin, MN
125.550/370.900	Green Bay, WI
125.600/281.500	Jamestown, ND
125.650/288.100	Des Moines, IA
126.100/269.200	Alexandria, MN
126.400/317.700	Marysville, NE
126.450	Hayward, WI
126.800/263.000	Dupree, SD
127.100/290.200	Redwood Falls, MN
127.300/380.200	Mason City, IA
127.350/278.300	Fargo, ND
127.600/279.600	Minot, ND
127.650	Escanaba, MI
127.800/256.900	Roseau, MN
127.900	Duluth, MN
128.000/385.500	O'Neill, NE
128.500/306.200	Watertown, SD
128.600/363.000	LaCrosse, WI
132.050/317.400	Sioux Falls, IA
132.150	Grand Forks, ND
132.350/307.300	Rochester, MN
132.900/398.900	Traverse City, MI
133.650.281.500	Rhinelander, WI
133.700/307.900	Minneapolis, MN
133.550	Ironwood, WI
133.650/281.500	Rhinelander, WI
134.000/288.300	Dodge, IA
134.600/317.650	Pellston, MI
134.750/251.100	Bemidji, MN
135.000/306.900	Mankato, MN

MILCOM

Larry Van Horn
larry@grove-ent.com

New Blue Angel Frequency Monitored

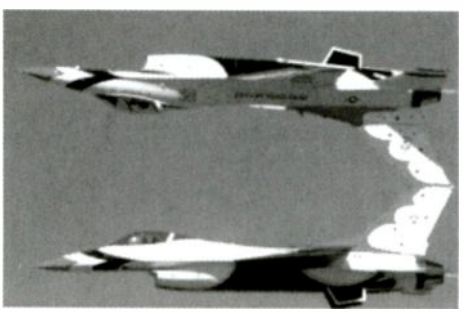
Longtime friend and monitor Robert Wyman passes along the following Blue Angel frequencies monitored at the Fort Lauderdale Air & Sea show in May. Milcom enthusiasts should note the 227.175 frequency, which Robert said is new to his list (and to mine as well). Great job, Bob, and thanks for sharing that with our readers.

170.900	Blue Angels ground crews
227.175	Blue Angels pre-show and post-show interplane (new one for my list)
238.150	Blue Angels interplane
263.350	Blue Angels interplane
275.350	Blue Angels interplane
345.900	Blue Angels interplane

Speaking of new airshow frequencies, while attending the Chattanooga Airshow 2000 in April, I stumbled on a couple of new U.S. Army Golden Knights VHF frequencies: 122.575 and 123.500 MHz.

In addition to the Golden Knights, the Air Force Thunderbirds were also present at the show and when the crowd heard them on my scanner, we had a little horde listening in. Here were the active ones I found during the weekend.

118.300	Lovell Field VHF Tower (AM mode)
119.850	ATIS (Carrying the closure announcement of the field to all but regular scheduled airlines during T-bird shows)
121.700	Lovell Field VHF Ground Control (AM mode)
122.950	Unicom (Controlling private traffic in the immediate vicinity of the field
125.100	Chattanooga Approach and Departure Control paired with 379.100 (AM mode)
141.850	Thunderbird Primary air-to-air (Victor 1-AM mode)
235.250	Thunderbird Control (AM mode)
257.800	Lovell Field UHF Tower (AM mode)
322.950	Thunderbird solo aircraft (AM mode)
348.600	Lovell Field UHF Ground Control (AM mode)
353.800	Atlanta Center low altitude discrete (AM mode)
379.100	Chattanooga Approach and Departure Control paired with 125.100 (AM mode)
413.025	Thunderbird Ground Maintenance (Narrowband FM)



If you attend an airshow, we want to hear from you. You can send your reports to the email address in the masthead.

Military Satellite Frequencies

Since our theme for this issue is satellites, I thought I would share with you my exclusive list of Ultra High Frequency Follow On (UFO) UHF downlink frequencies, printed for the first time in the pages of *MT*. This list was previously presented in the pages of the old *Satellite Times* and to attendees at various forums I gave at the old Grove Communications Expos in Atlanta.

Fleet Broadcast Channels (25 kHz) Channel 1 Downlinks

250.350	UFO November Primary
250.400	UFO November Secondary
250.450	UFO Oscar Primary
250.500	UFO Oscar Secondary
250.550	UFO Papa Primary
250.600	UFO Papa Secondary
250.650	UFO Quebec Primary
250.700	UFO Quebec Secondary

UFO Navy Fleet Relay (25 kHz) Downlinks

	November	Oscar	Papa	Quebec
Channel 2	251.850	251.950	252.050	252.150
Channel 3	253.550	253.650	253.750	253.850
Channel 4	255.250	255.350	255.450	255.550
Channel 5	256.850	256.850	257.050	257.150
Channel 6	258.350	258.450	258.550	258.650
Channel 11	260.375	260.575	260.425	260.625
Channel 12	260.475	260.675	260.525	260.725
Channel 13	261.575	262.075	261.625	262.125
Channel 14	261.675	262.175	261.725	262.225
Channel 15	261.775	262.275	261.825	262.325
Channel 16	261.875	262.375	261.925	262.425
Channel 17	263.575	263.775	263.625	263.825
Channel 18	263.675	263.875	263.725	263.925
Channel 7	265.250	265.350	264.450	265.550
Channel 8	266.750	266.850	266.950	267.050
Channel 9	268.150	268.250	268.350	268.450
Channel 10	269.650	269.750	269.850	269.950

UFO AFSATCOM (5 kHz) Downlinks

	November	Oscar	Papa	Quebec
Channel 19	243.915	243.995	244.075	244.155
Channel 20	243.925	244.005	244.085	244.165
Channel 21	243.935	244.015	244.095	244.175
Channel 22	243.945	244.025	244.105	244.185
Channel 23	243.955	244.035	244.115	244.195
Channel 24	243.965	244.045	244.125	244.205
Channel 25	243.975	244.055	244.135	244.215
Channel 26	243.985	244.065	244.145	244.225
Channel 27	248.845	248.975	249.105	249.235
Channel 28	248.855	248.985	249.115	249.245
Channel 29	248.865	248.995	249.125	249.255
Channel 30	248.875	249.005	249.135	249.265
Channel 31	248.885	249.015	249.145	249.275
Channel 32	248.895	249.025	249.155	249.285
Channel 33	248.905	249.035	249.165	249.295
Channel 34	248.915	249.045	249.175	249.305
Channel 35	248.925	249.055	249.185	249.315
Channel 36	248.935	249.065	249.195	249.325
Channel 37	248.945	249.075	249.205	249.335
Channel 38	248.955	249.085	249.215	249.345
Channel 39	248.965	249.095	249.225	249.355

Military Unit Profiles

This is the first in a series of military unit profiles here in the Milcom column. This report comes from Middle Atlantic reader Ron Perron. Thanks a million, Ron. If you have a profile of a military unit from your part of the country, we want to hear from you at *larry@grove-ent.com*.

113th Fighter Wing/121st Fighter Squadron
(DC Air National Guard)
Home Base: Andrews AFB (Clinton, MD)
Aircraft: F-16 C/D'S
Aircraft callsigns: Bully/Wild/Ravage/Caps/Cleat/Chosen/Noble/Angry/Budman/Bandit/Scary
Watergate 121st Fighter Squadron Operations
Senate 121st Fighter Squadron Supervisor of Flying

Frequencies:

	VHF	UHF	
1	139.900	234.800	SOF (Supervisor of Flying/Safety of Flight)
2	127.550	393.100	Clearance delivery
3	121.800	275.800	Andrews Ground
4	118.400	289.600	Andrews Tower
5	127.275	396.100	Tactical/Washington Departure

6	143.600	257.200	Tactical/Washington Departure
7	138.450	281.400	Tactical/Washington ARTCC
8	139.750	325.800	Tactical/Baltimore Approach
9	125.125	281.800	Tactical/Patuxent River Approach
10	34.300	Unknown	Tactical/Unknown
11	32.650	249.800	Tactical/FACSFAC VaCapes (Giant Killer)
12	139.625	286.200	Warren Grove (PA) range
13	122.900	349.100	Dare (NC) range-Air Force
14	122.900	358.000	Dare (NC) range-Navy
15	41.300	237.300	Kiowa (PA) range
16	138.025	277.400	Tactical/Washington ARTCC
17	32.850	323.000	Tactical/Washington ARTCC
18	124.000	294.500	Washington Approach
19	119.300	335.500	Andrews Approach
20	113.100	251.050	Andrews ATIS

Other Frequencies:

The DC ANG F-16s will routinely use the following Washington ARTCC (ZDC) freqs: 360.7, 254.3 and 285.4

Navy VaCapes FACSFAC Giant Killer frequencies: When working in Giantkiller (FACSFAC, NAS Oceana) the DC ANG F-16s are usually found on: 238.1, 233.7, 249.8 and 255.0

Patuxent River NAS: Quite often the DC ANG F-16s will train in the Patuxent River restricted areas -4002, R-4005, R-4006, R-4008 and R-6609 using the following Patuxent freqs: 270.8 Advisory, 354.8 Advisory and 281.8 Approach.

201st Airlift Squadron (ALS)- Air National Guard

Home Base: Andrews AFB (Clinton, MD)
Aircraft: C-22, C-38
Aircraft callsigns: Boxer
Note: According to published reports (March 2000) the 201st ALS is phasing out their C-22s in favor of the C-38's

Frequencies:

118.40	Andrews Tower
119.30	Andrews Approach
124.00	Andrews Approach
124.20	Washington Approach
119.85	Washington Approach
125.65	Washington Departure
118.95	Washington Departure
141.55	Special Air Mission Command Post
378.10	Special Air Mission Command Post
122.85	Andrews Dispatch
372.20	Andrews Dispatch
314.25	Air National Guard Operations

Aircraft Numbers:

C-38 94-1569
C-38 94-1570
C-22 83-4610
C-22 83-4615
C-22 83-4616
C-22 83-4618

Remarks:

The 201st ALS is operationally part of the 113th FW (DC ANG) and provides air transport and liaison services for the Secretary of the Air Force and the Defense Department.

The Boxers normally use a two-digit suffix when conducting local training. However, when flying scheduled JOSAC missions they will use the last three digits of the JOSA mission number as their callsign.

Monitoring the Military is Back

Daryll Symington's *Monitoring the Military* – a Milcom hobby standard for years – has now been completely updated and is now available for purchase from Grove Enterprises. This enormous frequency collection is every utility listener's dream, and it's now available as an up-to-date electronic file!

Pages of informative text assist your listening tactics, followed by hundreds of accurate 30-420 MHz frequency listings, agencies, uses, and locations! This isn't a reprint of old information from days gone by like other publications. This new 3rd edition has been exhaustively overhauled and all new comprehensive information on military communications presented.

The format for this new 3rd edition is also completely different than the previous two editions produced by Daryll. We are providing the information by individual state via the Grove website (**www.grove-ent.com**). Each state has in its own PDF file, which does require a computer with Adobe Acrobat Reader to be installed to view the information.

So start tuning in on practice bombing runs, fighter training, flight tests, air shows, military police, survival exercises, air-to-ground comms, disaster nets, command posts, and much more! Get your *MTM* state listing today. Not all states are available at this time. Please check the Grove website for the status on what states have been released.

Until next time, 73 and good hunting.

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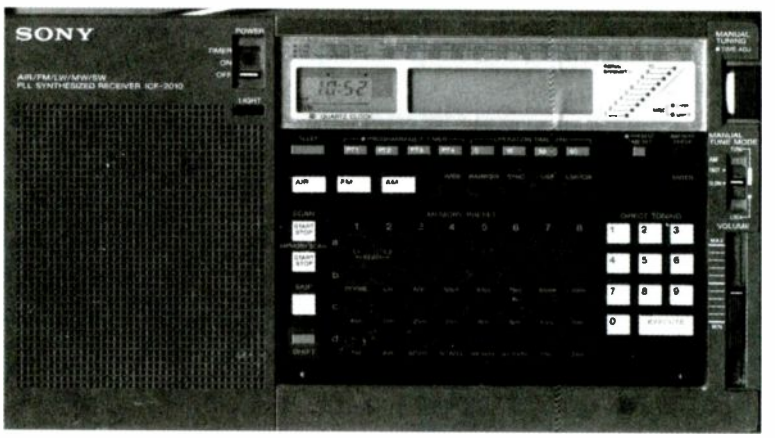
Doug Smith, W9WI
w9wi@bellsouth.net

Popularity Contest

"What's the best receiver for AM DXing?" That's a common question. There is no one answer; it depends on your budget, the space available, and how serious you are about the hobby. What I can tell you is what equipment is most *popular* with AM DXers. I examined five copies of the National Radio Club's *DX News* from early this year, keeping track of how many DXers used each model of receiver. This isn't a perfect survey, but I think it gives us a good idea of who's using what in the land between 530 and 1710 kHz.

45 different models of receiver were used by at least one DXer. The most popular was the Drake R-8, used by 15 different people. Second place went to the Sony ICF-2010, with 10 owners. The various GE SupeRadios and various car radios tied for third place, with six users each. The only other set claimed by more than two listeners was the Kenwood R-1000. Considering all models made by a given manufacturer, Drake and Sony remained the most popular with 17 and 14 users respectively. Radio Shack came in third, with nine users of eight different models. Kenwood, with eight users, came in fourth.



My Sony ICF-2010 has heard a lot of DX over the years. This is one of the most popular radios with AM DXers.

I also surveyed the types of antenna in use. Small loops were most popular, with 42 DXers using various types of loop. The Kiwa was the most popular model, with 13 users. The Quantum loop and Select-A-Tenna were also popular with five and four users respectively. The other types of antenna with a major following were various types of wire, with 27 users.

Accessories were seldom mentioned in the reports, but the MFJ-1026 phasing unit is popular, as is the Timewave DSP-599 digital signal processing unit.

I was surprised by the small number of "boatanchors" in use. Only six DXers reported using receivers with tubes. *Monitoring Times* reader Ragnar Danneskjold was the only one to report using a homemade receiver. (I've DXed with a homemade receiver in the past – it's a real blast logging DX on a set you built yourself!) There also wasn't much ham gear reported – one listener with a Yaesu FT-1000MP and another with a Kenwood TS-440. I use my Kenwood TS-940 for most of my DXing, and it really works very well. Hams should try hooking up a random wire antenna (or 160-meter antenna if they have one) to their HF rig and see what comes in; they might be surprised!

On the other hand, I was not surprised by the three most popular receivers. The R-8 has a solid reputation among all types of listener, and its users have always had excellent results. The ICF-2010 has been on the market for over 15 years; I'm hard pressed to think of any other radio that's been sold for that long. Sony really created a classic there. The SupeRadios are unbeatable in the "bang for the buck" category.

Robert Miller in North Carolina had given up on AM DX for years due to noise, especially from TV sets. He recently moved into a metal mobile home with a metal roof – and could rejoin the ranks of the DXers. His solution was to buy a used AM digital car radio (for $5) and a standard car radio antenna. The antenna was mounted on the roof of the trailer, and connected to the radio with 24' of standard car radio lead-in cable. (You *cannot* use regular coaxial cable, the capacitance is too high and it will shunt signals to ground.) Robert's results have been excellent, with 20 states logged in one night.

❖ Bits and Pieces

Another new station has appeared in the expanded AM band. WTAW-1620 is in College Station, Texas. (Yes, a W call in Texas. The calls were in use for years on their regular-band station on 1150.) The format is news/talk. DXers are also reporting hearing open carriers and test signals on 1660 on the West Coast; KAXW Merced, California, may be about to come on the air.

A few readers have been hearing things they shouldn't – broadcast stations coming in on frequencies outside the broadcast band. Both Ben Loveless and David Parsons have been hearing KFXX-910 Portland, Oregon, on 25.95 MHz shortwave. This is an auxiliary station, used with remote broadcasts. Its purpose is probably to allow someone back at the station to cue announcers at a remote location to begin speaking.

Another DXer, Rick Larkin of Midland, Texas, logged KDGO-1240 Durango, Colorado, on 2480 kHz, its second harmonic. All stations have harmonics – spurious transmissions on multiples of their actual frequency. Usually, these harmonics are too weak to DX. But, at any given time, there are usually three or four AM stations whose transmitters are far enough out of adjustment to allow their harmonics to be heard at considerable distances. It can be quite productive to listen between the top of the AM band and the bottom of the 80-meter ham band (3500 kHz) looking for broadcast harmonics.

Martin Field in Michigan is looking for addresses for several stations. His reports to WTIR-1680, the Cleveland Airport station, and the stations at the Dallas-Fort Worth airport were all returned by the Postal Service. For WTIR, I have an address of Box 149161, Orlando FL 32814-9161. Any help with the other two stations would be appreciated. The address I posted for the DFW airport stations in the past is apparently no longer good, as Martin tried it without success.

Do you use an exotic receiver or antenna? Or do you have an interesting accessory in your station? Let us know. Write: Box 98, Brasstown NC 28902-0098, or by email to *w9wi@bellsouth.net*. Good DX!

OUTER LIMITS

THE CLANDESTINE, THE UNUSUAL, THE UNLICENSED

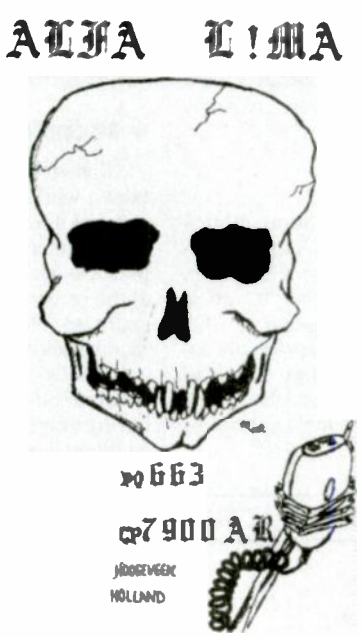
George Zeller
georgez@nacs.net

Peruvian Broadcaster Invades Pirate Band

Pirate broadcasters suddenly began to face competition during the spring, when a Peruvian broadcaster planted itself on 6956.7 kHz. **La Voz del Campesinos** from Huarmaca, Peru, probably isn't trying to reach a North American target audience, but its AM carrier has been noted by many in the 43 meter pirate band, including *MT* contributor Ross Comeau. Since many North American pirates transmit in upper sideband mode, the market for good notch filters in receivers just got a boost. When DXers tune to the standard 6955 kHz pirate frequency in upper sideband, the loud heterodyne whistle from Campesinos is tough to avoid.

Pirate broadcasters quickly noticed the interference. Two avoidance strategies are in widespread use. The pirates are still transmitting on 6955 kHz, but at hours when Campesinos is inaudible in North America. Whenever the Peruvian dominates the channel, many pirates have been sneaking down 5 kHz to the vicinity of 6950 kHz.

Radiodifusora Paratan, another Peruvian, caused similar interference last year. This has led some, including Takayuki Inoue Nozaki of Japan in *Numero Uno* #1577, to speculate that Campesinos could be using the Paratan transmitter. If you'd like to try and send a report, the Paratan address is via Alfonso Ugarte 109, esq. del Parque Leoncio Pardo, Huarmaca, Provincia de Huancabamba, Peru.



Pirates Going Legit

Some pirates are turning up in places that you might not expect. Graham Barclay, well known force behind New Zealand pirate **KIWI**, tells *MT* that several pirates from multiple countries are now streaming their audio via his internet server. The **http://www.live365.com/cgi-bin/directory.cgi?genere=search&searchdesc=soundwave%20fm** URL is a bit lengthy, but why not check it out?

North American pirate **Scream of the Butterfly** has also gone legit. They are relayed on Saturdays at 0400 UTC via **WRMI** on 7385 kHz. In addition, the **WAXX.fm** internet webcast service relays them at 0100 UTC Sundays, sponsored by *MT* advertiser Universal Radio! At **http://www.geocities.com/SunsetStrip/Garage/9861/testbroadcast.html** you'll find information on how to receive the internet programs.

Chris Lobdell, well known from his pirate radio columns in NASWA and ACE, solved another mystery from the May Outer Limits. Pirates heard on **WHRI** are normally part of his *DXing with Cumbre* pirate segment, usually scheduled for the third weekend of each month. At **www.cumbredx.org/** you'll find the latest schedule for this entertaining DX program. If you hear the pirate content on Cumbre, they reliably verify via Stoneham.

What's on the Air

Summer static has not scared the pirates away, although most are now signing on after 0100 UTC when darkness arrives. Station programming formats and contact maildrops are shown here for stations that were heard by *MT* readers this month:

Alpha Lima International- They have been the best heard Europirate in North America, given their 19 meter transmissions on 15070 kHz. (Hoogeveen)

Cell Phone Radio- Scanner listeners: are you tired of ECPA frequency deletions? This pirate relays cellular phone calls, with a slogan of "America's most illegal pirate radio station." (None)

Hippy Dippy Radio- A new one, hosted by Hippy Dippy, who promotes marijuana. (None)

Indira Calling- Vijay Nehru brings East Indian tunes and commentary to the pirate band. (Providence)

KMUD- Their rock music is probably the most widely heard pirate in western North America. (Lone Pine)

Mood Control- This new one broadcasts in the CB band on 27165 kHz. They even sent a schedule of 0330, 1330, 1930, and 2230 UTC, but they probably will be erratic. (None)

Omega Radio- This veteran Christian Rock station has returned. (Moline)

Psycho Radio- This newcomer mixes rock, folk, parody ads, and old time radio replays (None)

Radio Aesop- If you need a fable fix, this is the place to go. (uses radioaesop@yahoo.com e-mail)

Radio Garbanzo- Fearless Fred is back with his earthy and hilarious comedy, from "down our antenna, and up yours." (Belfast)

Voice of Captain Ron Shortwave- Captain Ron is a TV critic between his rock songs. (uses captainronswr@yahoo.com e-mail)

Voice of Prozac- If you're hyper, the Relaxation Station will calm you down. (Pittsburgh)

WBIG- Big Mike has had some technical problems, but his rock music is still there. (Belfast)

WBNY- The Easter Bunny was back with his rodent revolution clandestine parody this year. (announces defunct Washington address)

WDRR- Lately they have been playing ancient oldies rock. (Belfast)

WHYP- The James Brownyard Memorial station, last year's most active pirate, is still broadcasting. (uses whyp1530@yahoo.com e-mail)

WMFQ- Their classic rock is overshadowed by their chanting IDs that promise QSLs. (Providence)

WMOE- Moe Howard's rock is on 6955, but he says that he sometimes uses 13915 kHz. (uses wmoe6955@yahoo.com e-mail)

Reports and QSLs

Reception reports to pirate stations require three first class stamps for USA maildrops or $2 US to foreign addresses. Send your letters to PO Box 1, Belfast, NY 14711; PO Box 28413, Providence, RI 02908; PO Box 88, Moline, MI 49335; PO Box 146, Stoneham, MA 02180; PO Box 928, Lone Pine, CA 93545; PO Box 25302, Pittsburgh, PA 15242; and Post Office Box 663, 7900ar Hoogeveen, The Netherlands.

Some stations verify logs in *The ACE* ($21 annually via Belfast, *Free Radio Weekly* (free to contributors via yukon@mdn.net), or via the *Free Radio Network* web site at **http://www.frn.net/.** The rest solicit reception reports via postal or e-mail addresses noted here.

Thanks

Your snail mail input is always welcome via PO Box 98, Brasstown, NC 28902. But, please note my changed address of **georgez@nacs.net** for e-mail contributions. This month's contributors include John T. Arthur, Belfast, NY; Shawn Axelrod, Winnipeg, Manitoba; Graham Barclay, Napier, New Zealand; Ranier Brandt, Hoefer, Germany; NY; Ross Comeau, Andover, MA; Harold Frodge, Midland, MI; Paul Griffin, Berkeley, CA; Sheldon Harvey, Montreal, Quebec; William T. Hassig, Mt. Prospect, IL; Chris Lobdell, Stoneham, MA; Greg Majewski, Oakdale, CT; Bill McClintock, Minneapolis, MN; Mke Prindle, New Suffolk, NY; Jesse Rose, Hampton, VA; Joe Szentivanyi, Chicago, IL; Lee Silvi, Mentor, OH; Bud Stacey, Setsuma, AL; and Niel Wolfish, Toronto, Ontario.

Kevin Carey, WB2QMY
lowband@gateway.net

Summertime Tips

If you've been at the longwave hobby for any length of time, you know that summer can be a tough time for monitoring. Natural static (QRN) tends to be higher during the warmer months, and it often covers all but the strongest signals. Still, summer is not a time to put your gear away, and it can even present some opportunities that are not available at other times of the year. This month we'll discuss some ways of getting the most out of your warm-weather listening.

❖ Start early

The late "Longwave Wizard" Ken Cornell once took me to task for referring to summer as "the close of the longwave DX season." He felt that there was still plenty to be heard, but that one must look for signals in the morning, say, before 10 o'clock. Ken was right. Frequently, the noise levels are quite low at these hours, and there's still some nighttime skip in effect – especially on the higher LW frequencies.

❖ Try a smaller antenna

This may sound like strange advice for a band that most people associate with big antennas, but remember, we're talking about *reception* here. True, a transmitting station requires a large antenna for reasonable efficiency, but the listener can do quite well without such formalities. In fact, a "longwire" antenna or other large array can actually become a "noise collector" when used on the low and medium frequencies.

Quite often, the ferrite loop antenna inside most LW portables will provide good results. These antennas are highly directional, which can be an aid in eliminating unwanted signals. A box-frame loop is another excellent choice for receiving. Several articles have appeared in *MT* over the years with construction details, including the September '92 edition of *Below 500 kHz*. An active antenna designed specifically for LF is another low-noise option.

❖ Take a trip

Summer is the traditional time for vacations. Why not pack up your portable receiver, a beacon directory, and your logbook for some new-to-you signals. Imagine the excitement of tuning the band with an entirely new set of signals to listen to.

The pleasant weather of summer is also ideal for tracking down local beacons. All you'll need is your portable, a local map, and a compass. By plotting two or more bearings on a map, it is possible to zero in on any local station. This time-proven technique is known as *triangularization*.

Another activity well suited to summer is Natural Radio. If you've never explored this aspect of longwave, why not take the plunge? You won't hear the familiar sounds of beacons down here, but you will be treated to the music of the Earth – whistlers, sferics and tweeks. If you're lucky, you might even hear the beautiful dawn chorus. With the sunspot cycle 23 near its peak, there couldn't be a better time to tune in. A simple, yet effective natural radio receiver is described in the March and April 2000 editions of this column.

❖ Magic Moments

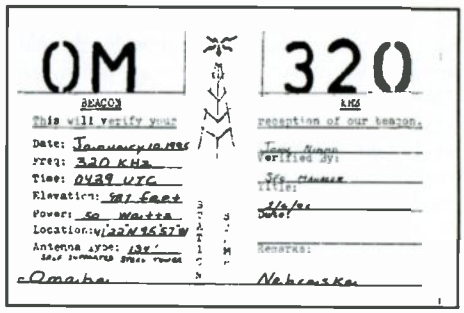
Inevitably, summer brings with it a few power outages. You can take advantage of these "radio quiet" events by keeping some fresh batteries on hand. With virtually all computers, TVs, fluorescent lights, motors, and other static-generating equipment shut off, the result should be static-free listening for you – at least for a little while. You might even discover some signals you never knew were there. Keep your logbook handy, and happy listening.

❖ Loggings

Our loggings this month come from contributor Allen Renner (PA). Allen uses a Realistic DX-440 receiver and a homespun preamplified loop. (He built the loop from the September '92 article mentioned earlier.) To date, he's logged nearly 700 beacons and has sent out 416 QSL requests. Amazingly, he's received almost 300 replies – not a bad return! Allen's list (Table 1) includes an assortment of DX intercepts as well many US beacons not often reported here.

Table 1. Beacon Loggings

Freq.	ID	Location
201	YKX	Kirkland Lake, ON
206	GLS	Galveston, TX
206	QI	Yarmouth, NS
257	SQT	Melbourne, FL
260	JH	Jackson, MS
261	2H	Lebel-sur-Quevillon, QC
326	PKZ	Pensacola, FL
333	HQU	Thomson, GA
341	LDM	Ludington, MI
344	ZIY	Georgetown, Cayman Is.
347	YG	Charlottetown, PEI
353	LLX	Lyndonville, VT
353	HOT	Higuerote, Venz.
353	FOA	Flora, IL
360	KIN	Kingston, Jamaica
375	GGL	Titusville, FL
379	ACZ	Wallace, NC
380	UCY	Cayojabo, Cuba
381	MNI	Manning, SC
391	DDP	San Juan, PR
396	PH	Inukjuak, QC
402	C	Camaguey, Cuba
414	AZE	Hazlehurst, Georgia
417	EOG	Greensburo, AL
450	PPA	Peurto Plata, Dom. Rep.
515	RRQ	Rock Rapids, IA
526	ZLS	Stella Maris, Bahamas


OM 320
BEACON KHZ
This will verify your reception of our beacon.
Date: January 10 1996
Freq: 320 KHz
Time: 0439 UTC
Elevation: 981 feet
Power: 50 watts
Location: 41°22'N 96°57'W
Antenna type: 135'
Remarks:
Omaha Nebraska

OM/320 kHz, Omaha, NB (Allen Renner, PA)

❖ BeaconFinder updates

Remember ace DXer Al Hemmalin (RI)? It's been a while since we've heard from Al, but he checked in recently with an update to his activities. He took a break from beacons for a while to pursue other DXing interests but now he's back at the receiver, and is hearing enough to be encouraged. He logged 251 calls during his first month back on longwave.

Al also sent along some updates for the *BeaconFinder* directory (Table 2). Those already having a copy of the guide may wish to note these additions inside. (The data will be added to all future printings of the *BeaconFinder* – P.O. Box 56, West Bloomfield, NY 14585.)

That wraps it up for another month. Enjoy the warm weather and I'll see you again in August!

Table 2. BeaconFinder Additions

Freq.	ID	Location
210	YKX	Kirkland Lake, ON
216	FFA	Ft. Albany, ON
235	CA	Cochran, ON
250	UAC	Poste Montagnais, QC
257	SQT	Melbourne, FL
275	R1	Thetford Mines, QC
332	YFM	La Grande 4, QC
341	YYU	Kapuskasing, ON
350	DF	Deer Lake, NF
355	YWP	Webequie, ON
367	L	Toronto, ON
371	GW	Kuujjuarapkik, QC
373	YXK	Rimouski, QC
380	YNC	Wemindji, QC
397	A	Hamilton, ON
405	7L	La Sarre, QC

Ike Kerschner, N3IK
email: n3ik@hotbot.com

QRP versus QRO

As most of you know I am basically a QRP or low power operator; and I belong to several low power clubs and subscribe to the basic premise "use witts not watts." Using low power is a choice I made a long time ago, and it is something that keeps the hobby enjoyable to me. It also seems that ever since I joined the low power types someone has been trying to prove something to me.

For example, a good friend who would never consider using anything less than the legal limit proclaims that I make contact with high power and then reduce power to a few watts. John's other claim is that QRP ops cause QRM (man-made noise) because no one can hear them and they are just an annoyance in the background.

For the record; that is simply not the story of QRP. With five watts or less, the entire world can be worked on CW or phone with good and useful signals. My present goal is DXCC (contact 100 countries) with one watt on SSB. True, it hasn't been easy going, but I only need a handful of contacts to achieve that goal.

On the other hand

A lot of the QRP folk take battle every time they hear a loud high power station with accusations of frequency hog, or QRM maker, etc. You know that ain't the way it is either.

If you choose to operate within the confines of QRP, then accept the fact that a lot of stations will whip your butt if you are going head to head with them in a contest or trying to break a pile up. I and many of the QRP brothers and sisters frequently beat a QRO station out in a battle but it is not an everyday happening. Every now and then you get lucky.

In the old days a lot of ops had problems aligning and operating high power amplifiers; and in some cases they were wide and splattered. In today's world that almost never happens unless the op is a real lid (poor operator) and cannot read. Manufacturers are making equipment that is nearly foolproof and both low and high power can operate in the same area without problem.

I gotta get this off my chest

The thing that annoys me more than anything else is the QRPer who will feebly shout QRP, QRP in hopes that someone takes pity on him! For crying out loud; give it a rest. You chose to operate with low power so take it in stride. I am also annoyed with the movement to differ QRP stations by using 72 instead of 73, etc. If you want to be a tough QRPer then do it; don't hide behind pity! When I QSO a station and enjoy a chat with him it is seldom till the end of the QSO that I identify myself as QRP. The reason for this mainly is so the guy will at least give me the effort he would give any other station (often if stations know you are QRP they'll simply give up if there is a little QRN or QRM). On the other hand a lot of operators will go to great lengths to make a QRO signal workable.

In more than 35 years of QRP operation I never felt left out because of power. For example: For three years I operated on the EPA (Eastern Pennsylvania) traffic net as NCS (net control), 3rn (third regional rep) and as a basic QTC (traffic) op. In that time I relayed hundreds of messages with no more fills or corrections than the average station, all that time I ran a Heath HW-8 at a power of three watts and no one ever said I had a weak signal. If you want to run low power do it, but if you prefer high power that is OK, too. It is your choice and all I want is for you to respect each other.

Flight of the Bumblebees

July 30 is the day the Bumblebees come out. The Adventure Radio Society is running this popular event again this year. Bumblebee stations will take to the woods, creeks and mountains using all forms of human locomotion, no engines allowed. Stations will walk, paddle or bike to their destination and set up a radio station to work other operators all over the world.

Here is full info on this years' Flight. This is a four hour fun event; starting times are 10:00 PDT, 11:00 MDT, 12:00 CDT and 1:00 EDT end times are 2:00 PDT, 3:00 MDT, 4.00 CDT and 5:00 EDT.

Both home and portable stations are invited to participate. Maximum power is five watts and operation will be on CW on 40, 20, 15 and 10 meters. The club is pushing for use of 20 meters and up, to allow the world to work the Bumblebees. Scoring is one point on 40, 20 through 10 meter contacts equal 2 points. Each Bumblebee is a multiplier, so if you work 40 bumblebees, multiply your final score by 40 (ie: 20 QSOs on 40 =40 pts, 30 QSOs on 20 =60pts, 25 QSOs on 15=50 pts and 10 QSOs on 10 =20 pts x 40 bumblebees =160 x 40 =6400 total).

If you would like to participate as a Bumblebee contact AA7QU by e-mail *russ@natworld.com*, by phone 541-896-026 or by 47227 Goodpasture Road, Vida, OR 97488.

Send logs to same addresses: if you use a paper log, include full name and call, homebased or bee, date total number of completed contacts with bumblebee and all other stations.

You are also invited to send photos, comments, stories and obtain more info to **http://www.natworld.com/ars/pages/pageone_material/advice.html**

Final Final

Many of you have been reading my various columns in *Monitoring Times* for a long time. I began writing for *MT* shortly after it was born (seems 20 or more years). Through the magazine I have made many friends and I have enjoyed writing this column more than I can ever say. However: I have just turned 62 years of age and have gone into a sort of retirement in the labor force. I have three boys (ages 16, 12 and 3) who I want to spend more time with, and it would be nice to go fishing, flying and play radio a little more than I have been. In addition, I have never been good at meeting deadlines and I find it more difficult as I grow older.

So, it is time to turn this column over to some one else so you can get their perspective on hamming and allow them to have some fun, too.

I expect to do some articles from time to time and tell you what sort of adventures I have been having, or tell you about some of my projects which seem to be an ongoing thing here. You can keep in touch with me at my e-mail address or at amateurradio101@onelist.com. With that I will say good hamming and 73 de Ike, N3IK

Clem Small, KR6A
email: clemsmal@bitterroot.net

Building Your Own Antennas

It's always fun to build something for yourself, and then find that it performs really well. For radio enthusiasts one of the most interesting and rewarding do-it-yourself projects is making your own wire antennas. And, generally speaking, you can make wire antennas which perform just as well as the commercial models available, and at considerably less cost. This month we'll take a look at building dipole antennas.

❖ The Dipole: An Industry Standard

Perhaps no other antenna design has been employed so frequently and broadly as the dipole configuration. It's not only a good antenna for the beginner; it is an excellent performer. Many experienced radio operators continue to depend on dipoles long after they could change to other designs if they wished.

Just as the name implies the dipole configuration consists of two conductors (fig. 1). These conductors are usually each a quarter wavelength long, and together produce the most common dipole: a half wavelength dipole. The halfwave dipole is a resonant antenna, and we can calculate its approximate overall length by the formula:

Length (in feet) = 468/frequency (in MHz) or
Length (in meters) = 143/frequency in MHz

For example a dipole for use at 10 MHz (30 meters) would be 468/10, or 46.8 feet long. In meters that's 143/10, or 14.3 meters.

On the other hand it is possible to shorten the antenna by as much as half the length given by the above equations, and still get decent receiving and transmitting performance. Some longer dipole designs are available which provide gain above the halfwave in certain directions.

At typical installation heights for HF antennas, the halfwave dipole gives a feedpoint impedance of somewhere between 25 and 100 ohms. This will usually work with either 50-ohm or 75-ohm feedline for short runs between antenna and rig. For longer runs, perhaps 75 to 100 feet or longer, and for transmitting purposes, hardline is preferable. Hardline is expensive, but on long runs open-wire or ladder line works great in combination with an "antenna tuner" (transmatch).

All things considered a dipole is a good choice for a first antenna, and many other situations,too. So let's build one for your favorite band. Although the dipole is not a wideband antenna it should give decent performance at frequencies near its design frequency, so try calculating its length for the middle of the band you want to cover. And, although the dipole is not a multiband antenna, it will even perform to some extent for reception on other bands than the one for which it was designed. On the other hand, when fed with open-wire, ladder line or even low-loss coax plus a transmatch, a dipole is actually a respectable multiband antenna.

As discussed in last month's *Antenna Topics* column, the tuning or resonant frequency of a dipole antenna will vary depending on what kind of objects are in its immediate environment and how close it is to them. Once we have the antenna constructed and installed, we can adjust its length more closely to resonance by following the techniques described last month. Making the antenna resonant at the frequency of desired operation has some advantages. On the other hand, if you don't have the equipment to measure its resonance it will still likely give you good service whether it is exactly at resonance or not.

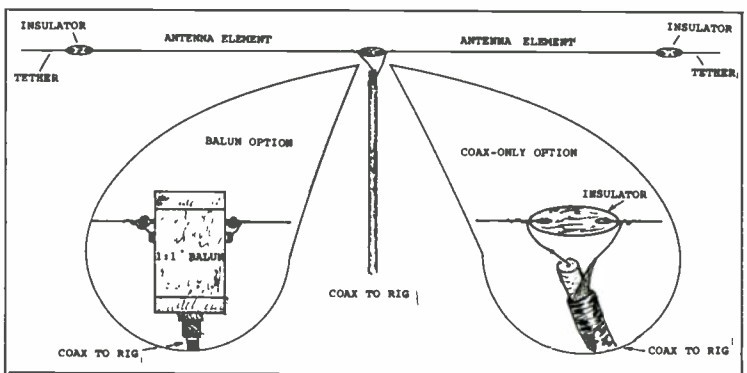


Fig. 1. A halfwave dipole with insets showing choice of balun connections or coax connections.

❖ Do You Need a Balun?

Some installations work well without a balun between the antenna and feedline. Sometimes an improvement is noted when a balun is added to an antenna system which had none. If your antenna is high enough to be well clear of any objects that might interfere with its radiation and reception (R&R) pattern then a 1:1 balun may give you an R&R pattern closer to the textbook shape (if that's important to you) than an antenna without a balun will. You may also get a better match between the antenna and feedline.

It's just that there are sometimes so many objects in the environment that affect the R&R pattern and match that you may not get a textbook pattern or better match anyhow. My inclination is that a balun is often a waste of time and money. On the other hand, you may find that a balun improves performance at your particular installation.

❖ Let's Build One!

To build a dipole you need to collect a few feet more wire than the above equations say you need for overall length; three antenna insulators; some rope or wire for attaching the antenna to its masts, trees or buildings; some 50 or 75-ohm lead-in coaxial cable; some coax sealant; and a balun if you are going to use one.

Radio Shack® and some hardware stores sell a multi-strand antenna wire, sometimes called "ground wire," that works very well. Try these sources for insulators and lead-in cable too. Electric fence wire and insulators work well. Baluns and balun kits are available from a variety of sources. Radio supply houses, such as those listed in *Monitoring Times* or ham radio magazines, often have the supplies you need.

When cutting your two elements to length, remember to leave enough extra length to bend around and attach to the insulators. If you are going to trim your antenna to resonance later, then make it 10 percent or so too long to start with. Clean any wire well where it must be attached to another wire, and solder the joints if

This Month's Interesting Antenna-Related Web site:

Some interesting history on underground or in-ground antennas can be found at **www.angelfire.com/ak/egel/roger.html**.

Also, readers who could not locate the NEC4Win antenna design program site given in the April column can find information on that program at **www.orionmicro.com/n4wpage.html**

you want the antenna to last. Be sure to seal any exposed coax end with coax sealant. If you use a balun, the connection to the lead-in may be via a cable connector; in that case, seal around the connector as well.

If the antenna is used where lightning is at all likely, some form of lightning protection should be used. The minimum here is to never use the antenna during weather likely to produce lightning, and to disconnect the antenna and ground it when it is not in use.

Mount the antenna as in-the-clear as possible. To emphasize HF DX performance mount the antenna a half wavelength or more above the ground; for shorter-haul HF communications, a quarter wavelength above the ground is preferable. For VHF or UHF, it's usually the higher the antenna the better.

Good luck!

RADIO RIDDLES

Last Month:

I asked: "What widely-known information do you suppose leads to the derivation of the antenna-length equations given above?"

Well as you probably know, radio waves travel at the speed of light. This is about 300,000,000 meters per second. And each radio wave also goes through a particular number of electrical cycles in one second. For instance if its frequency is 1 MHz (one million cycles per second) then it goes through a million cycles in one second. Because it experiences a million cycles in one second we see that during each cycle the wave will travel one millionth of the distance it would cover in a full second. So the distance covered during one cycle is one millionth of 300 million meters, or 300 meters. This distance which the wave travels in one cycle is known as the "wavelength" of that wave.

But the wave travels a bit slower in wire than in air or space. And something called "end effect" also affects the length we cut for an antenna element. So basically the determiners of a wave's length are the speed at which it travels in the medium (air, wire, etc.) through which it is traveling, and the frequency at which the wave oscillates. From such considerations we determine how long an antenna element must be to be a halfwave, quarterwave, or whatever length antenna we want.

This Month:

Why does a single-band dipole become a multiband antenna when used with low-loss feedline and a transmatch as mentioned above?

You'll find an answer for this month's riddle, another interesting, antenna-related web site, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

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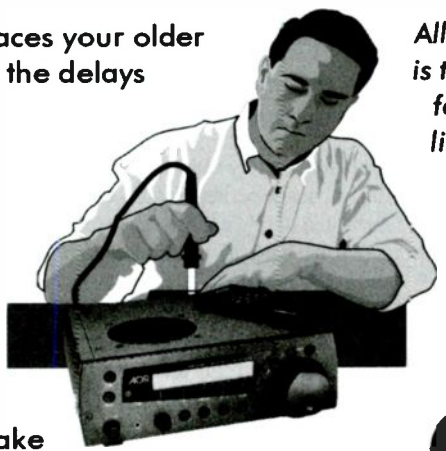

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A.C.-D.C. Evolution

In the last column, we talked about the development of the "minimal" alternating current-direct current radio in response to the financial constraints of the depression-era listening public. As the depression began to lift in the years just prior to World War II, this popular radio design became a little more expansive both in circuitry and in cabinetry.

❖ The A.C.-D.C.'s New Look

Developments in plastic molding techniques freed cabinet designers from the restrictions of working with wood. It was now possible for them to create, inexpensively, the rounded, streamlined forms that were becoming so popular in industrial design. Polished wood grains and bandsaw-effect speaker openings were replaced by flowing forms realized in Bakelite and other plastics. Development of smaller, more compact, tubes allowed the sleek new cabinets to have a lower profile.

Bakelite was most commonly seen in its familiar natural deep brown tone, but was sometimes painted in other colors. Among the other plastics less commonly used was "Catalin," which could be manufactured in a variety of iridescent colors and striking patterns. Since Catalin is a plastic that does not age well, sets with these cabinets are rare today and command astonishingly high prices.

The use of molded Bakelite made it possible to design cabinets with the sleek rounded lines favored by late 1930s industrial designers.

Circuitry evolution included a trend away from the old TRF (tuned radio frequency) design in favor of the superheterodyne. This meant that the tube count needed to increase – becoming, typically, five tubes (including rectifier) instead of four. One such tube set became so standard that we know it today as the "All American Five." It included a 12SA7 oscillator/mixer, 12SK7 intermediate frequency (i.f.) amplifier, 12SQ7 detector/amplifier, 50L6 power amplifier and 35Z5 rectifier. These tubes had higher-voltage filaments that made it possible to eliminate the series resistor (see last month's article) required for series-string operation across the 115-120 volt line. Note that the filament voltages (first two digits of the type number) of this set add up to 121.

Another circuitry innovation was the development of the PM (permanent magnet) speaker, making it possible to eliminate dynamic speakers with their bulky d.c.-powered field coils. Though the field coil had usually doubled as the power-supply filter choke, that function was now assumed by a power resistor. The substitution degraded filtering action, but the loss was easily made up for by the upgrading of the electrolytic filter capacitors, which were now commonly available in much larger sizes.

A final item worthy of note was the substitution of a built-in loop antenna for the hank of wire formerly laid under a rug or tossed out a window. The increased sensitivity of the superhet circuit, coupled by the increase in number and power of broadcasting stations, enabled this innovation to be made. Freed from the hobbling external antenna and housed in a trimmer, more compact cabinet, the radio could now be moved easily to any location in the house, providing information, entertainment, and good company wherever it was needed.

Not only could the improved sets be moved around the house at will, but new developments were making it almost as easy to bring radio along to the beach, park, sporting event, baseball game, fishing expedition trip or family vacation. This advance in portability was made possible by a special variant of the a.c.-d.c. radio that could run on lightweight batteries.

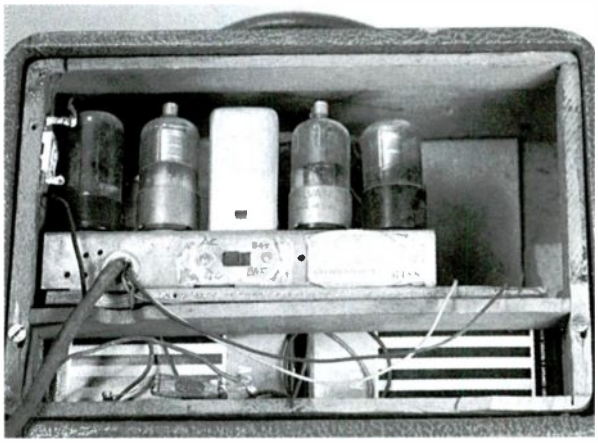
❖ The Three-Way Portable

As you might imagine, the three-way portable got its name through being designed to operate on a.c., d.c., or battery power. The little sets which, like the improved a.c.-d.c.s, also appeared on the market in the late 30s, were typically installed in jaunty "airplane luggage" cases. They were often smaller than the homebound a.c.-d.c.sets, even though they had to include battery storage compartments.

These radios were made possible by the development of a new range of tubes with filaments that drew only .05 amperes and could be operated from 1.5-volt flashlight cells. A 1.5- (actually 1.4-) volt tube set equivalent to the "All American Five" might include a 1A7 oscillator/mixer, 1N5 i.f. amplifier, 1H5 detector/amplifier, 1A5 power amplifier and 117Z6 rectifier. A few years later, these standard tube sets would change with the introduction of miniature glass tubes that would make possible a new generation of even more compact and portable receivers.

Why the exotic-sounding 117Z6 in the battery tube set? Well the 1.5-volt battery tube filaments were not suitable for use on a.c. and, in any case, would not drop enough voltage to be practical in a 115-volt series string. Yet a rectifier tube operating from the a.c. line *was* required for the power supply that provided filament and plate operating voltages when the receiver was running from a wall plug. Since there were no other tube filaments that could be put in series with the rectifier heater for this application, a special rectifier tube with a 117-volt heater was developed so that it could be lit directly from the a.c. line. The "117" in the tube designation, of course, refers to the heater operating voltage.

Remember the nomenclature we introduced you to a few issues back, by the way. We refer to the filament of the rectifier tube as a "heater" because it does not supply the tube's electron stream directly, but rather indirectly by heating another element (called a cathode). However, the filaments of the 1.5-volt tubes *do* supply the electrons directly, and hence are not given the "heater" designation.



Making room for the batteries required careful interior design. This portable's "B" batteries are under the shelf. The "A" battery (removed) and line cord were stowed in space at right.

When not plugged into the wall, the "3-way" operated on its batteries, of course, which typically included a single 67-1/2 volt "B" battery (or sometimes two 45-volt units in series). The "A" battery (which lit the filaments of the four battery tubes) sometimes consisted of several flashlight cells in parallel. But if the battery tube filaments were wired in series, a special "A" battery supplying the total required voltage was used.

Three-way portables have their own special lure for the collector. In their trim, luggage-style carrying cases, they still suggest the excitement folks must have felt when they realized that they could now easily carry a radio with them wherever they wanted to take it. The physical and mechanical features of the little sets are also fun to study. The need to create a compact, easy-to-carry package for a complete superheterodyne receiver and its batteries was a challenge to the ingenuity of the designer. Many are marvels of interior space management, and also incorporate interesting features such as flip-up tuning dials and loop antennas that could be removed from the set for best positioning in weak-signal areas.

The first "3-way portables" sported jaunty cases that gave owners an "on the go" image.

❖ Transformer-Powered Sets

We have spent a lot of time in this column, and the previous one, on the a.c.-d.c. set and the 3-way portable. This was partly because of their interesting features, partly because they were such widely accepted and widely-used designs. But I don't want to downplay the importance of the more expensive transformer-powered a.c.-only radios that were also appearing during the same era.

Dwelling on the features of these radios in detail is beyond the scope of the overview we've been presenting for the past several months. But they, too, were made in large numbers – and in a wider variety of cabinet styles than the a.c.-d.c. sets. There were table models and consoles, radio-phono combinations, multiband units with broadcast, shortwave and even FM. In their basic electronics, these sets were not very different from the a.c.-d.c. radios. But they typically used 6-volt heater tubes – which of course were lit from a special filament winding of the power transformer rather than connected across the a.c. line.

The same 5-tube circuit used in the a.c.-d.c. radios was common in these sets, employing 6-volt equivalents (such as the 6SA7, 6SK7, 6SQ7, 6F6) of the tube types used in a.c.-d.c. designs. Of course the additional power available from the transformer and the higher selling price of these sets made possible additional features. Tube counts could be higher because of enhanced audio output stages, additional r.f. amplification for greater sensitivity, special tuning indicators and circuits and other "luxury" touches.

In the late 1930s and early 1940s, with most of the basic circuitry of the home radio developed and requiring little further improvement, radio marketing began to stress special features rather than competitive performance. We'll take a look at some of these features next month, when we will wrap up the radio evolution overview begun with the start of this column in the January 2000 issue of *MT*.

After that, we'll turn our attention to the process of radio restoration that will become the main thrust of this column. Look for information on setting up your workbench, necessary tools and equipment and electrical safety followed by a series of actual restorations illustrating simple but highly effective techniques for coaxing your flea-market relic or Aunt Millie's old Philco back to life.

In the meantime your mail and feedback is always welcome. The E-mail address is at the top of this column; snail mail should be addressed to me at P.O. Box 1306, Evanston, IL 60204-1306. See you next month!

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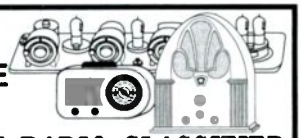

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Software Developments for the Ten-Tec RX-320

Sometimes, upon revisiting a piece of equipment, I find my original impressions have changed. It had been two years since I first used the Ten-Tec RX-320 PC receiver. Recently, there has been press coverage of Ten-Tec's new, "high-end," $1000-plus receiver (*see p. 98*). But, instead of reaching for my wallet, I decided to dust off the RX-320.

The RX-320 is a black-box that connects to a PC and becomes a full function shortwave receiver. Unlike other PC receiver manufacturers, Ten-Tec decided to concentrate their efforts on 0.1 to 30 MHz. Although the RX-320 does not cover VHF/UHF frequencies, what it does, it does very well. Since it is a true DSP (digital signal processing) receiver, the filtering can be manipulated to have a wide range – from very narrow 300 Hz for data reception, to 8000 Hz for voice reception. This one feature alone makes the RX-320 worth revisiting. At a price of under $300 it was a very exciting product when it was introduced.

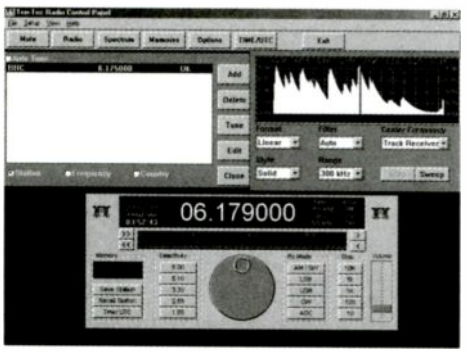

Figure One - Ten-Tec version 1.28 Beta

Now, approximately two years since my first encounter with the RX-320, a search of the internet turned up a plethora of options and features in new software packages. Some of the software is available free – for example, the latest update from Ten-Tec; others, such as ERGO, must be purchased via the internet. I used an HP Pavilion 2237, 233 MHz Pentium, with 32 MEG of RAM, running Windows 98, to exercise these RX-320 software.

❖ "Parental" Control of the RX-320

Ten-Tec continues to support their product well. Although version 1.27 is the "accepted" version, I used version 1.28 Beta. The "Beta" tag indicates that it is under development and may contain bugs; I did not find any.

Installation is quick and simple. The main screen of version 1.28 is shown in Figure 1. It provides flawless, simple, but adequate, operation of the RX-320. A spectrum display feature is also included. No advanced features are provided, but the operation is simple and intuitive. For first time and casual users, version 1.28 will be fine. Ten-Tec's software can be downloaded free at **www.tentec.com/RX320FTP.htm**.

❖ Getting Xtra Features

Dxtra has produced a software package, version 1.2 World Station for the RX-320, that has a unique operating screen. See Figure Two.

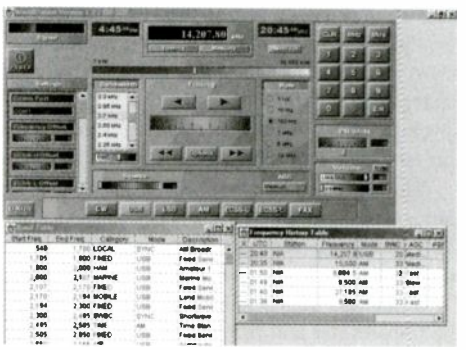

Figure Two - Dxtra version 1.2

Installation is not convenient. It is not automated and takes a fair amount of downloading time. Dxtra uses Java, and lots of Java screens are loaded during the install. Although this is done automatically, it may be the source of the sluggish response of the program.

Dxtra's display screen attempts to simulate "edge spin" tuning wheels – a nice concept, but operationally it doesn't add anything, except a bit of initial confusion. Also, I could not find a spectrum scope function in Dxtra.

Dxtra has many nice features, such as its History Table. This saves a "history" of recently tuned frequencies for quick and easy recall. Dxtra has nice scanning features and many convenient tuning methods. Tuning can be achieved via the keyboard, or point-and-click. Dxtra's integral database captures copious amount of station and receiver-setting data for each entry. Dxtra's World Station software is available for $79.95 at **www.dxtra.com/**

❖ RX-320 and DSP

One of the DSP audio programs (GNAPS1) we looked at in May was produced by Gerd Niephaus. This same author also produced an RX-320 program called GNR. Installation of the RX-320 program is simple. However, installation of its database program is a separate operation and requires a bit of hand holding.

The screen display, Figure Three, is very basic with no tuning "knob." A pushbutton receiver panel screen is the business end of this program. All controls are obvious and easy to use. But, intuitive computer keyboard controls have not been totally implemented. For example, keyboard arrows are not functional. Point-and-Clip is the order of the day.

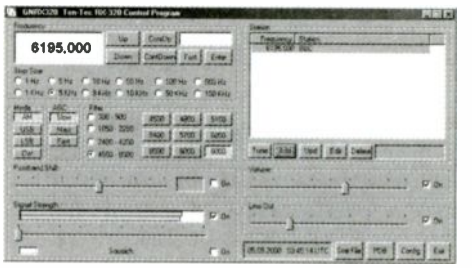

Figure Three - GNR by G. Niephaus

Although basic and lacking a spectrum display, GNR does have some expansion of the basic radio functions. For example it provides separate level controls for both the speaker and line-out. Use of the database is the both comprehensive and easy. In fact, it was one of the most easy-to-use databases we tried for the RX-320.

When used with the aforementioned DSP audio program, available from the same website, the package is nice, simple and free. GNR is available for downloading from **http://members.tripod.com/~gniephaus/**.

❖ One of the Best

I had problems downloading an RX-320 program authored by Clifton Turner, KF5OJ. Finally, on the fifth try, downloaded files were saved and I proceeded with its installation. I am sure glad that I persevered. With the exception of the awkward installation, which could stand more detailed, clear instructions, I have only praise for this program.

The KF5OJ program has so many different methods of tuning no one will be disappointed.

See Figure Four. The horizontal frequency "tape" makes big frequency jumps very easy, while maintaining tuning down to one hertz. Band selection buttons brings the user directly to shortwave and ham bands, just in case you don't remember them. The mouse is primary method of control. Keyboard keys cannot easily be used as mouse substitutes.

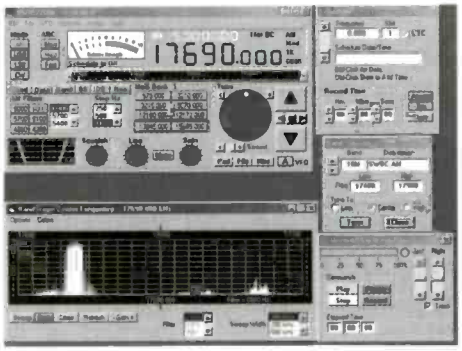

Figure Four - KF5OJ, C. Turner's Approach To The RX-320

Likewise, passband tuning can be performed using a number of different methods, including a graphical drag feature. And, in case you need help with other functions of the program, a very comprehensive interactive help function is included.

A digital audio recorder function is built-in and works simply and easily. In order to use the recorder, the receiver's audio must be fed to your computer's sound card.

The KF5OJ program has features I did not see in any other RX-320 program. For example, if a digital mode is being monitored, the actual frequency is off-set by the tones being used. Using the program's Frequency Compensation Menu, the frequency display will be adjusted for the offset.

The database program, version 1.06a, matches the controller program's ease of operation.

If the download and install were a bit easier, for most aspects of controlling the RX-320 this program has it all – ease of use, excellent interactive Help, uses all of the RX-320's capabilities and adds even more functions, and it's free.

Try the KF5OJ program yourself at **http://pages.prodigy.net/kf5oj/KF5OJ.htm**

❖ Is There More ?

YES! Three more programs to control the RX-320 are available.Next time we'll cover the remaining three. Also, we will look at a hardware add-on that greatly expands the use of the RX-320. If you're interested in the RX-320 receiver you will not want to miss next month's conclusion.

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Jock Elliott, KB2GOM
lightkeeper@sprintmail.com

Drake's Nifty Minitalk-99

The Family Radio Service (FRS) is now officially "mainstream," and I have definitive proof. On April 6 of this year, the venerable *New York Times* published a lengthy article entitled, "With Family Radios, the Walkie-Talkie Comes of Age."

Getting an article in the *New York Times* is in many ways the cultural equivalent to a Papal Blessing: "Yea, verily, thou art now part of the very fabric of our society, with all the attendant rights and privileges."

The *New York Times* notwithstanding, there are still lots of people in this great land of ours who don't know what the Family Radio Service is all about or who have eyed those cool-looking two-way radios in a store and wondered if they were worthwhile or not.

So here's the scoop on FRS. The Family Radio Service was established in 1996 on 14 frequencies:

Channel	MHz		
1	462.5625	8	467.5625
2	462.5875	9	467.5875
3	462.6125	10	467.6125
4	462.6375	11	467.6375
5	462.6625	12	467.6625
6	462.6875	13	467.6875
7	462.7125	14	467.7125

FRS radios are limited by FCC rules to 1/2-watt maximum power in FM mode, with no external antennas. These small (often pocket-sized) handheld transceivers generally offer crystal-clear communications over ranges up to about two miles, and no license is required. Because of the frequencies at which FRS radios operate, they work well in buildings, outdoors, and inside vehicles. What's more, they are easy to use – just select a channel and push the button to talk.

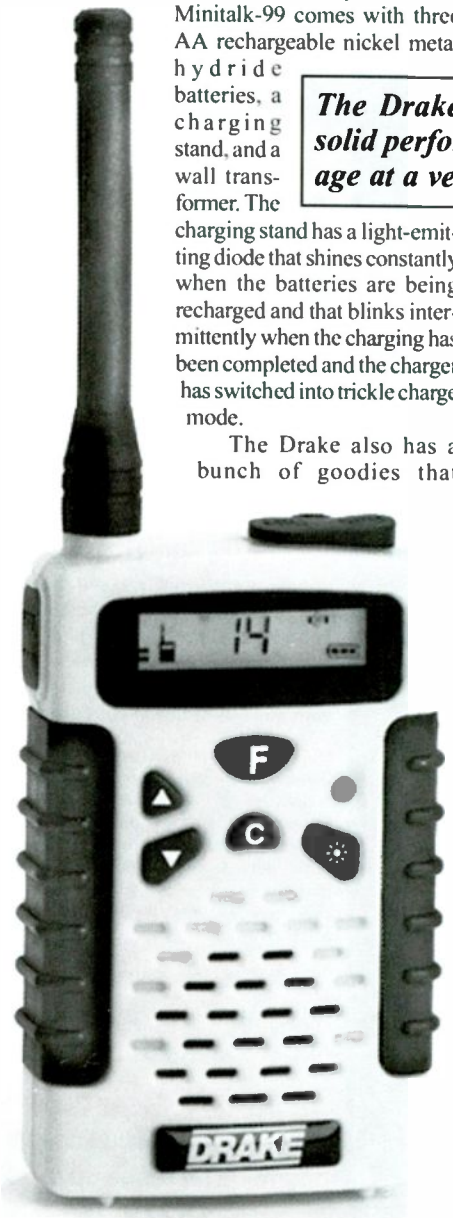
One of the reasons that FRS is becoming incredibly popular is the versatility of the radios. They can be used between vehicles on a trip; at an amusement park or shopping mall to coordinate family activities; between hikers, bikers, and skiers; and even as a mobile intercom in an office building. As a testament to the rising demand in the market, radio manufacturers were granted approval to produce 14 FRS models in 1997, 41 in 1998, 72 in 1999, and 23 as of April this year, according to the *New York Times*.

The Minitalk-99

Drake's Minitalk-99 is one of the smallest FRS handitalkies available, measuring just 3.4 inches high (5.9 inches with antenna), 2.1 inches wide, and 1.2 inches deep, excluding belt clip. It offers a full 14 channels, 38 so-called privacy codes, and a full half-watt transmitter power. The Minitalk-99 comes with three AA rechargeable nickel metal hydride batteries, a charging stand, and a wall transformer. The charging stand has a light-emitting diode that shines constantly when the batteries are being recharged and that blinks intermittently when the charging has been completed and the charger has switched into trickle charge mode.

The Drake Minitalk-99 delivers solid performance in a tiny package at a very reasonable price.

The Drake also has a bunch of goodies that should prove useful in a variety of situations: autoscanning of the 14 channels, seven different call tones for alerting other units and even a remote monitoring capability. Drake has even thoughtfully provided the ability to set a battery-saving low-power transmission mode as well as the ability to do voice-activated transmissions with adjustable sensitivity.



The layout of the Drake FRS unit is simplicity itself. At the top of the front panel is a backlit liquid crystal display that displays operating conditions. Below that are six buttons: an orange power button, a button for turning on the display backlight and turning off the autosquelch, a pair of up/down slewing buttons, a function button that serves to enable various functions, and a C button that used for sending tone calls and for activating "privacy" codes.

Below the buttons is a grill that houses the separate speaker and microphone. On top of the radio is a rubber-covered port to plugging in a speaker microphone. On the left side is a push-to-talk button. On the back of the unit is a hatch for installing the batteries and a round knob that slips into an innovative belt clip that stays on your belt. (The radio just pops in an out with the touch of a button – very handy.)

How's it work?

The Minitalk-99 is easy to operate. To change volume settings, simply press the up/down slewing buttons. To change channels, press the function button, then the slewing buttons. To activate the continuous tone-code scanning squelch "privacy" codes, press and hold the C button for a moment, then use the slewing buttons to select the code number you want. Your radio will now reject conversations from others who are not on the same channel and code, but they will *NOT* be private. To turn off CTCSS codes, simply press and hold the C button for a moment. To access additional functions and features, press the function button two or more times. In all, the Minitalk was straightforward to operate, and the eight-page operating manual did a good job of explaining what to do.

The performance of this small FRS unit is excellent. The audio on transmit and receive is very crisp and clear, and the range over our standard test course showed that the Minitalk-99 performs with "the big boys."

The Minitalk-99 is available directly from Drake for $79.95 each and comes with a 14-day money back guarantee and a six-month limited warranty. To order, call 1-800-9-DRAKE-4 during Eastern Time zone business hours or order directly by visiting **www.rldrake.com**.

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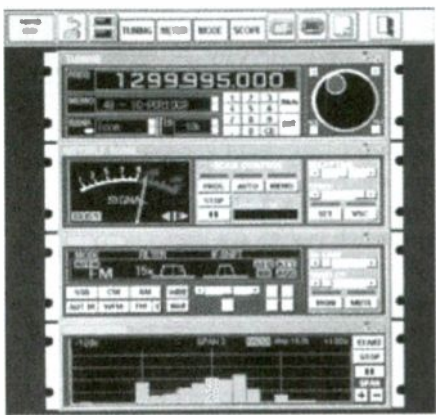

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Other features include drift-cancelling AFC, voice scanning control to skip unmodulated channels, S-meter-settable squelch, CTCSS (subaudible tone "PL") squelch decoder, user-selectable scanning methods and tuning steps, 20 dB RF attenuator for overload protection, triple up-conversion design, high sensitivity (0.4 uV typical on NFM), 5 selectivity choices, and 1 Hz tuning resolution.

Requires Windows 3.1 or 95, 486 or better, 10 MB hard disk, 16 MB RAM. serial interface, 640 x 480 pixel resolution or better. Accessories provided include program disk, telescopic antenna, RS232 interface cable, AC adaptor, and full instructions.

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Review by Bob Grove
bgrove@grove-ent.com

Listening Luxury: The new Ten-Tec RX-340

When the military needed a reliable receiver, they sat down with leaders of the communications industry. Initially, Watkins Johnson produced the early versions of the WJ8711, but as sales began to diminish with time, WJ turned to the hobby sector, releasing the legendary HF1000 receiver.

Although this quality product caused quite a stir a few years ago, sales were disappointing; but then, this was a $4000 radio! WJ gradually withdrew from the SWL/amateur sector, relegating the HF1000 to history.

But Ten-Tec is still very much alive, and they have been producing "black box" remote control receivers (model RX-331) for the government for nearly a decade. Now they have taken their successful mil-spec receiver and wrapped it in a very appealing, highly functional new package, quality built for 100% duty cycle with no down time.

The Ten-Tec RX340 is neat, clean, and straightforward to operate.

While the rugged, mil-spec design and construction of the RX-340 minimizes circuit failure, a built-in test and evaluation (BITE) provides instant readout of just about any conceivable board-level failure.

Off the shelf, it has the most-commonly-used functions factory programmed, but the user can custom-select operating characteristics like AGC attack/hang/decay timing. A laboratory precision clock oscillator provides stability of +/- 1 PPM over a temperature excursion of 0-50 degrees Celsius (32-122 degrees Fahrenheit).

We were privileged to take a sneak peek at the new RX-340, and we were very impressed with what we saw – and heard.

Let's Take a Look

MT contributor Tom Sundstrom provided readers with a technical overview of the RX-340 in our May issue (*What's New*, p.102), so we will concentrate on the operational aspects of the receiver in this column.

Since the receiver is intended for rack mount, it is not finished in a wrap-around cabinet; the heavy anodized shielding is the final finish behind the panel. Ten-Tec provides a set of rubber feet for those users who elect to set the receiver on an operating table.

A high quality, 4" speaker faces upward from the top shield grill and provides excellent sound. Even at full, room-filling volume, there is no audio distortion. Alternatively, the user may wish to plug a larger, external speaker system into the 1/4-inch rear-panel phone jack, thus disabling the internal speaker.

That Rear Panel

The RX-340 is intended for agility. The rear panel is loaded with BNC connectors for various RF tasks and offers an RS232C data port as well for computer interfacing and a separate port for custom audio requirements.

A wideband, first mixer IF 45.555 MHz output is provided to feed an optional spectrum display unit limited only by the front-end filter selected. Span varies from a few hundred kilohertz at MF to several megahertz at HF.

While Ten-Tec does not offer a spectrum display unit, an excellent choice would be the AVCOM SDM42A, ordered with the 45.555 MHz IF input frequency and the rack-mount option if needed.

A second mixer IF feed is also provided for post-DSP 455 kHz output with bandwidth determined by the filter selection. Separate 455 kHz signal monitor outputs may be taken with and without AGC delay.

For increased precision frequency measurements, an external reference oscillator of 1, 2, 5, or 10 MHz may be injected into the rear-panel BNC.

Line-level audio (600 ohms @ 0 dBm) is available from two circuits, permitting the separate detection of independent sideband (ISB) signals. A string of DIP switches may be reset for configuration selections.

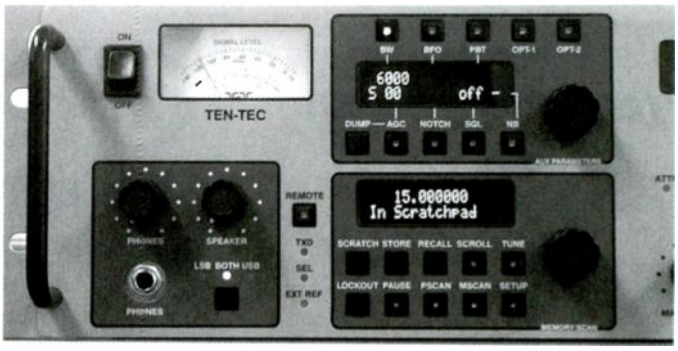
Intended for rack mounting installations, not mobile/portable facility, the receiver has no provision for DC power; it is operable only from worldwide 90-240 VAC, 48-440 Hz (30 watts nom.) mains.

That Impressive Front Panel

Simply watching the receiver come on is a treat in itself as the circuitry sequentially activates its readouts. Amber-lit function keys and brilliant blue fluorescent alphanumeric displays signal their status. The primary display shows mode, frequency (to one hertz accuracy – that's six decimal places!), and stepping increments, all in bright, half-inch characters. A two-inch tuning knob sports a textured rubber grip, while a finger-indent allows rapid slewing through the bands. The action is smooth.

Unlike the busy, multi-function pushbutton galaxies found on many shortwave receivers (and especially scanners), the RX-340 has dedicated, single-function buttons for the most part. And when alternate function keys are pressed, the associated display automatically changes to reflect their settings.

Stereo headphones may be plugged into the standard 1/4-inch jack, affording channelized (binaural) reception of separate ISB, LSB, and USB functions. All other modes are monaural.



A close-up of the S meter, audio gain controls, and fluorescent menu-selection displays.

The large fluorescent display and single-function keypads are a pleasure to execute.

A separate volume control, next to the speaker volume control, is used for the headphone jack.

The illuminated signal strength meter is a husky, analog (D'Arsonval) movement with separate – and accurate – scales for dBm (-140 to +10) and S units (0 to S9+80 dB).

Control Functions

Of all the controls on the receiver, none is more impressive than the IF bandwidth (selectivity) adjustment. Since this alters the actual digital signal processing (DSP) channel width of the final IF stage, you can actually hear the bandwidth change proportionately as you firewall the desired signal from adjacent signal interference!

While you rotate the control from as wide as 16 kHz wide to as narrow as 100 Hz (in 57 discrete steps!), a digital readout accurately announces the bandwidth in hertz. With a filter shape factor of 1.5:1 or better (70 dB ultimate attenuation), the audible effect is astounding. You can tailor the adjustment to suit your listening preference as you slew the control, balancing adjacent-signal-interference reduction with audio intelligibility.

And even if you have a residual heterodyne tone remaining, simply invoke the razor-sharp notch filter and slice it out without degrading the remaining audio passband (SSB and CW modes only).

But variable IF bandwidth isn't the only way to reduce interference. In addition to normal full-carrier AM detection, the RX-340 also has selectable-sideband synchronous detection. This allows the user to choose which sideband of an AM signal to eliminate for the reduction of adjacent-signal interference or, if he prefers, full-envelope synchronous detection.

We found the synchronous mode to be very effective, locking on weak signals in spite of high interference levels, although the bandwidth is irrevocably set at 6 kHz in this mode. The receiver can be tuned only a few hundred hertz from center carrier without losing lock in the synchronous AM mode, and it will lose lock on signals near the noise floor.

Momentary dropouts in synchronous lock may be heard when new selections are made for attenuation or preamplification, or when resetting the manual (RF) gain control.

But let's not forget yet another, highly-effective noise reduction technique: passband tuning (PBT). The RX-340 allows the user to move the apparent center of the received signal away from adjacent-frequency interference in five hertz steps to as far as 2 kHz from its original position, effectively placing the interference outside the filter's selectivity skirt for brick-wall rejection.

The PBT works in the USB, LSB, ISB, and CW modes only, not AM or FM. In AM, the Synchronous detection does the job, and in FM, the capture effect restricts adjacent channel, and even weaker co-channel, interference.

To remove background noise while monitoring for activity, an all-mode squelch, continuously adjustable over a 150 dB range, is included.

In spite of the superlative dynamic range (3rd order intercept point 30 dB typ.), a 15 dB attenuator function is supplied, and in spite of the excellent sensitivity (-112 dBm SSB), a 10 dB preamplifier is selectable as well. Spurious IF rejection is a superb 90 dB.

Scanning

The RX-340 includes 100 scannable memories; the scan functions are in a display block all by themselves (see photo). There's a scratchpad memory as well for holding current information. Search between two preset limits is provided as well. Although the scan rate is not as lightning fast as modern VHF/UHF scanners, it is several channels per second, probably too fast to get any audible indication of activity.

Memory contents include frequency, mode, bandwidth, and BFO setting. Channels can be temporarily locked out of the scan sequence, and pause may be selected as well.

So Who Needs it?

Jaded listeners might think that the new Ten-Tec RX-340 is just too much receiver; after all, aren't receivers in the $1000 class eminently listenable? Sure, or reputable companies wouldn't be selling them. But there's another perspective besides audible quality.

Those whose success depends upon ultimate reliability (military departments, government agencies, laboratories, surveillance organizations, shortwave broadcasters, etc.) require the confidence offered by the RX-340. They need the assurance that they have not only the best reception possible, but long-term dependability as well.

And then, of course, there's you and me – wouldn't you just love to tell someone you were using a Ten-Tec RX-340 as your primary monitoring instrument?

Ten-Tec RX-340 receiver, $3949 plus $15.95 shipping and insurance from Grove Enterprises (PO Box 98, Brasstown, NC 28902; 800-438-8155 sales or 828-837-9200 tech.)

The rear panel affords flexible I/O options.

Update on the Grundig Millennium 800

In our May issue we reviewed the long-awaited Grundig Millennium 800 receiver. We noted both good and not-so-good observations on our pre-production sample. Since Grundig spokesmen assured us that our concerns were being addressed, we promised an update to our readers.

By now hundreds of the 800s are in daily use by U.S. and Canadian listeners. Athough two randomly-picked samples of the current production run did still displayed some self-generated spurious signals, under actual reception conditions, signals strengths seem to overcome the spurs.

Larry Van Horn, our in-house reviewer, agrees, observing that the prevalence of internal interference heard on the pre-production prototype was not observed when tuning throughout the shortwave ranges with the antenna connected. He did note, however, that tuning synthesizer noise is still quite prevalent, with the annoying crackling noise especially prominent on the AM and FM broadcast bands, less so on shortwave. The noise is only present as the tuning knob is being rotated.

Although the three samples we tested over a two-month period seemed to exhibit different sensitivities on AM and FM, most listeners are quite satisfied with its performance. The Millennium 800 has good sound and is easy to operate—and easy to see with its giant display and pushbuttons. And by actual count at Grove Enterprises, fewer than 10% of the radios sold have been returned—a low return rate for a brand new product.

Bob Parnass, AJ9S
parnass@megsinet.net
www.megsinet.com/parnass

Electra Tiger Scan TSA

Our scanner collection is full of Electra Bearcat BC-Ls (fig. 4), BC IIIs, BC-101s, BC20/20s, BC-250s, BC-300s, and other Electra models, most built in the USA. If you enjoyed scanning thirty years ago, Electra should be a familiar name. Electra Corp., a small Indiana firm, developed the classic Bearcat line of scanner radios. James (Al) Lovell founded Electra Corporation in 1964. The company grew and was bought by Masco seven years later. Uniden bought the Bearcat scanner line in 1984.

Figure 1. Electra Tiger Scan TSA

While other scanner manufacturers were slow to innovate, Electra is known for their "Yankee ingenuity." It was evident in the BC-100 (fig. 5), the first handheld programmable scanner and in new features like per-channel rescan delay, service search, and auto store.

Innovation runs in the Lovell family. James Lovell's son Dave restarted Electra Corporation in 1991, concentrating on industrial electronics. Carrying on the family tradition, the reincorporated Electra is back in the scanner business with the Tiger Scan TSA (fig. 1). It was introduced at the 1999 Dayton Hamvention and demonstrated at public safety shows across the country.

The TSA is a bare bones, VHF-high band scanner which sells for about $70. It has no knobs. All functions are controlled by three pushbuttons and status is displayed on a pair of bright red LEDs.

It has a built-in service search covering seven NOAA weather frequencies and you can program two NFM channels in the 136 - 174 MHz range. The TSA powers up in the NOAA weather radio search mode. One pushbutton cycles the TSA through four options: NOAA weather search, monitor channel 1, monitor channel 2, or scan both channels 1 and 2.

The frequency programming procedure is novel. Instead of a VFO or numeric keypad, you tap each frequency digit using a single pushbutton akin to a telegraph key, waiting for a confirmation tone after each digit.

The specification sheet does not list the tuning step size. When I program 165.2375 MHz, the TSA reads back 165.237 MHz but is actually tuned to 165.235 MHz.

The squelch is automatic and you have no control over it. The squelch threshold of our radio (S/N 137213) measures 12 dB quieting.

One pushbutton controls the volume, an arrangement unique to the TSA. The audio level defaults to a pre-

Figure 2. Tiger Scan uses surface mount components on a single board.

set level each time you power on the TSA. For more volume, you press and hold the pushbutton. The radio gets louder until you release the pushbutton. If you press and hold the pushbutton again, the volume will decrease. The direction of the volume reverses with each press of the pushbutton, a counterintuitive arrangement. This leads one to crank up the volume by accident when you want to soften it instead!

A stiff, plastic covered helical antenna protrudes about 2-1/2" from the TSA. It is glued to the top panel and soldered to the printed circuit board (fig. 3), so it cannot be removed without surgery. This precludes connecting the TSA to a signal generator to perform sensitivity and image rejection measurements.

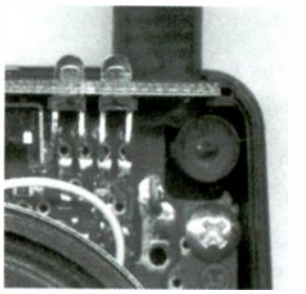


Figure 3. Permanent 2-1/2" helical antenna is glued to the top panel and soldered to the circuit board.

A subminiature (3/32") jack atop the TSA can be used for an earphone. An optional charger plugs into the same jack when the TSA is fitted with rechargeable batteries.

Quality and Performance

An old adage says first impressions can be deceiving. My first thought upon seeing the TSA in its blister packaging was "here's another cheap electronics gadget dressed in chintzy black plastic." In fact, the TSA is housed inside a sturdy plastic clamshell case. It feels solid and doesn't flex when squeezed. The bottom is rounded so the TSA cannot stand up on its own. The top panel appears to be made from glass epoxy circuit board material painted black on one side.

The TSA frequency coverage is specified as 136 - 174 MHz, but we can program and receive signals in the 130 - 179.995 MHz range. The firmware would not permit programming frequencies outside these limits.

The permanent antenna prevents us from measuring the TSA's SINAD sensitivity. In actual use, our TSA is noticeably more sensitive than our ICOM IC-R2.

Our radio breaks into oscillation near 155.58 MHz, a local police channel. We can actually hear the oscillation generated by the TSA in another receiver if we position the second receiver near the TSA. Placing a hand near the TSA's

Figure 4. Early Electra Bearcat BC-L scanner. Note the lack of channel lockout switches.

antenna temporarily stops the oscillation. When contacted, Electra offered to replace our TSA under warranty.

Our TSA beats our IC-R2 in the audio arena, too. The TSA internal speaker (fig. 2) produces clear, crisp audio and is significantly louder than my ICOM IC-R2.

As mentioned earlier, you have no control over the squelch level. Our TSA emits a moderate length noise burst at the end of each transmission. Weak signals have a tendency to open and close ("pop") the squelch rapidly and the squelch action would be improved with more hysteresis.

Figure 5. Electra Bearcat BC-100, the first programmable handheld scanner

The one page specification sheet does not list the IFs (intermediate frequencies), but lab tests reveal IFs of 10.7 and 0.455 MHz.

Our TSA's power requirements are meager - only 17 mA while scanning. There's supposed to be a low battery voltage warning system, but it doesn't activate when powering our TSA from a lab power supply and gradually reducing the voltage. We can receive the NOAA weather radio signal as long as the power supply voltage exceeds 5 V.

Measurements

Electra Tiger Scan TSA Scanner S/N 137213

List price $69.95 plus $6.95 shipping and handling
Electra Corporation
11915 E. Washington St.
Cumberland, IN 46229-2951
tel. (317)894-3329
email: electra@tcon.net
www.electra.com

Frequency coverage (MHz):
130 - 179.995 (5 kHz steps)

Squelch threshhold: 12 dB SINAD

Intermediate Frequencies (MHz):
10.7, 0.455

Power requirements: 9 VDC battery
off: 2 uA
manual: 17 mA
scanning: 17 mA
full volume: 100 mA
low voltage warning: none detected

❖ Accessories

Electra Corp. sells accessories for the TSA. The $19.95 padded carry case is impressive (fig. 6). It is made in USA of a Cordura-type material. The top is open and an adjustable strap fastens over the top of the Tiger Scan to hold it in. A spring steel belt clip holds the case to your belt or sun visor. What a refreshing change from the thin, overpriced "glove" cases sold for imported scanners!

Electra offers other options, like an earphone ($9.95), wood and metal desktop stands ($9.95), and a rechargeable battery ($24.95).

❖ Bottom Line

The Tiger Scan TSA is limited due to being a single band, 2 channel scanner. That's no surprise if you've read anything about the TSA. What is surprising is how well it's built, its good sensitivity and outstanding audio quality. We like the 9 volt battery operation, but wish for improved squelch action.

The TSA is well suited to volunteer firefighters, emergency service workers, businesses, and others who have an interest in monitoring a couple of VHF frequencies without spending a lot of money. We use it for monitoring a ham radio repeater and a public safety channel.

Electra plans to introduce a UHF model sometime soon.

❖ Vintage Scanners

If you are interested in collecting or using older vintage scanners and monitor receivers, check out the new "vintagescanners" email list at **http://www.onelist.com**.

Brett Miller, N7OLQ, collected photo images of older scanners and placed them on his web pages, **http://N7OLQ.home.att.net/Radio**. If you have a photo image of an old scanner or monitor to contribute and the photo is not copyrighted, send it to Brett at *brett.miller@intel.com*.

Figure 6. TSA shown in its optional carry case.

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MT REVIEW

Ramsey Mobile RDF System

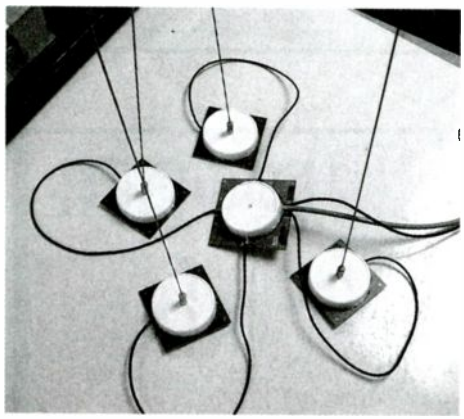
By Bob Grove

Radio direction finding (RDF) antennas find myriad uses in communications, from locating sources of intentional or incidental interference, to homing in on downed aircraft beacons. Amateur radio "fox hunts," locating hidden transmitters, are a popular pastime in some radio clubs. Members often use those talents to find repeater jammers.

Classical systems use loops, Adcock arrays, Yagi (beam) antennas, and other manually rotated antennas to determine target bearings from the operator's position. But automatic direction-sensing antennas with a compass-bearing readouts are certainly easier to use, and often more accurate.

Doppler schemes use multiple antennas, arranged in a circle and electronically sampled hundreds of times per second by a rapidly switching circuit. Different signal arrival times at the different antennas are automatically compared and translated into direction, then displayed on a control panel as a digital bearing or, more often, as an LED in a circle representing a compass rose.

While commercial Doppler RDF systems can be very expensive (often thousands of dollars), Ramsey Electronics has recently released an inexpensive kit. The DDF-1 Doppler Direction Finder is based on a circuit published in *QST* magazine (April/May 1999 issue), contributed by WA2EBY.



A single Doppler RDF system can be operated over a wide frequency range, as illustrated by the advertised 130-1000 MHz span of the Ramsey. However, proper positioning of the whips at different frequencies is critical for accurate bearings, meaning that antenna lengths and separations must be changed for wide frequency excursions.

The DDF-1 display contains an array of 16 LEDs, and it is capable of resolving bearings within 22.5 degrees (16 x 22.5 = 360). While this may not be accurate enough to position a rocket launcher, it is adequate for following and finding a target transmitter. And a second operator using an RDF at another location could radio his bearings as well, allowing cross-coordinates to be plotted on a map for rapid resolution of the target's location.

Putting It Together

A 36-page assembly/calibration manual is included with the kit. Although assembly is not particularly difficult for an experienced kit builder, calibration procedures may be rather daunting for someone unfamiliar with radio or electronics theory.

It is important to have access to an oscilloscope to verify the square wave pattern of the logic circuits; a frequency counter to measure the operating frequency of the clock oscillator; a voltmeter to assure correct operating voltage in the circuitry; and an audio generator to calibrate the signal level circuitry.

The operator will also need to secure the assistance of a confederate with a walkie-talkie or mobile rig who is willing to drive around, communicating with you to coordinate proper positioning and alignment of the rooftop array and control settings.

The DDF-1 kit contains all the parts necessary to assemble a full system, including approximately 150 circuit board components, plus miscellaneous hardware. You will need to supply the coax cable (RG58/U or RG174/U) downlead and five-conductor cable (multi-conductor telephone or computer cable will work well) from the rooftop array to the console. You will also need to supply the DC cable with a standard power connector and an audio cable to connect between the control box and your radio's external speaker/earphone jack.

While the ABS plastic box utilized a professional stick-on panel, the antennas will look quite homemade. Four copper-clad steel rods anchored to small circuit boards housed in white-plastic jar lids comprise the antenna array. Plenty of unimpeded rooftop space will be needed to accommodate the four whips, spaced a yard apart.

The antenna bases are "anchored" to the vehicle roof by flexible tape magnets with barely enough strength to hold them upright. The manual recommends slow driving speeds or replacing the magnetic strips with something more substantial, like speaker magnets. Good idea, unless you are satisfied taking all bearings from one position.

In Operation

The panel consists of a central ring of red LEDs with a center green LED; two red LEDs indicating low/high audio level; a Power switch; a stop/run Scan switch; and a normal/reverse Phase switch. There are also three controls: Calibrate (used to set your initial compass bearing); Damping (used to average out flutter in the logic circuits); and Audio Level (used to balance the input level with required speaker volume).

After some fiddling with the controls, we found the system actually quite simple to use, but the newcomer will need to do considerable experimenting with known signals to feel comfortable with the variables that accompany any direction-finding effort.

The DDF-1 Doppler Direction Finder kit is available for $149.95 plus $6.95 shipping from Ramsey Electronics, 793 Canning Parkway, Victor, NY 14564; ph. (800) 446-2295. Visit their Website at **www.ramseyelectronics.com**.

Super Select-A-Tenna

By Larry Van Horn

One of my radio hobby passions is DXing (listening for distant stations) in the AM broadcast band (525-1710 kHz). When first I started in this hobby in 1963, AM broadcast band (BCB) DXing was my main listening focus and I continue to DX these frequencies years later. I have used a plethora of bought and built equipment and antennas for AM DXing over the years to weed out weak signals in this spectrum – some good and some not so good.

Needless to say I was excited when given the opportunity to test Intensitronics Corporation's latest addition to their BCB antenna product line – the Super Select-A-Tenna. I have been using the company's original offering, the Select-A-Tenna (both first and second generation models), for several years now. While it isn't my primary BCB DX antenna, it does an excellent job when matched up with two of my secondary portable receivers that I use from time to time – the Sony ICF-2010 and GE Super Radio III.

Evolution of an Idea

To back track a bit, the original Select-A-Tenna is a passive device that requires no wires, no batteries, no plugs, etc. It works by simply placing it next to your radio and turning the large tuning knob to the same station frequency as your radio. This antenna functions by concentrating the radio station signal energy in the near proximity of the Select-A-Tenna. If the radio you use has an internal antenna and is placed in that same near proximity, the radio and antenna share the same signal concentration and gain improvement. The manufacturer claims 30dB improvement of signal with the original Select-A-Tenna and my testing showed that is the case over most of the BCB spectrum.

Recently Intensitronics released their second generation of Select-A-Tenna (Grove ANT-21). This antenna has the same intrinsic +30dB signal strength improvement and features of the original version. In this second generation model, a jack on the front panel allows the unit to either be connected to an outside long wire and ground, or directly to a radio's antenna and ground terminals when the radio has no internal ferrite rod antenna (such as in a communications type receiver). This opens up several receiver options over the earlier version.

Users in all-metal buildings or campers where AM radio signals do not suitably penetrate will also find this unit effective, because a long wire outside antenna and ground may easily be connected directly to the Select-A-Tenna. This allows outside AM signals to be ported through the Select-A-Tenna to a ferrite-loop-only receiver.

Other users with radios having only an antenna jack and ground terminals, but who want an alternative to the long wire and ground, can connect the Select-A-Tenna directly to the radio using the external antenna and ground cable assembly that is provided with these antennas.

The New Super Select-A-Tenna

The brand new Super Select-A-Tenna was developed for listeners who require better performance working within some very specific AM listening applications.

One of these applications involves coupling older model internal ferrite rod antennas that don't work well to this antenna to obtain good, high-Q, mutual coupling. My Sony 2010 tends to fit into this category and the Super-Select-A-Tenna did show a significant improvement over the second generation model I have been using with it.

This new model is an active device with additional controls for an internal regenerative amplifier, and it does require a 9-volt battery (not included) to operate this unit. Normally, you find regeneration circuits on top end AM-BCB air-core loop antennas such as the Kiwa. This is a very nice additional feature to and it works quite well to narrow down adjacent channel splatter when activated.

This unit has an additional variable 0dB to +10dB gain added to the intrinsic +30dB mentioned before for a useful gain up to +40dB. While this didn't really matter much on some of the clear channels station we monitored in our test (loud is still loud), it was really useful when trying to dig out a single station from hundreds on the crowded AM BCB graveyard channels of 1230, 1240, 1340, 1400, 1450 and 1490 kHz.

Gain is not what you always want on these crowded frequencies. In fact it can be a curse, depending on conditions and your local radio environment. The combination of directionality plus the ability to adjust the gain supplied by the antenna to the radio, resulted in a couple of new stations added to my logbook during our testing.

This unit has both coarse and fine tuning controls (like its more expensive brother, the Kiwa) for ease of operation at the higher gain settings. It also has the ability to effectively drive a remote ferrite probe. This is useful when using the antenna with a large case radio which may prevent effective proximity coupling and reduce the effectiveness of the Super Select-A-Tenna.

To recap, this new model may be used in any of four different modes of operation:

(1) Direct near proximity, just like the first and second generation Select-A-Tennas
(2) Ferrite probe near proximity
(3) Direct wired antenna connection, and
(4) External antenna and ground for metal-buildings when using modes 1 and 2.

The new Super model has a high-signal level and low-impedance balanced drive port for the ferrite probe. This provides the capability to not only drive the 6-foot coaxial cable and probe, which are included, but the cable may be extended to as much as 26-feet (not included). We found this particularly useful for remotely locating the Super Select-A-Tenna away from radio noise sources (including the human kind) or into better signal locations without having to move the radio itself. (It's hard to make an AC-only rig portable.)

Bottom Line

I was particularly impressed with this new version of the Select-A-Tenna as an owner of both the original and second generation models. This is a significant improvement over those early antennas, and its four modes of operation will make the Select-A-Tenna of benefit to an even greater number of hobbyists.

While it couldn't hold a candle to my Kiwa (I didn't expect it to, given the price differential), it really performed quite well for an antenna in its price range. If you can't afford a Kiwa, but you want a capable, loop style antenna for the BCB frequencies, take a serious look at the new Super Select-A-Tenna. This model (Grove ANT-40) is available from Grove Enterprises (800-438-8155 or **www.groveent.com**) for $189.95 plus shipping.

WHAT'S NEW?

TELL THEM YOU SAW IT IN MONITORING TIMES

Monitoring the Military

Monitoring the Military by Daryll Symington has been a hobby standard, but it has not been republished for several years, while military communications and base assignments have continued to experience drastic changes. *MT* Assistant Editor, Larry Van Horn, is completely updating Symington's data from the first two editions to create an entirely new third edition in a totally new format. *Monitoring the Military* is being published as a PDF file, available for purchase by state from the Grove Enterprises web site at **www.grove-ent.com**. You'll need a computer and the free Adobe Acrobat Reader to take advantage of this new publication.

Pages of informative text assist your listening tactics, followed by hundreds of accurate 30-420 MHz frequency listings, agencies, uses, and locations. Start tuning in on practice bombing runs, fighter training, flight tests, air shows, military police, survival exercises, air-to-ground comms, disaster nets, command posts, and much more! Not all states are available at this time. Please check the Grove website for pricing and state availability or call 800-438-8155 for more information.

2000 Shortwave Frequency Guide

Few would deny the reference authority of the Joerg Klingenfuss frequency directories, and the 2000 edition of the *Shortwave Frequency Guide* is certainly no exception. With more than 21,000 entries of broadcast and utility stations from medium wave to 26 MHz, this worldwide listening guide should be at the fingertips of every serious DXer.

Arranged by ascending frequency, data fields include call sign, station ID, location, mode, and technical details as applicable. A by-country list of shortwave broadcasting schedules is included, listing languages, frequencies, and times of broadcast.

Services include international and domestic broadcasting, military, federal government, press agencies, Red Cross, meteorological data, ship to shore, air to ground, point to point, diplomatic communications, Coast Guard, MARS, time and frequency standards, and more.

Appendices and abbreviations assist the listener sort out the services and vernacular associated with the shortwave field.

Also available as a CD-ROM, compatible on any PC Windows 3.1, 95, or 98 platform.

Printed edition $39.95 plus $5.95 second day shipping, CD-ROM $34.95 plus $5.95 from Grove Enterprises, PO Box 98, Brasstown, NC 28902; ph. (800) 438-8155.

New Shortwave Guide from EDXP

Bob Padula and the Electronic DX Press (EDXP) email club have announced a new publication intended to bridge the gap between annual reference books which appear in the winter period but which go out of date over the spring and summer seasons, and also to provide an inexpensive, timely, and accurate alternative to the more expensive guides. Padula says this reference will be useful for all world radio monitors, irrespective of location.

Key features: A-2000 period, effective Mar-26 to Oct-28; 24 pages A4, commercially printed and bound; external service schedules in *all languages* of broadcasting organizations located in Asia, the Far East, Australia, the Pacific, and the Indian sub-continent. Over 2000 entries, with information given in two sections: by order of studio country and by frequency, the latter in a database format. Full data shows studio country, organization, transmitter site, transmitter country, relay sites, start time, end time, frequency, language, target zone, broadcast days, and general notes.

The *SWG* is compiled by Bob Padula, from material supplied by a worldwide network of EDXP recipients. The SWG is A$10 to Australian addresses: elsewhere (airmail): A$15, US$10, or 10 IRCs. Orders with payment should be forwarded to: Bob Padula, 404 Mont Albert Road, Surrey Hills, Victoria 3127, Australia, Tel/FAX: +61 3 9898 2906, E-mail: *bobpadula@bigpond.com* or visit **http://members.tripod.com/~bpadula/edxp.html**

The new *Guide* is a non-commercial venture, with the price covering essential expenses; future editions will be dependent upon the success of this first edition.

Space Architecture: The Work of John Frassanito

We have all been awed by the gorgeous illustrations that issue from NASA's public relations department. The lush coloring and meticulous detailing show professionalism, realism, and polish. This is largely the work of John Frassanito and his staff of artistic engineers.

Space Architecture: The Work of John Frassanito & Associates for NASA is a new book by John Zukowsky. One hundred forty separate illustrations fill the large, cloth-bound book's 96 glossy pages which trace the current space program and give us alluring glimpses into its future as well. A warm prologue by "Buzz" Aldrin ushers us into the book as we leave the Apollo program and enter the Shuttle era.

This is an exquisite collection for anyone interested in the space program and would keynote the waiting area of any office!

$58 plus $4 shipping from the National Book Network, 4720 Boston Way, Lanham, MD 20706; ph. (800) 462-6420.

2000 Guide To Utility Radio Stations

For those serious shortwave addicts who specialize in monitoring the two-way communicators, nothing beats the classic *Guide to Utility Stations* from Joerg Klingenfuss. Now in its 18th edition, the 612 page *Guide* is considerably more than a directory of over 11,000 frequencies and users.

The new edition has exhaustive reference pages on receiving WEFAX, NAVTEX, radiofax, international call signs, radio abbreviations, tables of Q and Z codes, SINPO/SINPFEMO signal reporting codes, emission designators with examples, explanation of station services and classes, and even fold-out charts and maps for maritime channel plans, and aircraft MWARA, RDARA, and VOLMET regions.

$39.95 plus $5.95 shipping from Grove Enterprises ph. (800) 438-8155 or **www.grove-ent.com**.

DigiPan: Freeware for PSK31

DigiPan stands for "Digital Panoramic Tuning" and brings ease and simplicity to PSK31 operation. (See *Digital Digest* column, Nov & Dec 1999 for more on PSK modes.) Using an HF receiver or transceiver, computer (100 MHz, Pentium, Windows 95 minimum), and sound card, DigiPan provides the ability to tune to an active station or vacant frequency with a simple click of the mouse on a panoramic spectrum display on your computer screen. Depending upon the receiver or transceiver's IF bandwidth, it is possible to "see" as many as 40 to 80 PSK31 stations at one time. (A low-cost 20 meter transceiver kit from Small Wonder Labs, see below, makes full use of DigiPan's panoramic capabilities through the use of a 4000 Hz wideband IF!)

Tuning to a station is done by simply pointing with the mouse cursor and clicking the left mouse button. DigiPan also has a "Snap" function to snap the cursor quickly to the center of the displayed station, and AFC to keep it tuned there. Because of the panoramic capabilities of DigiPan, it is no longer necessary to use the receiver tuning control; just set the receiver to either the low or high end of the PSK31 portion of the band and use the mouse for station selection. An electronic dial scale shows either the actual frequency of reception or the tone frequency being used.

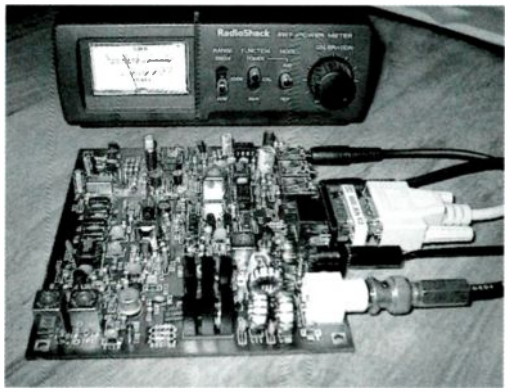
Hams will find DigiPan has a number of features that will make digital operation "fun again." A type-ahead buffer and twenty-four operator-configurable macro keys can be used to control almost all the operational functions of DigiPan and eliminate repetitive typing, leaving the operator free to enjoy the QSO. DigiPan also has a built-in logging feature that logs the call, name, QTH, time, date, frequency, RSTs, and remarks, and an automatic search and display function that continuously displays the call, name, and QTH of any station previously logged for easy reference during a QSO.

DigiPan version 1.1 includes Station Seek, which makes completely mouseless tuning possible; CW ID; and an experimental new mode called FSK31.

DigiPan is a joint effort between Skip Teller, KH6TY, and Nick Fedoseev, UT2UZ, and is intended to make PSK31 operation easier and more enjoyable for everyone. Check out this FREE decoding program at **http://members.home.com/hteller/digipan/** or email *hteller@home.com* (Howard "Skip" Teller, KH6TY, 335 Plantation View Lane, Mt. Pleasant, SC 29464)

Build Your Own PSK-20 Transceiver

Small Wonder Labs has simplified and streamlined an SSB transceiver design which appeared in *QST* magazine to serve as an entry-level platform for PSK31 use. It



covers the 14.0695-14.073 segment of 20 meters where most PSK31 activity is found.

The rig is crystal-controlled and is designed to work with the popular (and ***free!***) DigiPan software (see above). Output power is 3W PEP. The crystal control provides excellent stability and its simplicity keeps the cost low.

Kit assembly is straightforward – there are only four toroids to wind. The number of adjustments is kept to the minimum, and no special test equipment is needed to perform the alignment. All interface connectors mount on the rear of the circuit board. The board kit includes a 26-page manual with color figures and step-by-step assembly instructions.

The PSK-20 transceiver kit is $95 from Small Wonder Labs. Order on-line at www.smallwonderlabs.com or contact Dave Benson, NN1G, 80 East Robbins Avenue, Newington, CT 06111,e-mail *dave@smallwonderlabs.com*

Iridium Collectibles?

Dan Veeneman reported seeing Iridium briefcases and fold-out solar panels being sold at the Dayton Hamvention for $125, "and even though they were the Kyocera brand and not Motorola, lots of people seemed to want a souvenir." He also noted that there were a bunch of Iridium L-band antennas (1.6 GHz) at his booth, "but no one really seemed interested in them." Sounds like there could be some bargain satellite equipment to be had at this summer's hamfests!

Books and equipment for announcement or review should be sent to " What's New?" c/o Monitoring Times, P.O. Box 98, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to mteditor@grove-ent.com.

Swagur ENTERPRISES

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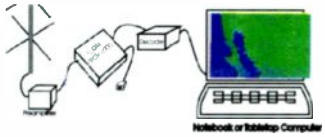

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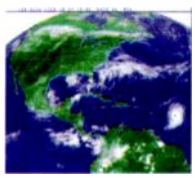
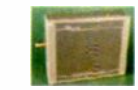


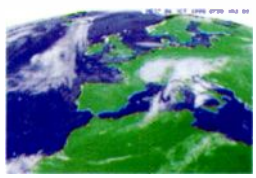
U S GOES/WEFAX IMAGE

Dish in window



Timestep GOES RECEIVER

Timestep interface



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EDITORIAL STAFF

Correspondence to columnists may be mailed c/o Monitoring Times; any request for a reply should include on SASE.

Frequency Manager	Gayle Van Horn	gayle@webworkz.com
Frequency Monitors	Mark J. Fine	fineware@erols.com
	Dan Roberts	
Program Manager	Jim Frimmel	frimmel@star-telegram.com
American Bandscan	Doug Smith, W9WI	w9wi@bellsouth.net
Antenna Topics	W. Clem Small, KR6A	clemsmal@bitterroot.net
Ask Bob	Bob Grove	bgrove@grove-ent.com
Beginner's Corner	T.J. Arey, N2EI	tjarey@home.com
Below 500 kHz	Kevin Carey, WB2QMY	lowband@gateway.net
Bright Ideas	Gary Webbenhurst	ab7ni@arrl.net
Closing Comments	Bob Grove	bgrove@grove-ent.com
Communications	Rachel Baughn	mteditor@grove-ent.com
Computers and Radio	John Catalano	j_catalano@conknet.com
Digital Digest	Stan Scalsky	sscalsk@mail.ameritel.net
	Mike Chace	mike.chace@mindspring.com
Easy Access Radio	Jock Elliott KB2GOM	lightkeeper@sprintmail.com
Federal File	Larry Van Horn, N5FPW	larry@grove-ent.com
Frequency Monitors	Dan Roberts	outfarpress@saber.net
Letters to the Editor	Rachel Baughn	mteditor@grove-ent.com
Milcom	Larry Van Horn, N5FPW	larry@grove-ent.com
On the Ham Bands	Ike Kerschner, N3IK	N3IK@hotbot.com
Outer Limits	George Zeller	georgez@nacs.net
Plane Talk	Jean Baker, KIN9DD	jeanieandbob@earthlink.net
Programming Spotlight	John Figliozzi, KC2BPU	jfiglio1@nycap.rr.com
Propagation	Jacques d'Avignon	monitor@rac.ca
QSL Corner	Gayle Van Horn	gayle@webworkz.com
Radio Reflections	Marc Ellis	mfellis@enteract.com
Satellite Radio Guide	Robert Smathers	roberts@nmia.com
Scanning Equipment	Bob Parnass, AJ9S	parnass@megsinet.net
Scanning Logs	Larry Van Horn, N5FPW	larry@grove-ent.com
Scanning Report	Richard Barnett	ScanMaster@aol.com
SW Broadcasting	Glenn Hauser	wghauser@yahoo.com
SW Broadcast Logs	Gayle Van Horn	gayle@webworkz.com
The Fed Files	Larry Van Horn, N5FPW	larry@grove-ent.com
The Launching Pad	Ken Reitz, KS4ZR	ks4zr@firstva.com
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Closing Comments

By Bob Grove, Publisher

You'll Find Me in the Flea Market

-- Dateline: Dayton --

Every spring, the signs are there: radio sales slow down, inquirers ask "will you be there," and thoughts of a myriad bargains occupy our minds. Dayton is coming!

The Dayton Hamvention, now decades old, is a tradition among hams worldwide, and more recently to shortwave listeners and scanner enthusiasts as well. As the artificial barriers fall which formerly divided "upper-class" hams from "lower," SWLs from scannies, licensed amateurs from listeners, and radio hobbyists from computer devotees, Dayton has become the melting pot for electronic hobbyists worldwide.

With typical attendance approaching 30,000 eager attendees, the May event in Dayton, Ohio is a legend. And this year was an excellent example. Although the three-day (Friday, Saturday, Sunday) phantasmagoria peaks on Saturday, the Friday opener was the best in years, with the aisles more crowded with enthusiastic browsers – and buyers – than exhibitors could remember in recent years.

While there's no denying that computers have made tremendous inroads into radio communications, and digital control commands the greatest respect and attention, analog circuitry is still very much alive – much to the relief of many old timers!

Dayton officially heralds new product introduction for many manufacturers. Yaesu announced their new wideband receiver; Alinco sampled their credit-card-size wideband scanner; AOR surprised us with their upgraded AR8200 Mark II handheld and a base/mobile wideband receiver, too.

It's a social event as well, with warmth, friendly smiles, renewed handshakes, and new friendships. Forums, presented by recognized experts in their fields, cover every imaginable interest area. But my favorite event covers 14 acres – the flea market!

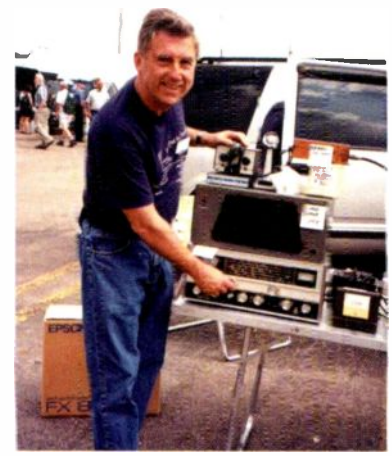
In the past, Judy and I were confined (except when I could sneak away for a few precious minutes) to our indoor vendor's booth; all I could do was to enjoy our many visitors, answer their never-ending questions, and look longingly – from a distance – at the beckoning mass of outside tables, covered with unimaginable bargains. I just knew I was missing the bargain of a lifetime.

But this year it was different. Judy and I decided to attend the Dayton hamfest as visitors, put our cares aside, and just have fun. And what fun we had! We visited all the inside booths (to the envy of our friendly competitors who just wished they could follow us around!) and every table in the flea market – an exhausting, yet exhilarating daylong odyssey!

And, as I had suspected over the years, the bargains were there. Watkins-Johnson surveillance receivers were all over the place. I picked up a like-new Cushman C-15 spectrum analyzer (1-1000 MHz, AM/FM audio recovery) for $400! I just missed an IFR 1200SR surveillance receiver for $1000, and drooled over the endless line of car-trunk dealers hawking Kenwood, Yaesu, Icom, Alinco, and countless other name-brand HF transceivers.

Vintage collectibles abounded, with vacuum-tube radios, World War II militaria, even quack medical devices (my personal passion) punctuating the "boneyard." And while prices are climbing for the old stuff, now that it is becoming collectible, there were many excellent bargains to be had. And by Sunday, when sellers were growing weary, the trashcans were brimming with discards. What a site for bargain-basement salvage hunters!

Now back at home, with Dayton 2000 still fresh on my mind, I reflect on what I saw: lines of backed-up traffic jockeying for position, thousands of humans seething through buildings and crowded aisles, millions of dollars in equipment – new and used – for every electronic interest. A fascinating, blurring mix of sensory delights – flashing lights, beeping tones, excited voices bursting from hand-held radios, barbecue smoke from commercial grills and tailgaters alike.



The sounds, the sights, the smells, the pleasant memories will linger for a long time, at least 12 months – until next year! I'll look for you at Dayton 2001; you'll probably find me in the flea market!

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- **New telescopic antenna included for better reception**
- **New keyboard layout for easier operation**
- **Attractive new black case**
- **Now includes 1100 mAh high capacity Ni-Cd batteries**
- 500 KHz ~ 2040 MHz * coverage
- 1,000 memory channels (20 banks)
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- Download free control software from AOR web site!
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- Includes 3 KHz SSB filter!
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- Wide choice of accessories
- Patented design (U.S. Pat. No. 6,002,924)

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Tall, telescoping antenna with BNC connector.

Use the TFT color display:
- To show simple or advanced operation settings
- To scan for wireless cameras, like those found in race cars
- To catch your favorite TV shows
- In conjunction with a digital wireless camera to monitor babies, traffic, etc.

Simulated picture

When the TFT color display is not needed, or if you just want to conserve power, use the mono LCD to display all necessary information.

4 way action joystick quickly moves you through settings.

Simulated picture

IC-R3* NEW

FOR A LOOK BEHIND THE SCENES

ICOM wide band receivers always let you HEAR more of what's out there. With the new IC-R3, now you can SEE more, too! This pocket sized marvel receives from 0.5 - 2450 MHz†, and sports a 2-inch TFT color display. Scan for wireless camera broadcasts. It's great for watching the action *behind* the scenes at sporting events. Or, just watch your favorite TV programs. A video/audio output terminal lets you display to a large monitor or recording device. All this, and advanced ICOM receiver features like 450 memory channels with alphanumeric names, CTCSS, attenuator, & more.

Lithium Ion Power
A long lasting Li-Ion battery offers easy charging, lightweight performance, and up to 27 hours of continual use on the mono LCD

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IC-R2
Excellent audio, tiny package

500 kHz – 1.300 GHz†

AM, FM, WFM • 100 mW audio output • easy band switching • weather resistant • CTCSS tone squelch • 400 memory channels • backlit LCD • priority watch • includes Ni-Cd batteries and charger, or use alkalines • PC programming (optional)

IC-R10
Advanced listening excitement

500 kHz – 1.300 GHz†

All mode • large, alphanumeric display • 1000 memory channels • band scope • 7 different scan types, including VSC (pauses only on voices) • easy mode • comes with rechargeable Ni-Cds and charger, or use alkalines • PC programming (optional)

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