16 Page 2011 Radio Buyer's Guide Inside

Monitoring Times®

A Publication of Grove Enterprises

Volume 29, No. 11
November 2010

U.S. $6.95
Can. $6.95
Printed in the United States

New Look at Cycle 24

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In this issue:

- New Hi-Def Eyes on the Sun
- Inside the Low Power FM Movement
- Rock Guitar Legend Joe Walsh WB6ACU

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Monitoring Times

Vol. 29 No. 11 November 2010

2011 Radio Buyer's Guide

If this month's issue seems a little heftier than usual, it is! In addition to the feature stories detailed on this page, and the regular columns you've come to expect each month, you'll find the 16 page 2011Radio Buyer's Guide attached at the center. The Guide is designed as a pull-out reference you can turn to throughout the next twelve months with information about the latest in amateur radio equipment, shortwave radios, scanners, antennas, C.B. sets and handheld two-way radios. We've asked experts to review all available products and make their own recommendations which appear in the Radio Buyer's Guide as feature articles.

On Our Cover

A full-disk multi-wavelength extreme ultraviolet image of the sun taken by the Solar Dynamics Observatory (SDO) on March 30, 2010. False colors trace different gas temperatures. Reds are relatively cool (about 60,000 Kelvin, or 107,540 F); blues and greens are hotter (greater than 1 million Kelvin, or 1,799,540 F). (Courtesy: NASA/GSFC/AIA) Also: Artist's concept of the Solar Dynamics Observatory. (Courtesy: NASA/Goddard Space Flight Center Conceptual Image Lab)

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R E V I E W S

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

Address: 7540 Highway 64 West, Brasstown, NC 28902-0098
Telephone: (828) 837-9200
Fax: (828) 837-2216 (24 hours)
Internet Address: ***www.grove-ent.com*** or ***www.monitoringtimes.com***
Editorial e-mail: ***editor@monitoringtimes.com***
Subscriptions: ***order@grove-ent.com***

Subscription Rates: $32.95 in US; $42.95 Canada; and $58.95 foreign elsewhere, US funds. Label indicates number of issues left. Renewal notice is cover sheet 3 months before expiration. *See page 76 for subscription information.*

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Postmaster:
Send address changes to *Monitoring Times*, 7540 Highway 64 West, Brasstown, NC 28902-0098.

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COMMUNICATIONS

by Ken Reitz

SHORTWAVE/AMATEUR RADIO

TV via Shortwave. Really!

Fraunhofer Institute for Integrated Circuits announced the worldwide launch of Diveemo, the new small-scale video service for Digital Radio Mondiale (DRM), September 13 at the IBC 2010 show in Amsterdam at the Thomson booth. The live video broadcast featured BBC-based video content displayed on a NewStar DRM receiver. If the receiver looks familiar, it's made by the same company that makes the Uniwave DiWave DRM receiver (a review of which is found in the April 2010 *MT*).

According to a press release from the company, "Diveemo offers free of charge reception and is independent of gatekeeper and third party providers like satellite and cable networks." The system was developed with Fraunhofer IIS, Thomson, and NewStar to "offer a convenient, mobile, small scale video service allowing users to quickly switch between channels and enjoy consistent audio and video even under bad reception conditions." The system, designed for a single DRM transmitter, also offers one or more audio channels allowing multi-language support.

Radio/TV Martí Director Resigns

Fallout continues at the Broadcasting Board of Governors (BBG) as Pedro Roig, who served seven years as the director of the Office of Cuba Broadcasting (OCB), resigned, according to a BBG press release. Months ago the Senate issued a stinging report that showed the ineffectiveness of both Radio and TV Martí in reaching its target audience, the people of Cuba. Since that report was issued there has been a shake-up at the OCB, the director's resignation being the latest.

Judge: HT not a Cell Phone

With many states enforcing new laws prohibiting the use of a cell phone while driving without using a hands-free device, hams operating mobile may be subject to being cited for such a violation. Since these laws vary from state to state, challenges will also have to happen state by state. Last year California's Department of Motor Vehicles ruled that CB and amateur radios were not to be considered cell phones, regarding its rules for driving and talking on a non-hands-free device.

(Courtesy: Icom and Motorola)

The ARRL reported that recently a New York state ham was pulled over for talking on his HT. While the traffic court judge ruled against him, an appeal to city court found a favorable ruling that "…a handheld Amateur Radio does not fit the description of a mobile telephone."

FCC to Review Personal Radio Services

In August the FCC issued a sweeping 92 page Notice of Proposed Rule Making (NPRM) that represents a grocery basket of proposed changes, and in some ways the dawning of reality. The NPRM states, "we propose to eliminate obsolete or redundant rules where appropriate and to consolidate, conform, and update general operating rules under a new subpart… to apply to all Personal Radio Services (PRS) that we propose to keep under Part 95."

To view the entire document go to: **http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-106A1.pdf**. The PRS includes Family Radio Service (FRS), General Mobile Radio Service (GMRS), Multi-use Radio Service (MURS), Radio Control and CB radio services among others. Here's a quick look at some proposed changes.

General Mobile Radio Service (GMRS):

Usually paired with Family Radio Service (FRS) frequencies, the GMRS has required a license for legal use, but few of the millions who bought such sets ever applied for such a license. Now the FCC wants to drop the license requirements, fees and call signs issued. They would also like to ask GMRS makers to narrowband their frequencies from 25 kHz to 12.5 kHz.

Voice Scrambling:

Somehow some companies have been allowed FCC certification with features that amount to voice scrambling that were designed to add another layer of privacy to FRS and GMRS channels. Now, under this NPRM, the FCC wants to de-certify these products.

Combination Radios:

The FCC is concerned about manufacturers offering radios with combined band capability, specifically FRS/GMRS and VHF marine frequencies. The obvious potential problem is widespread use of VHF marine channels by landlubbers; especially channel 16, the emergency channel.

CB Radio:

The FCC may agree to allow hands-free wireless microphones and after-market adapters for such devices. The FCC has admitted the dramatic drop in CB radio use over the last 15 years and that archaic rules regarding the length of time an operator may transmit and then remain off the air before resuming transmissions should be changed. I'm sure that's been the cause of sleepless nights for many CB operators.

Cobra 29 LTD CB radio (Courtesy: Cobra Radio)

Further, and this may be hard to even read, "We also seek comment on whether the Commission should amend or eliminate section 95.413(a)(6), which prohibits the transmission of music, whistling, sound effects or any material to amuse or entertain." This is surely a sign of the end times.

And, finally, after some 50 years, the FCC wants to discuss the issue of skywave propagation on CB channels. The FCC believes, according to the NPRM, that the temptation for working skip on 27 MHz is what leads CBers to use illegal linear amplifiers and wonders if reducing the allowed power output might not be the answer.

It Pays to Advertise

While researching AM loop antennas this past summer I found myself reading the reviews for the Eton Grundig AN200 antenna sold on the Radio Shack website. One customer wrote: "… By placing the loop at a right angle to the radio, it produces, full quieting on AM and shortwave stations. I listened to a pirate (WBNY) on 6925 in USB and, by moving the loop, it gave me a super clean, quiet and readable signal."

I asked Commander Bunny if this was not a most clever piece of propaganda. To which he replied, "Ah yes, we have infiltrated the instructions-for-monkeys arena and are controlling ape-humans via the 'loop antenna' route."

It's as we feared.

Former SW Talk Show Host Convicted

Radio Business Report noted the conviction mid-August of Harold (Hal) Turner of threatening three federal judges after two previous trials had ended in mistrials. Turner had been part of a radio talk show called "The Right Perspective" but left that show in 2002. For the next two years he bought time on WBCQ shortwave and since then he was heard via the Internet. The report said that Turner faced up to 10 years in prison and a $250,000 fine.

FM RADIO

Radio Free Austin Scorns FCC

A story in the *Austin (Texas) Chronicle*

detailed the group calling themselves Radio Free Austin, an unlicensed FM broadcaster on 90.1 FM. According to the report, the FCC had issued a $10,000 forfeiture nearly a year ago to the group which claims the FCC lacks jurisdiction over their station. Those associated with the station told the *Chronicle* they had no intention of paying the fine. The station has no plans of shutting down and plans instead expanding their operation to cover more of Austin, according to the article. A spokesperson for the group said they planned to launch a series of law suits that could have the issue tied up in court for years.

"We-are-not-Pleased" Dept.

The New Jersey-based personal injury law firm, Keefe Bartels, LLC., is looking for comments from those who are not happy with their HD Radio reception in new cars that included built-in HD-Radios in the purchase price. At the center of their investigation is "whether consumers are being forced to purchase technology that does not work as claimed." It's not clear if the information gathering will lead to some sort of consumer-related class-action law suit.

SATELLITES

XM Slow to Minority Programming

Among the few concessions the FCC required from the merger of Sirius and XM satellite radio into a monopoly in 2008 was that subscription fees would be frozen for a certain amount of time; low price, a la carte programming would be available to those not able to or not wishing to pay the full $14/month subscription fee, and that a certain percentage, amounting to six channels for each of the two program platforms would be given to minority groups for programming.

While a la carte never appeared to be available, subscription fees were kept at the same rate, though a $2/month royalty fee was added last year. The deadline for handover of channels to minorities has been extended by the FCC several times, and they'll do it at least once more. The FCC agreed at the end of August to let the issue slide until late November.

DARPA's Mini-Satellite Network

The Defense Advanced Research Projects Agency (DARPA) is one of those quirky government research institutions that seem opaque and transparent at the same time. Announcement of a new initiative at DARPA appeared in *InformationWeek Government Newsletter* with this cheery intro: "The Department of Defense's research arm (DARPA) is modifying a program to build a wirelessly connected small-satellite network to provide a more scalable set of technologies that can be integrated through open standards." Hmmm.

On the surface this sounds interesting, yet nothing is revealed. Or is it? DARPA, as usual, has playfully named the initiative F6, standing for "Future, Fast, Flexible, Fractionated, Free-Flying Spacecraft United by Information Exchange." Now, that sounds like a fun project. But, what exactly is it?

Courtesy: DARPA

According to *InformationWeek*: "The system is meant to replace traditional large, monolithic satellites that are costly to build, launch, maintain and update with a group of smaller, wirelessly networked modules that share resources and thus are more cost-effective." Hmmm. Sounds like this satellite system would be harder to hit.

It actually gets better. Quoting DARPA, it says that the program will entail, "real-time, fault-tolerant resource sharing over wireless cross-links; algorithms for safe and agile multibody cluster flight; persistent broadband communications between low earth orbit (LEO) spacecraft and the ground; and a robust and scalable multi-level information assurance architecture." That's just exactly what you thought.

Japanese Spy Satellite over DPRK Down

An article on the *Voice of Russia* from *ITAR-TASS*, reported that a Japanese spy satellite operating over the Democratic People's Republic of Korea (aka North Korea) has stopped working. The report quoted Japanese officials as saying the radar-based satellite, launched in February 2007, was expected to have a five year lifespan but suddenly, "went down…causing the satellite to go completely out of order." That left, according to the report, only three other Japanese spy satellite looking at the Korean peninsula, one of which was at the end of its design life and none of which are radar-based, relying instead on "optical devices."

CELL FONE FOLLIES

Déjà vu Cell Phone

An AP report told of a California man who bought a cell phone from an Internet seller only to discover it was his old cell phone that had been stolen in a recent car burglary. Police investigators found some 163 phones at the seller's address – found on the outside of the package in which the phone was sent.

FCC ENFORCEMENT

FM Pirates Busted in 6 States and P.R.

FCC Enforcement was active during the months of August and September rounding up unlicensed FM operators from California, Michigan, New Mexico, New York, South Dakota, Washington, and Puerto Rico. All received Notices of Unlicensed Operation (NOUO). There were two cited for QRO (high power) pirate operations. One, from Carlsbad, New Mexico who was transmitting on 101.9 FM from his residence with an output of 293,473 microvolts/meter at 3 meters, and another from California operating at more than 522,000 microvolts/meter at 262 meters. Maximum allowed output for an unlicensed Part 15 FM device is 250 microvolts/meter at three meters.

Fined in Florida

A Lauderhill, Florida man has been issued a forfeiture notice in the amount of $10,000 by the FCC for operating an unlicensed FM station at 95.9 from his home after ignoring his first NOUO and Notice of Apparent Liability (NAL).

Oregon Sweep Nets 3 on 1710 kHz

Two Portland, Oregon men and one Woodburn, Oregon man were issued NOUOs for operating unlicensed AM stations on 1710 kHz from separate residences. Agents measured the output of one station at 1,200 microvolts/meter at 320 meters, another at 8,000 microvolts/meter at 580 meters and the other a whopping 14,000 microvolts/meter at 50 meters. The maximum allowed for an AM Part 15 device is 30 microvolts at 30 meters. *Radio World Online* speculated that the three may have been playing pass-the-transmitter in order to avoid FCC detection and confiscation.

Another Ship Radio Malfunctions

Nearly every month the U.S. Coast Guard reports a malfunctioning VHF transceiver aboard a docked ship causing interference on the VHF distress frequency 156.800 MHz. This month's loser was docked in Seattle, Washington.

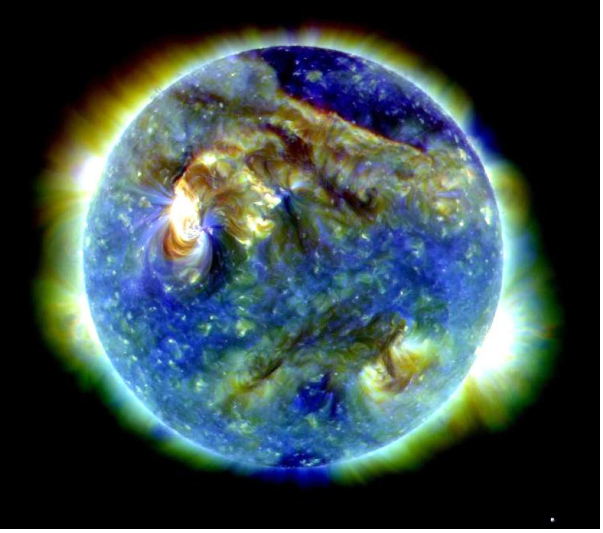
PA CBer Caught with Linears

A Pittsburgh, Pennsylvania CB operator, whose signal was apparently getting into neighbors' televisions and telephones, was visited by FCC field agents who, on inspection of the man's station, found several linear amplifiers. According to FCC documents, the man admitted to having and using the amps as well as one in his car. He claimed he had a business repairing such equipment.

CBer Warned on Gear and Language

A CB operator in Enid, Oklahoma was issued a NOUO by the FCC for operating a non-certified transmitter at his residence. And, for good measure, they cited the CBer for indecent language. It was not clear from FCC documents if the swearing was heard on the air or after having had his station inspected. At any rate, everyone knows that swearing and linear amplifiers are reserved for 80 meters.

"Communications" is compiled by Ken Reitz KS4ZR (kenreitz@monitoringtimes.com) from news clippings and links supplied by our readers. Many thanks for this month's fine reporters: Anonymous, Rachel Baughn, Bob Grove, Norman Hill, Steve Karnes, Larry Van Horn and Jim Ward.



August 1 eruption that had media outlets in a dead panic. (Courtesy: NASA/SDO/AIA)

Winter Shortwave Propagation Outlook:
The Sensational vs. the Real Story

By Tomas Hood NW7US

Perhaps the quiet of the prolonged solar cycle minimum between Cycle 23 and Cycle 24 is to blame. Maybe it's the fascination that some have with the idea of 'the end of the world by 2012!'

Whatever the reason, there has been a seemingly growing trend toward ever more sensationalism on the part of many news media outlets since my last propagation column, many stemming from the August 1, 2010 double-eruption event that occurred on the Sun.

Bracing for the "Solar Tsunami"

A C3.2 magnitude soft X-ray flare erupted from NOAA Active Sunspot Region 11092 (1092) at approximately 0855 UTC on August 1, 2010. This is a rather low-energy X-ray flare, but it did trigger a coronal mass ejection (CME), which is the ejection of hot solar plasma in a huge cloud in a direction away from the Sun. Amazingly, this particular flare also caused a "solar tsunami," a huge wave that rippled away across the corona (one of the Sun's atmospheric layers) toward the Sun's northern pole. Scientists believe that this tsunami triggered a huge filament eruption, as well as a second coronal mass ejection.

Launch of Solar Dynamics Observatory (SDO) at Cape Canaveral (Courtesy: NASA/GSFC)

Prior to the filament's eruption, NASA's Solar Dynamics Observatory (SDO) Atmospheric Imaging Assembly (AIA) instruments revealed an enormous plasma filament stretching across the Sun's northern hemisphere. When the solar tsunami wave, triggered by the X-ray flare, crashed through this large filament, the filament erupted and released a huge plasma cloud CME (a movie can be seen at **http://tinyurl.com/pcaug1wave**). During this time, multiple filaments of magnetism were seen lifting off the Sun's surface. Incredibly large-scale shaking of the solar corona was also observed.

The two coronal mass ejections reached Earth's magnetosphere starting on August 3. When the shockwave of the huge plasma clouds plowed into Earth's magnetic force field, it connected in a way that "opened" the atmosphere, allowing the plasma to ride the magnetic field lines down to Earth's magnetic poles. Because of this, the Northern Lights were seen during the nights of August 3 and 4, as far south as Michigan.

The news media jumped all over the exciting solar activity of August 1. News reports painted a dire picture of widespread devastation; that a "solar tsunami" was racing toward Earth. The leap was made by the media because solar scientists recently held conferences where the impact of that once-in-a-century extreme space weather storm caused by incredibly large, Earth-directed solar flares (of the X-class magnitude) was discussed. Reporters connected the description of a "tsunami wave" on the Sun's corona, to the idea of a plasma cloud heading toward Earth. They sensationalized that this space weather event could be "the big one," a solar tsunami racing toward Earth, possibly taking out our electrical-based infrastructure.

While the August 1 double eruption event was truly unique, in the grand view of a Sun that is billions of years in age, and even within the span of the last few decades, this event was a rather small one. We've seen much more powerful events in the recorded history of flares, filament eruptions, and coronal mass ejections.

The August 1 X-ray flare was on the lower end of the C-class scale. When it occurred, it barely caused any shortwave signal fading on the sunlit side of the Earth, because it was a weak X-ray flare and the plasma released was not noticeably huge, either.

Regardless, what was being called the "tsunami" wave actually moved along the surface of the corona. It did not ripple out into interplanetary space, as many news stories claimed. So it was, in fact, not a tsunami wave headed toward Earth, resulting in some major Earthly destruction. The term "solar tsunami" is only accurate in describing a wave that moves across the Sun's corona. A reference about these solar tsunami events is found here: **www.nasa.gov/mission_pages/stereo/news/solar_tsunami.html**.

Fearing a "Solar Katrina"

The sensational news stories died down soon after August 4. However, on August 7, an M-class X-ray flare erupted from active sunspot region 1093 (a movie can be seen at **http://tinyurl.com/pcaug7mflare**). This flare was 10 times more powerful than the C-class flare on August 1 that caused so much media attention, and peaked at 1824 UTC on August 7. It released a huge coronal mass ejection of solar plasma, but the CME mostly missed the Earth and didn't even trigger auroral displays.

This M1.0 magnitude solar flare was one of the biggest since the start of Cycle 24, and it triggered a metric type II radio burst. As the flare erupts, this kind of radio burst can be heard from a radio receiver tuned to any shortwave frequency. The burst sounds like rushing wind or a strong hiss that slowly changes strength. You can hear a recording of a type II radio burst as recorded on 50 MHz by Thomas Ashcraft on April 2, 2001 at 2151 UTC that occurred during the X22.0-magnitude X-ray flare, by browsing to **http://tinyurl.com/50MT2RB** (this is a 2 minute audio clip and can be opened with Windows Media player or similar platform). Incidentally, the April 2, 2001 flare is the second largest event on record after the X28.0-magnitude mega-flare that occurred on November 4, 2003.

One news source, talking about this specific series of events, said that it could well be the "expected storm of the century" or "storm to top all storms." Many reports stated that, "it could be the Katrina of the World."

It's interesting how such sensationalism is perpetuated. The truth of the matter is that every solar cycle has a regular show of X-ray flares, filament eruptions, coronal mass ejections, and, yes, even sunspots. Perhaps because many in the news media were not aware of past solar cycle

events and how a cycle progresses from periods of quiet through periods with peak activity, they are mesmerized by the current rise in solar activity.

This time around, as we watch the start of a new sunspot cycle, we have nearly "front row seats" because we have spacecraft armed with amazingly accurate, high-definition instruments that practically "stream" live views of the Sun. With this solar data "beamed" into our lives "as it happens," we can be overcome with the idea that the activity on the Sun is unprecedented. It isn't. It is unprecedented to have this level of information at our fingertips, and in the ready view of the public. But, it is not so uncommon to see the Sun become active.

There are many radio operators just coming into the hobby who have probably never experienced a sunspot cycle from start to finish. Certainly, the last three or four years have been mostly uneventful, from a solar perspective. The experience new radio operators gained over the last few years does not offer a perspective of what we're just now beginning to experience because the Sun is "coming awake."

Predicting Cycle 24

What can we expect as new Cycle 24 activity increases? Those who have witnessed the last sunspot cycle know that the increased solar activity comes with a price. While higher solar activity tends to strengthen the ionosphere, enabling world-wide radio communications on the higher shortwave frequencies (even on ten and six meters), this high level of solar activity includes many X-ray flares and coronal mass ejections, both of which cause degradation of HF communications.

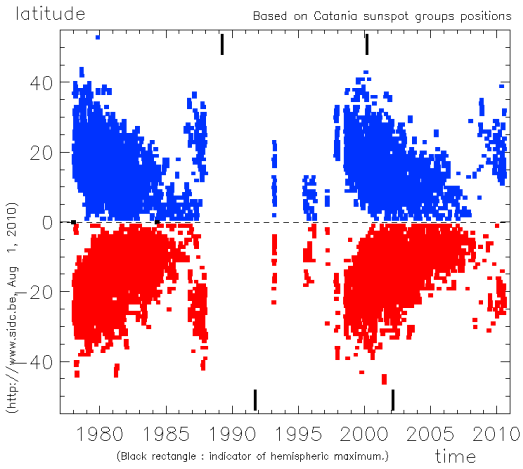
A radio operator may be in the middle of an exciting exchange with a station on the other side of the world, when all of the sudden there is a rushing, hissing sound on the radio, and the other station is completely lost. This silence can last up to an hour or more. Several days later, aurora erupts and the operator can hear stations with rapid flutter and fading.

The first phenomenon occurs on the sunlit side of Earth, because an X-ray flare releases a lot of energy in many wavelengths. This energy penetrates down into the lowest ionospheric regions (the D-region), causing a very high level of ionization. Effectively, the D-region becomes so energized that no radio signal in the HF spectrum can penetrate; those radio waves are completely absorbed. This happens within eight minutes of the X-ray flare (because that's the amount of time it takes the X-ray flare's energy, at the speed of light, to reach Earth's ionosphere).

The second phenomenon occurs two to four days later, because it takes this long for the plasma cloud of the coronal mass ejection to race toward Earth. When it arrives, it can magnetically "connect" and cause the geomagnetic field to become highly active. Because the geomagnetic field lines exist through the ionosphere, when the field lines become unstable and move chaotically, it causes the ionosphere to lose energy. This lowers the maximum usable frequencies (MUF) of a given ionospheric radio signal path by as much as 30 to 40 percent below normal.

As we move closer and closer to the solar cycle maximum, when we will see a great number of daily X-ray flares and many sunspot regions, we will note that higher shortwave frequencies become more usable and reliable, but we'll also see moments of communication breakdown. This cycle is also not expected to be more than a moderately-strong cycle, compared to the last few. Many scientists do not agree, but the official forecast is for the peak of this cycle to occur between 2013 and 2014.

With such a dismal forecast, it is unlikely that we'll see the end of the world. What we will see, however, is the return of world-wide shortwave communications of even low-powered radio signals, and on the higher segments of the spectrum. Now is the time to get your antennas ready and your radio shack in top shape. By this time, next year, shortwave radio will be red hot.



Butterfly Catania showing solar hemispheric maximum (Courtesy: Author)

Autumn and Winter Shortwave Season

The start of the autumn DX season began right after the September Autumnal Equinox and this year's season is gearing up to be moderately active. As is typical of the autumn and winter HF season, low-frequency activity vastly improves over summer conditions, due to the decrease in lightning storms and the longer daily periods of darkness. The bands (below 20 meters) are alive and well and have been throughout the solar cycle minimum between Cycle 23 and 24. But, now that the Sun's activity is increasing, there are significant changes on these bands, bringing unique DX opportunities.

The higher shortwave frequencies are alive, too. During the winter months the maximum usable frequencies (MUF) are generally higher during the daylight hours than during the summer daylight hours, due to the shorter distance between the Earth and Sun during this season.

This provides short but strong openings on higher shortwave bands during the winter day. Then, at night, the MUF dips down much lower than what would be seen during the summer nights. Summertime MUFs are generally higher during the night hours than during the winter nights, due in part because the ionosphere stays energized through the short nights. Winter nights are longer, so recombination of the ionosphere (which results in a lowering of the MUF) is more complete.

This also means that the D layer of the ionosphere is less ionized during the winter, allowing medium wave and shortwave frequencies to propagate through the D layer and off the E and F layers. Finally, the seasonal decrease in weather-related noise makes it easier to hear the weaker DX signals on lower frequencies. With thunderstorms few and far between, storm-related static and noise is greatly reduced.

Seasonally, the geomagnetic activity tends to be quiet during the winter months. The most active geomagnetic seasons are centered on the two equinoxes, in the spring and autumn. The seasonal decrease in geomagnetic activity, combined with the still-low geomagnetic activity typical of early sunspot cycle years, creates band conditions that are still fair to good, with generally quiet conditions on lower HF and on the MF spectrum.

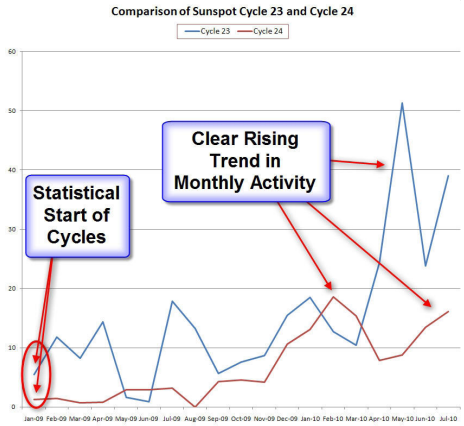
December is well enough past the autumnal equinox and the associated peak auroral activity to support transpolar propagation. With this overall reduction of geomagnetic activity and the decrease of radio signal absorption comes more stable high-latitude propagation. Medium wave DXers enjoy catching broadcast station transmissions from over the North Pole. Shortwave DXing over high-latitude paths becomes exciting, even if the higher frequency bands might be dead.

During October, signals below 75 meters are still hard to hear under the seasonal static. The static then steadily decreases as we move into the longer hours of darkness during November and the winter months. With the seasonal reduction in thunderstorms and noise of atmospheric static in the Northern Hemisphere, it becomes easier to hear the weak-signal DX.

As we get closer to January, expect DX openings during the hours of darkness and into the sunrise period. Look for openings from Europe and the south if you are listening in the eastern half of the United States, and from the south, the Far East, Australasia, and the South Pacific if you are in the western half of the country.

Expect long-range DX on the low bands, starting right after sunset and extending farther as the night develops. Signals here should peak from Europe and from a generally easterly direction around midnight. DX paths will move farther west through the night. By morning, openings from Asia should be common. For openings in a generally western direction, expect a peak just after sunrise. The band should remain open from the south throughout of the night. Propagation in this band is quite similar to that expected on 41 meters, except that signals will be somewhat weaker on the average, noise levels will be a bit higher, and the period for band openings in a particular direction will be a bit shorter.

Forty-one meters should be the hottest DX band during the dark hours as the seasonal static



Cycles 23 and 24 Comparison (Courtesy: Author)

levels are lower than they were during the summer. This band should be open first for European DX in the eastern United States during the late afternoon. Signals should increase in intensity as darkness approaches. During the hours of darkness, expect good DX openings from most areas of the world. Signals should peak from an easterly direction about midnight, and from a westerly direction just after sunrise. Excellent openings toward the south should be possible throughout most of the nighttime period.

The all-season bands, 31 and 25 meters, are crowded, and signals are usually very strong and steady. These bands will often remain open into many areas late into the night and will open early in the morning, especially when part of the propagation path moves through sunlit regions. Twenty five meters is expected to be an excellent band for medium distance (500 to 1500 miles) reception during the daylight hours. Longer distance reception (up to 2000 to 3000 miles) should be possible for an hour or two after local sunrise, and again during the late afternoon and early evening. Heavy congestion will occur here, since many international and domestic broadcasters make use of 25 meters.

Thirty-one meters, the backbone of worldwide shortwave broadcasting, will provide medium-distance daytime reception ranging between 400 and 1200 miles. During November, reception up to 2500 miles is possible during the hours of darkness, and until two to three hours after local sunrise. Thirty-one meters, too, is highly congested, making reception of weak exotic signals a bit more of a challenge.

Twenty-two through 19 meters compete with 16 for the best daytime DX band during October. They will open for DX just before sunrise and should remain open from all directions throughout the day, with a peak in the afternoon. Nighttime conditions will favor openings from the south and tropical areas. Since the Southern Hemisphere has long daylight hours, DX paths on these bands from stations in the south will be common.

Nineteen through 25 meters compete with 16 for the good daytime DX during November and December. They will open for DX just before sunrise and should remain open from all directions throughout the day, with a peak in the afternoon. Nighttime conditions will favor openings from the south and tropical areas. Since the Southern Hemisphere has long daylight hours, DX paths on these bands from stations in the south will be common.

Sixteen through 13 meters will be open occasionally. Paths from Europe and the South Pacific as well as from Asia are possible, especially on 16 meters. Look for best conditions from Europe and the northeast before noon and from the rest of the world during the afternoon hours. Reception from the South Pacific, Australia, New Zealand, and the Far East should be possible well into the early evening. When flux levels remain lower, these openings may be short-lived.

The best propagation aid is a set of sunrise and sunset curves, since DX signals tend to peak when it is local sunrise at the easterly end of the path in question. A good Internet web site featuring a gray line map is found at **www.fourmilab.to/earthview**. Follow the link, "map of the Earth" showing the day and night regions.

For short-skip openings during December, try 90 through 41 meters during the day for paths less than 250 miles, and 90 down to 120 meters at night for these distances. For openings between 250 and 750 miles, try 41 meters during the day, and both 90 and 120 at night. For distances between 750 and 1300 miles, 22 through 31 should provide daytime openings, while 41 down to 90 will be open for these distances from sunset to midnight. After midnight, 90 meters will remain open out to 1300 miles until sunrise. Try 31 and 41 meters again for about an hour or so after sunrise.

For openings between 1300 and 2300 miles, look for them to occur on 22 through 16 meters, with fewer on higher bands, during the daylight hours. During sundown to midnight, check 22 through 41 meters for these long-distance openings, and then check 41down to 90 meters after midnight until sunrise. Try 41 and 31 meters again for an hour or so after sunrise.

Propagation changes again after January, as the hours of daylight increase. March is one of the optimal DX months. As the spring equinox approaches, the gray line terminator begins to run straight north and south. The return of sunlight to the polar north creates north-south openings on 11 through 25 meters.

By March, 16 meters will still stay open long into the evenings. You will occasionally find 16 meters open all night long. Daytime paths will not degrade much until midsummer. You will see more early closures if you live closer to the North Pole.

Twenty-two and 19 meters will remain in excellent shape. Both short and long path circuits are reliable and solid. All nighttime paths are wide open during March. Prime time evening hours in the United States are sunrise hours across Russia, Africa, and both the Near East and Far East. Expect a lot of short and long path DX from these areas of the world.

Between sunset and midnight, expect occasional DX openings on all bands between 15 and 41 meters. Conditions should favor openings from the east and south. These bands should peak for openings from Europe and Africa near midnight.

From midnight to sunrise, expect optimum DX conditions on 31 through 90 meters, and occasionally, 120 meters. Conditions should favor openings from the west and south. Some rather good openings on 19 and 22 meters should also be possible from the south and west during this time.

Noise levels are slowly increasing as we move toward the spring season. Geomagnetic storms will increase, disrupting the mid- and high-latitude ionosphere. During the spring equinox, Earth's magnetic field is sufficiently disturbed by solar wind particles flowing into the auroral zone (between 50 and 70 degrees north geographic latitude) to cause the ionosphere to be depleted.

Propagation on VHF and Above

Quite a bit of meteor shower activity is expected in November and December, providing conditions for meteor-scatter openings on the VHF bands for distances up to about 1000 miles. When a meteor burns up in the atmosphere, its intense heat creates an ionized trail, called a train, making it possible for radio signals to propagate off the ionized train much like they would off the ionosphere.

Look for the November Leonids starting around mid-November. After the Leonids, check out the Geminid meteor shower in mid-December. Both of these showers provide great opportunities to experience VHF DX via the plasma vapor trains left by the intense heat caused by the meteor as it burns up in the atmosphere.

Because the height of these plasma trains is in the E layer of the ionosphere, the range of a meteor scatter contact is between 500 and 1300 miles. The frequencies that are best refracted are between 30 and 100 MHz. However, with the development of new software and transmission techniques, frequencies up to 440 MHz have been used to make successful radio contacts off these meteor trails.

Lower VHF frequencies are more stable, and last longer, off these ionized trains. A six-meter contact may last from a second to well over a minute. The lower the frequency, the longer the specific opening made by a single meteor train. Conversely, a meteor's ionized train that supports a sixty-second refraction on six meters might only support a one-second refraction of a two-meter signal. Special high-speed digital modulation modes are used on these higher frequencies to take advantage of the limited available time, in the neighborhood of hundreds of words per minute.

Write to Me

I hope to hear from you regarding your observations and with any questions you may have about space weather, the solar cycle, and radio propagation. Please explore the online resources at **http://prop.hfradio.org** and at **http://hfradio.org/forums**. If you are on Facebook, please join the "Space Weather and Radio Propagation Group" at **http://tinyurl.com/fbswx**. Finally, I invite you to become a "fan" of my personal radio hobby Facebook page, located at **http://tinyurl.com/fb-nw7us**. Until next time, I wish you a happy radio-monitoring season! *The author may be reached at NW7US@arrl.net.*

A New Eye on the Sun

By Tomas Hood NW7US

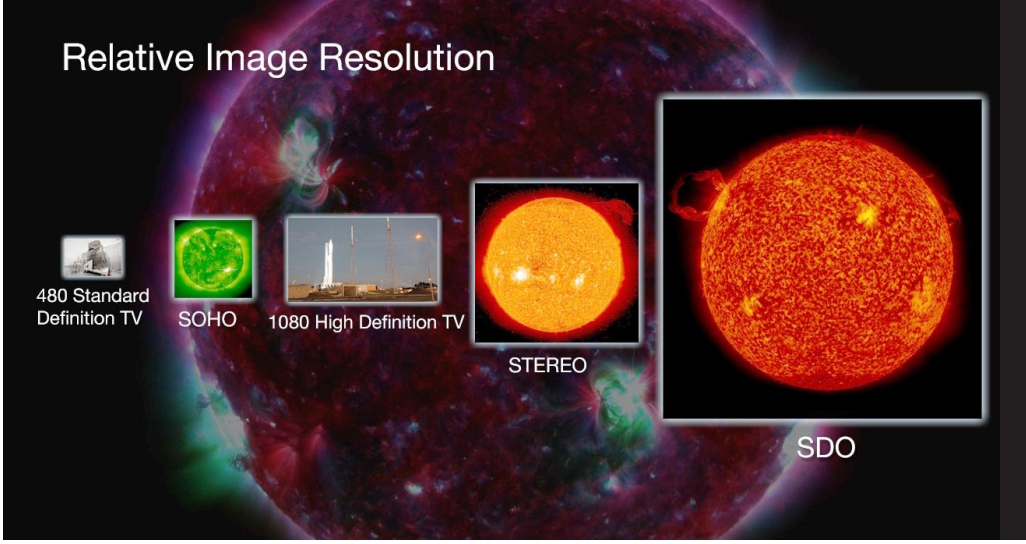


Image size comparison from NTSC TV picture to SDO display (Courtesy: NASA/GSFC)

On February 11, 2010, NASA launched a new spacecraft tasked with observing the Sun and space weather, also known as solar dynamics. This spacecraft is called the Solar Dynamics Observatory (SDO). It is the first satellite under the "Living with a Star" program at NASA and is the most advanced spacecraft ever designed to study the Sun.

During its five-year mission, it will examine the Sun's magnetic field, providing a better understanding of the role the Sun plays in Earth's atmospheric chemistry and climate. Since launch, engineers have been conducting testing and verification of the spacecraft's components. Now fully operational, SDO provides images with clarity 10 times better than high-definition television and returns more comprehensive science data faster than any other solar observing spacecraft.

The satellite is designed to fly for five years, but previous spacecraft have often outlived their initial mission life. The SOHO (SOlar and Heliospheric Observatory) spacecraft, for example, which was built to fly for five years, has celebrated its fifteenth anniversary this year!

SDO is unlike any other satellite. It is collecting huge amounts of data every day. In fact, SDO will produce enough data to fill a single CD every 36 seconds! Many satellites share a "ground system," the place on the ground where data and imagery are sent, and have recording systems onboard to save the data collected until the satellite can communicate with its ground station. Because SDO has no recording system and will be collecting so much data, the SDO mission built its own ground station. For this to be possible, SDO had to be placed in a geosynchronous orbit (GEO), meaning that SDO appears to be stationary directly above and in constant communication with its ground station in New Mexico.

Richard Fisher, Director of the Heliophysics Division at NASA headquarters in Washington, D.C., said that data from SDO "show a dynamic Sun that I had never seen in more than 40 years of solar research…. [it] will change our understanding of the Sun and its processes, which affect our lives and society. This mission will have a huge impact on science, similar to the impact of the Hubble Space Telescope on modern astrophysics."

SDO will help scientists continue to explore how the Sun's magnetic field is generated, structured and converted into violent solar events such as turbulent solar wind, solar flares and coronal mass ejections. Even more exciting is that SDO provides critical data that will improve the ability to predict these space weather events. NASA's Goddard Space Flight Center in Greenbelt, Maryland built, operates, and manages the SDO spacecraft for the agency's Science Mission Directorate in Washington.

"I'm so proud of our brilliant work force at Goddard, which is rewriting science textbooks once again," said Sen. Barbara Mikulski, (D-MD), chairwoman of the Commerce, Justice and Science Appropriations Subcommittee that funds NASA. "This time Goddard is shedding new light on our closest star, the Sun, discovering new information about powerful solar flares that affect us here on Earth…Better data means more accurate solar storm warnings," she said.

Anatomy of a Solar Spy

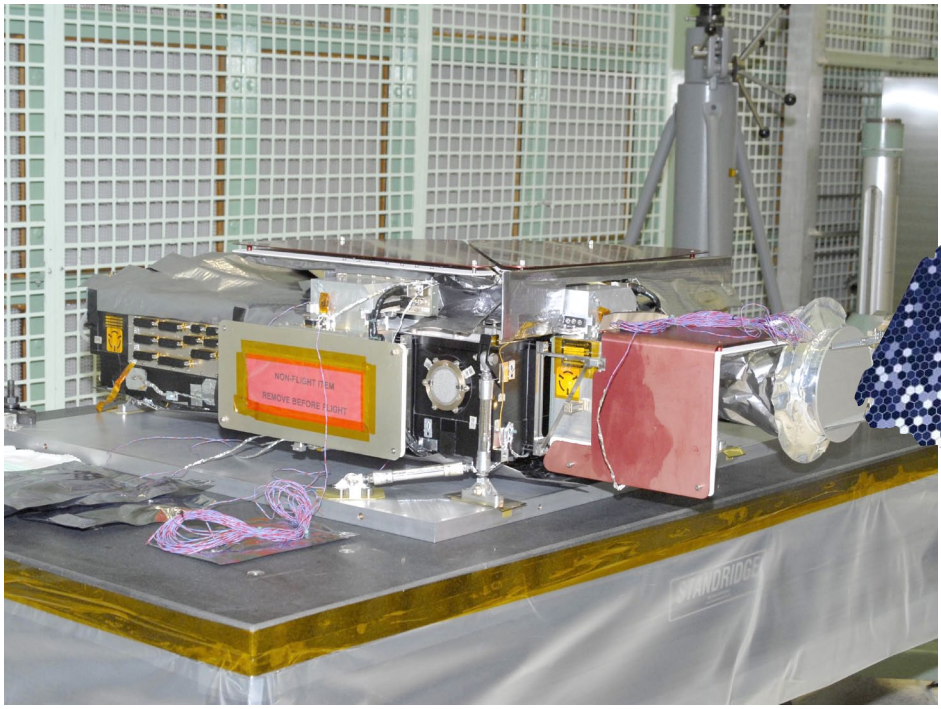
SDO contains a suite of instruments that provide observations that will lead to a more complete understanding of the solar dynamics that drive variability in the Earth's environment. This set of instruments does an amazing job, including measuring the extreme ultraviolet spectral irradiance of the Sun; making images of the chromosphere, and inner corona at several temperatures in a rapid cadence.

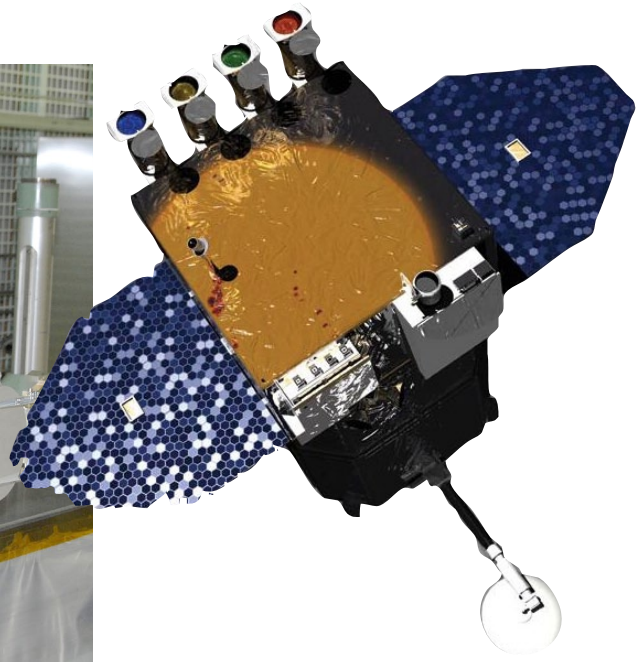
There are three primary science teams that receive the data from SDO, then process, analyze, archive, and serve the data. Each team is responsible for one of the three primary banks of instruments:

HMI (Helioseismic and Magnetic Imager)

The Helioseismic and Magnetic Imager extends current capabilities of the SOHO and

Main Atmospheric Imaging Assembly (AIA) installed in SDO (Courtesy: NASA/GSFC/AIA)





Main Helioseismic and Magnetic Imager (HMI) (Courtesy: NASA/GSFC/HMI)

MDI (Michelson Doppler Imager) spacecraft, with continual full-disk coverage at higher spatial resolution and new vector magnetogram capabilities.

AIA (Atmospheric Imaging Assembly)

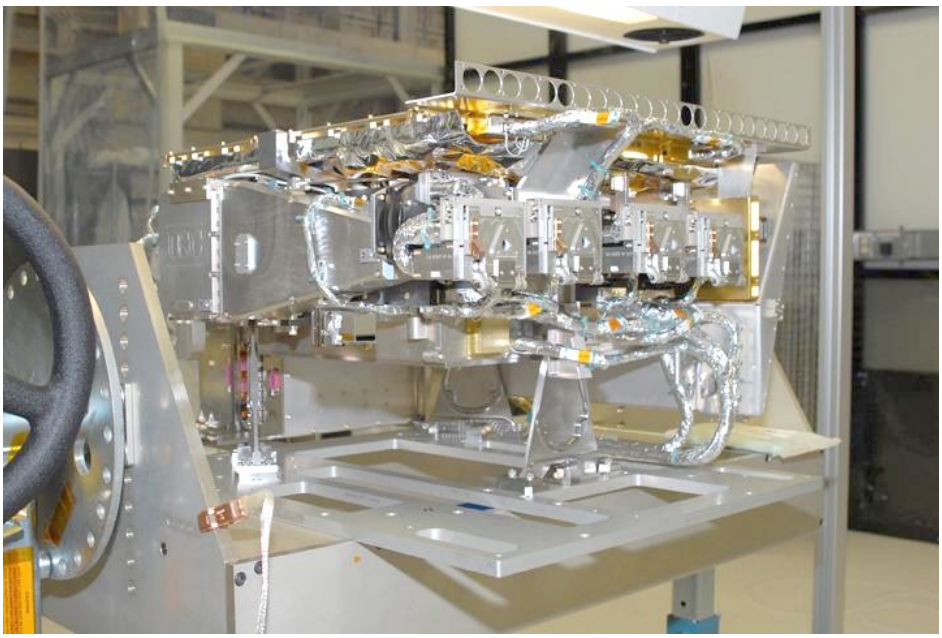
The Atmospheric Imaging Assembly images the solar atmosphere in multiple wavelengths to link changes in the surface to the interior. Data includes images of the Sun in 10 wavelengths every 10 seconds.

EVE (Extreme Ultraviolet Variablity Experiment)

This experiment measures the solar extreme-ultraviolet (EUV) irradiance with unprecedented spectral resolution, temporal cadence, and precision in order to understand variations on the timescales which influence Earth's climate and near-Earth space.

SDO's AIA instrument has twice the image resolution as current STEREO (Solar TErrestrial RElations Observatory) images, and four times greater imaging resolution than SOHO. The image cadence also varies. SDO takes one image every second. At best STEREO takes one image every three minutes, and SOHO takes one image every twelve minutes.

Each of the three instruments provides real-time data and images of our nearest star. "These amazing images, which show our dynamic sun in a new level of detail, are only the beginning of SDO's contribution to our understanding of the sun," said SDO Project Scientist Dean Pesnell of Goddard.



Up close and personal with EVE (Extreme Ultraviolet Variability Experiment) in the pre-launch clean tent (Courtesy: NASA/GSFC/EVE)

In April, NASA released an incredible movie showing a massive solar prominence erupting on March 30, 2010. You can view it at **http://tinyurl.com/nasasdoprom** (requires Quick Time viewer). "We've seen solar prominences before – but never quite like this," says Alan Title of Lockheed Martin, principal investigator of the AIA. "Some of my colleagues say they've learned new things about prominences just by watching this one movie," he said.

The successful launch and deployment of SDO is great news for radio hobbyists on many levels. "SDO is our 'Hubble for the sun'," says Program scientist Lika Guhathakurta of NASA headquarters, "It promises to transform solar physics in the same way the Hubble Space Telescope has transformed astronomy and cosmology."

"No solar telescope has ever come close to the combined spatial, temporal and spectral resolution of SDO," adds Title. "This is possible because of the combination of 4096 x 4096-pixel CCDs with huge dynamic range and a geosynchronous orbit which allows SDO to observe the sun and communicate with the ground around the clock."

Armed with such rich views of the sun, as well as the wealth of new space weather data, radio hobbyists around the world will be equipped to better plan communications, and to understand current conditions. Using tools like PropLab Pro (**http://hfradio.org/swp_proplab/)** and ACE-HF Pro **(http://hfradio.org/ace-hf/),** and, using sites such as my own web site **http://propagation.hfradio.org**, anyone can take advantage of favorable space weather, and work around space weather that degrades ionospheric propagation. Consider this: during the last fifteen years of Sunspot Cycle 23, amazing progress was made in the area of solar and terrestrial science. Imagine what we'll discover and see during this new Sunspot Cycle 24!

Inside the Low Power FM Movement

By Maggie Avener, KB1PBZ

All over the country and across the FM broadcast band, there are radio stations operating with the power of a light bulb. These Low Power FM stations (LPFMs) continuously pump out high-powered content. LPFMs are a forum for schools, churches, community centers, farm worker organizations, environmentalists, and just about anyone else who doesn't get much airtime on the higher-powered commercial and non-commercial stations. And, if all goes well in the next six months, there could be more of them than ever before.

Low Power FM Background

To understand the backdrop for Low Power FM radio, we need to look at the history of broadcast radio in the United States. Radio took off in the U.S. in the early 1900s. Most of those early radio stations were run by churches, schools, and individuals operating at less than 100 watts. There was no formal licensing process – new stations simply sprung up wherever there was space on the dial.

In the 1920s, larger companies such as the National Broadcasting Company (NBC) started to create networks of radio stations. Each station in a network would broadcast national material that was delivered over telephone lines from other network stations.

In 1927 Congress stepped in and approved the Radio Act, after being lobbied by the National Association of Broadcasters (NAB). The Act created the Federal Radio Commission (FRC) to regulate the radio waves. The FRC was given the authority to grant or deny broadcast licenses, with very little direction on how to do so. In practice, the FRC denied licenses mainly to stations that weren't "professional" enough. This forced many of the smaller, independent radio stations off the dial, while leaving the larger, networked stations on the air.

The rest, as we know, is history. The Communications Act of 1934 replaced the FRC with the broader Federal Communications Commission (FCC), noting that their role was to "regulate the public airwaves in the public interest," but still offering no specific requirements for soliciting the public's input.

DJ Eloisa Zamarripa runs the board at WSBL-LP in South Bend, Indiana. (Credit: Dave Witham)

In 1938, the FCC established Class D radio stations, which were allowed low power (up to 250 watts) and were only granted to non-commercial educational institutions. In 1978, however, the FCC stopped distributing new Class D licenses and forced existing Class D stations to increase their power or cease broadcasting. This left no legal option for small broadcasters who couldn't afford to operate at higher power, and many of the more community-oriented Class D stations went off the air.

The number of voices on the airwaves grew even smaller with the Telecommunications Act of 1996, which deregulated the radio industry and allowed single corporations to control more of the airwaves than ever before. In consequence, the number of radio station owners further declined, even as the total number of stations increased.

Rebellion in the Ranks

As big broadcasters gained more control of the licensed spectrum, smaller unlicensed broadcasters known as "micro-broadcasters" began to assert their places on the dial. Some saw their broadcasts as a form of civil disobedience, protesting their lack of access to the airwaves. Others simply chose to broadcast because their views weren't being represented anywhere else in the media.

The first well-known micro-broadcaster was Mbanna Kantako, who used a 1 watt transmitter to broadcast to his neighbors in a Springfield, Illinois housing project starting in 1987. Kantako used his radio station to discuss police brutality and other issues affecting his neighborhood. Kantako refused to shut down his transmitter after multiple requests by the FCC, insisting that he had a right to have a voice on the airwaves.

Stephen Dunifer of Free Radio Berkeley did the same in California in the early 1990s. Dunifer found himself in legal limbo after he refused to stop broadcasting, which kicked off a protracted court case. While the courts did eventually tell Dunifer to stop broadcasting in 1998, his case inspired many others to jump onto the airwaves where he left off.

Micro-broadcasters march in the nation's capital to protest the FCC's refusal to license low-power FM radio. (Credit: Jeff Pearson and Mary Jones)

The real victory for micro-broadcasters came in 2000. After years of shutting down unlicensed broadcasters by fining them and confiscating their equipment, the FCC finally decided to launch a new Low Power FM (LPFM) radio service. The service was to be entirely commercial-free, and licenses would only be granted to non-profit organizations. These licenses would allow stations to operate at no more than 100 watts, powerful enough to provide solid coverage within a 3.5-mile radius of the antenna, depending on the height and terrain of the antenna's location. Initially, there were also plans to license 10-watt stations, but that part of the service never got off the ground.

This was a major win for micro-broadcasters, who finally had an opportunity to be heard on the air without threats of fines or imprisonment.

Low Power to the People!

In 1998, a small group of activists based in Philadelphia, Pennsylvania joined forces and started an organization called the Prometheus Radio Project. Just as the mythological Prometheus introduced people to the power of fire, the Prometheus Radio Project sought to introduce people to the power of radio. Prometheus largely grew out of the micro-broadcasting movement; a number of the original members were self-identified "pirates" from West Philadelphia's unlicensed station "Radio Mutiny."

Once the FCC announced an opportunity for legal low power radio, Prometheus disengaged from unlicensed broadcasting in order to focus on creating new, licensed LPFMs, while keeping the FCC accountable to their promises.

The Prometheus Radio Project's work takes several forms. The core component is to help new

The Prometheus Radio Project works with prospective low power FM stations to get on the air.

voices get on the air. To that end, Prometheus went on tour to spread the word about the low power licensing opportunity to any group that had historically been excluded from the radio spectrum. Prometheus works with each of these organizations through the licensing process, and then supports them in getting on the air.

In some cases, Prometheus even partners with the organization to hold a radio station barn raising to launch their station. At barn raisings, hundreds of local, national, and international volunteers gather to build the station in a weekend. Barn raisings are structured as learning opportunities for everyone: Anyone who is interested in learning new skills is encouraged to work on building that part of the station that interests them. Anyone who already knows how to do something is encouraged to teach someone else. Workshops throughout the weekend promote skill-sharing in a more structured environment as well.

Prometheus barn raisings have launched eleven Low Power FM stations, and just this past September, Prometheus held its twelfth barn raising for WXGA-FM, a 3,000 watt station for Green and Columbia counties in up-state New York.

Not so Fast!

In 2000, the FCC announced it would open five licensing windows in which organizations across the country could submit LPFM license applications by region. The first two such windows opened and closed without a hitch. Thousands of applications were filed, many with the help of Prometheus.

Meanwhile, however, the NAB was busy lobbying Congress to restrict LPFM licensing. The NAB distributed what they called a "cross-talk demonstration" CD to members of Congress that purported to simulate the interference they claimed LPFMs would cause to full-service stations if they were allocated as planned. While the FCC reported that the demonstration was "misleading and... simply wrong," Congress complied with the NAB's requests anyway, passing the Radio Broadcast Preservation Act that required the FCC to change the rules about where LPFMs could be placed on the dial.

Originally, the licensing process required that an LPFM be a certain distance away from any other licensed station on their frequency (the "co-channel") or the next two lower or higher stations on the dial (known as the "first-adjacent" or "second-adjacent" frequencies). The new rules added "third-adjacent" restrictions as well, meaning that LPFMs needed to be 0.8 MHz (four "clicks" on the dial) away from any nearby radio stations. With that, 75% of the applicants from the first two windows were eliminated by the new rules and the majority of the organizations that had prepared applications for the final three windows were no longer able to apply.

As part of the Radio Broadcast Preservation Act, Congress also ordered the FCC to carry out a study to learn whether third-adjacent channel interference from LPFMs was actually a threat to full-power radio stations. The study, carried out by the MITRE Corporation, predicted that there would be *no* significant interference from LPFMs. However, Congress has yet to reverse their ruling based on this evidence.

The State of LPFMs

Today, there are over 500 licensed, low power FM stations on the air. While many of these stations are great, a few in particular stand out, offering programming that you can't find anywhere else on the dial.

One such example can be found in Opelousas, Louisiana, the home of zydeco music. Zydeco is a form of music that evolved from Creole and American Roots musical traditions and is a central focus in the region. Though over 20,000 people attend the zydeco festival in Opelousas each year, none of the local radio stations would play zydeco on the air until recently. This contradiction was part of what inspired the Southern Development Foundation to apply for an LPFM license in 2000. When the station went on the air in 2003 as KOCZ-LP, they gave zydeco a prominent role in their music programming. The station was an immediate hit. In fact, it was so successful that one of the local commercial stations took note and has since added zydeco to their programming.

Volunteers learn to solder audio cables at the WMXP-LP barn raising in Greenville, SC. (Credit: Dan Avener)

Some organizations use their LPFMs primarily as organizing tools. Pineros y Campesinos Unidos del Noroeste (PCUN) is a farm-worker union in Woodburn, Oregon. Organizers at PCUN wanted to use radio to discuss their issues and mobilize farm workers for their campaigns. They originally paid for a slot on a local commercial radio station, but were soon taken off the air after the station owner learned about the contents of their show. PCUN then applied for an LPFM and was granted a license in 2005. They named their station "Radio Movimiento," or "Movement Radio." KPCN-LP went on the air in 2006 and is now the only Spanish-language radio station available to many of its listeners.

Another important role of LPFMs is their ability to provide information to their communities in times of disaster. Larger radio stations often rely on "piped in" programming, sometimes with only a single person overseeing a station locally. Conversely, LPFMs are often run by locals who are attuned to the needs of their communities. What's more, a 100 watt station (unlike a 100 kilowatt station) can easily be run from emergency back-up power. When Hurricane Ike hit Chalk Hill, Texas, KZQX-LP was able to stay on the air using generators. The station aired road reports and other vital public safety information all through the storm while power was out for over a week.

Unfortunately, these burgeoning stations are under constant threat, because the FCC considers them "secondary" to full-power stations. If a full-power FM station (commercial or non-commercial) applies to move their tower next to that of an LPFM on a nearby frequency, the LPFM is not considered in the review process. In mild cases, this means the LPFM will be subject to interference from the full-power station. In more severe cases, where the LPFM is predicted to cause interference to the full-power station, the LPFM can be taken off the air.

LPFM advocates have been working for years to address this phenomenon, referred to in the LPFM community as "encroachment." Sometimes, the LPFM can simply move to another frequency. KYRS-LP in Spokane, Washington was granted a waiver to move to a frequency where they were closer to a second-adjacent full-power commercial station than would generally be allowed, but they weren't expected to cause any interference to the commercial station's signal. The FCC has since granted a number of other second-adjacent channel waivers to encroached LPFMs.

Ironically, the FCC cannot grant similar third-adjacent waivers because of the restrictions imposed by Congress on third-adjacent LPFM placement, even though the interference concerns are less serious on third-adjacent channels than on second-adjacent channels!

When a change in frequency doesn't do the trick, the LPFM may need to move to a new transmitting site. Some LPFMs have thus been pushed to the outskirts of town, compromising their ability to reach the communities they are licensed to serve.

The Local Community Radio Act

Beyond the threats to existing LPFMs, there's also the problem that no new LPFM licenses can be issued. Because of the third-adjacent channel restrictions, the FCC has held off opening another licensing window. This leaves thousands of high schools, churches, labor unions, and community groups without access to the airwaves.

There's hope for change, though. The Local Community Radio Act, known in the House as HR 1147 and in the Senate as S 592, is making its way through Congress as this is written. The bill would eliminate the third-adjacent channel requirements for LPFM licensing. This bill has already passed a full House of Representatives vote and has passed unanimously through the Senate Committee on Commerce, but has yet to pass the full Senate. Insiders such as Senate co-sponsor Patrick Leahy (D-VT) have reported that the bill is well on its way to passage!

LPFM in an Age of New Technology

In a time when much of the hype around radio focuses on Internet streaming and HD Radio (the name given to the industry and FCC approved digital broadcasting format), one common question analog FM operators have to continuously answer is, "Isn't analog radio dead?"

The truth is that it's not. According to a recent report from the industry ratings organization Arbitron, 93% of Americans listen to FM radio weekly. In contrast, only 11% listened to internet radio on a weekly basis, and only 26% had even heard of HD radio. And while internet-distributed content is easily accessible on many mobile devices, analog FM remains the easiest media signal to pick up in a vehicle.

Despite the recent opportunity afforded by new FCC rules for HD Radio power increases, the vast majority of LPFMs have not transitioned to the new digital operating platform. HD Radio is a hybrid system that involves using specialized equipment to send a digital signal in addition to the station's analog signal. The technology is sometimes referred to as IBOC, short for In Band, On Channel, because the digital and analog signals are both sent on the same FM channel.

HD Radio is also expensive. In addition to upfront equipment costs (IBOC transmitters start around $70,000), HD Radio stations are required to pay royalties of $5,000/year to license the technology. That amount is on par with the entire annual operating budget for some small LPFMs! While digital radio may mean positive things for the future of low-power broadcasting, most LPFM operators have recognized that the current implementation just isn't worthwhile.

On the other hand, LPFMs are quick to recognize the benefits of supplementing their terrestrial broadcast with Internet streaming. Today, over half of licensed LPFMs have a web stream. However, it's also clear that LPFM operators don't see streaming as a replacement for FM radio. Many LPFMs operate in rural or underserved parts of the country, where many of their listeners don't have access to fast enough Internet to listen to a web stream.

Additionally, streaming costs don't scale well as listenership increases. While it costs the same amount to operate an FM transmitter regardless of the number of listeners tuning in, streaming stations must pay for more bandwidth as they gain more listeners. For example, one popular provider of hosting services for streaming radio charges $100/month for a moderate-quality stream with up to 25 simultaneous listeners, but $1,500/month for 500 simultaneous listeners. As a result, even successful streaming stations are still looking for LPFM licenses.

Volunteers climb the newly-erected WRFU-LP tower in Urbana, IL. (Photo: © Jacques-Jean Tiziou / www.jjtiziou.net)

Mountain Area Information Network, a community-supported ISP in western North Carolina, has been organizing since 1996 – yet they still took the 2000 opportunity to apply for an LPFM license so they could reach more people. Media Bridges, a community center in Cincinnati that has been streaming for 10 years, launched a low-power station WVQC-LP just this past summer.

Additionally, some community organizations have grown from LPFMs into multi-media hubs. Davis Media Access in Davis, California is home to both KDRT-LP and two public access television stations. Urbana-Champaign Independent Media Center in Urbana, Illinois runs a Community Media and Arts Center that houses WRFU-LP as well as production studios and an online news program. Both organizations sponsor ongoing media education programs.

As other organizations begin to utilize radio in their communities, we can expect to see an explosion of community media centers of all varieties.

So, you want to start an LPFM?

Perhaps after reading about the power of low power radio, you're wondering how you can start your own LPFM station. The bad news is that you can't apply for an LPFM license until a licensing window is opened. The good news is that the FCC has said that if the Local Community Radio Act passes out of the Senate, they'll open a new window! While nobody knows for sure what the timeline will look like, estimates are that the next window would be 6 months to 2 years after the bill passes.

In any case, now is a good time to start planning for your radio station. For an LPFM application, you'll need to find a location from which you can broadcast as well as an open frequency. Rec Networks maintains an LPFM channel search tool at **http://cdbs.recnet.com/lpfm.php**. To get a preliminary idea of whether there's an open channel in your area, you can do a channel search with the option "LP-100 (except in Puerto Rico & the U.S. Virgin Islands) – MITRE (no 3rd Adj)". This will account for the lifting of the 3rd-adjacent channel restrictions. If the channel search comes up with a channel, then you're in luck! If not, there's still hope – the FCC hasn't ironed out the rules for the next windows, and further rule changes could open up new channels.

A good next step is to figure out what content you want to play on the air. The FCC doesn't regulate content on non-commercial stations, as long as you don't swear or broadcast commercials, and follow a few other basic rules. This means that you're just as likely to get a license to play Nintendo theme songs as you are to get one to talk about alien encounters. There may be "preference points" for station applicants who pledge to play locally-produced content for a certain number of hours per week, so your chances at a license won't be as good if you plan on playing syndicated programs all the time.

You should also figure out who you want to work with. Only incorporated, non-profit organizations can apply for LPFM licenses. If you're not already part of such a group that wants a radio station, consider whether there's one around with a mission that could fit with your broadcasting vision. If not, find some people to work with and look into your state's procedures for incorporation.

Once you have all the above details figured out, you can start planning for your station. Check the Prometheus Radio Project website at **www.prometheusradio.org** for resources on raising money, putting together a board, and finding equipment. Keep an eye on the news, and be ready to apply when the time comes!

About the Author:

Maggie Avener got her start in radio at the age of five, helping her father with his show on the community radio station WERU in Maine. She quickly grew to love the station and stayed involved as a volunteer and a part-time DJ through high school. Eventually, Maggie discovered that she enjoyed the technical side of radio even more than the production side and began to educate herself on RF engineering through college courses, reading, and a lot of trial-and-error.

Maggie currently works as the Technical and Training Organizer at the Prometheus Radio Project. Her job involves providing support for existing and potential community radio stations, teaching introductory workshops on radio, and working to demystify technology for anyone who wants to learn about it. She hold an Extra Class amateur radio license as KB1PBZ and has recently become a Society of Broadcast Engineers Certified Broadcast Radio Engineer.

A Growing Interest in 2.650 MHz

(Submitted Anonymously)

I have been an amateur radio operator for a couple decades and, for a few years running, I've had morning schedules in the Single-Sideband segment of the 40 meter band (7.0-7.3 MHz) with friends about five hundred miles away. For a period of three or four months, I have experienced intermittent wideband radio interference to the extent that I could not carry on a radio contact.

I had a similar experience about three years ago in which I had terrible radio interference below about 2 MHz. In that case I tracked it down to light dimmers in the next door neighbor's house. I approached them very diplomatically and they graciously let me replace the dimmers with regular light switches which cured the problem. That case was clinched when the neighbor heard the loud noise over the phone coming from my receiver as one of the dimmers was turned on and off. That was a very convincing demonstration.

From a hobby listener's perspective, light dimmers cause most problems in the medium wave band (540-1700 kHz) and in the marine and aeronautical beacon band (about 200-420 kHz). But, these bands were not affected during this most recent bout of interference. This type of interference was new to me and none of my ham friends had any idea, either.

In the 'Hood

In my immediate neighborhood, the homeowners live in their own houses, with one exception – the house across the street which had been rented to new people a few months before. I had not met them and did not feel entirely comfortable about approaching them to find out if the noise was coming from their house.

Back in my radio shack, I noticed that this new noise would come and go abruptly, and, when on, it was an unvarying S-9 on 40 meters on my HF ham transceiver in the SSB mode. I felt that it must be rather close – neighborhood close. When I disconnected the antenna, the noise would go completely away. But what could it be? Which house? I remained troubled about it for many weeks.

Then it Hit Me

All of a sudden one evening when I was scratching my head, an idea came to mind. Could someone be using indoor grow-lights in the neighborhood? Are there grow-lights that cause radio interference? I immediately started to do some Internet research.

What I found indicated that some grow lights (some other lights, too) use an "HF Generator," operating at 2.65 MHz to excite the gases in a specialized type of bulb. When I found that little piece of information, I quickly tuned to 2.65 MHz in the AM mode (more susceptible to noise) and found that I had 20 dB over S-9 of noise! Though a broad noise, frequency-wise, it was centered at about 2.65 MHz. I was almost stunned. What have I stumbled onto here? Maybe something, maybe nothing. I did not know.

The Frequencies

My communications in the 40 meter band were being disrupted – but, this was on 2.65 MHz, approximately one third of that frequency.

Wait a minute! By the nature of things, even harmonics (multiples of frequency) tend to cancel and don't radiate far, but odd harmonics can, especially from "dirty" radio energy sources. I then tuned to the 3rd harmonic and found a broad noise peak centered at about 7.950 MHz, the one that was killing my 40 meter contacts at a slightly lower frequency. I tried the 5th harmonic at 13.250 MHz and, there again, was a broad but much weaker noise peak.

Then, I started to log the on-and-off times. I knew right to the minute what time in the evening the noise had been stopping, twelve hours after the start time, confirming that all the frequencies were restored to normal background noise at the same time.

Out of curiosity, like a devoted radio hobbyist, I tuned around on my Icom R8500 receiver in the AM mode looking for unusual noise peaks. Sure enough, I found peaks centered on 36.3, 45.4, 61, 125, and 158.9 MHz that came on and went away with the 2.65 MHz interference.

When the interference first started, the start-and-stop times varied, sometimes considerably, but eventually settled down to twelve hours on and twelve hours off right to the minute each day. This interference was obviously on a timer and was on in the daytime, not nighttime – in a residential neighborhood!

Tips to Growers

A tip offered to growers of marijuana that I found on the Internet said to limit lighting to a maximum of twelve hours a day during the flowering stage. At other times in the plant's life cycle, longer periods of "on" time seem to be desirable. The irregular times first encountered may have been during set-up and testing.

Internet research indicated that some users of such lights for growing marijuana warn of detection and discovery of their growing operations as a result of the radio interference that they can cause. Growers are, in essence, installing radio beacons that can signal what they are doing.

What to Do?

Now, what to do with the information? My goal in life was not to rid the world of marijuana, or most of the rest of society's ills, but instead to get rid of the radio interference that had been plaguing me for so long and to help rid the neighborhood of a potentially bad element.

After some deep thought about the various possible consequences to all concerned – my family included – I contacted the narcotics division of the appropriate law enforcement agency for my area. After three phone conversations with a detective, I wrote up the complete story. I included the technology side of the radio interference, a cassette recording of when it would start and stop, and put it in a sealed envelope. I hand delivered it through a slot below a bullet-proof window at the police department.

At approximately one week intervals, I delivered more sealed envelopes with photos, license numbers, and time logs of all activities as my time permitted. I expected to see a bust come down, but instead, after many weeks, the timing changed to twenty-fours a day – a new crop under way seemed likely. Finally, within about eight months after it started, the people moved, the noise went away, and that's all I know.

The Bulbs

The bulbs have a different construction and principle of operation, compared to regular incandescent bulbs, and they are mostly used in commercial and industrial lighting. They have no filament and there are no electrical connections to the bulbs themselves.

The bulb has a similar shape to the common bulb, but it has a hollow tube going up inside from the base. When the bulb is screwed into its holder, an "antenna" protrudes into this tube which radiates radio frequency energy. The antenna is composed of an induction coil wound on a ferrite core. A separate generator provides the radio energy to the antenna via coaxial cable. Similar to a fluorescent lamp, the ultraviolet light produced from the energized gas is converted to visible light via the phosphor on the interior glass surface.

Now, the question is: What's growing in your neighborhood?

MT

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Life's Been Good to WB6ACU

By Ken Reitz KS4ZR

Photo courtesy: www.joewalsh.com

Joe Walsh is one of the most inventive guitar forces of any era of rock music. His iconic riffs on the more than 30 albums that he has recorded have brought critical acclaim and international stardom. His songwriting capability has helped take him – and the band he's most closely associated with, the Eagles – to the Rock and Roll Hall of Fame. How can he top that? Next year he'll be celebrating 50 years as an amateur radio operator.

Ohio Farmland to NYC Streets

Eleven year-old Joe Walsh thought he had it made when his family lived in Columbus, Ohio. "We had a nice house and a big yard, big fields to play in, vacant lots, and we used to run all over the place." Then the family moved to New York City. "So, I went from Ohio, as I just described it, to a two bedroom apartment on the third floor of an apartment building in New York City. It was kind of an environmental shock for me, so I just tried to adjust."

Being a typical 11 year-old, Joe set out to explore his new surroundings, starting with the mysteries of a city apartment building roof. "There was this thing on the roof and I noticed that Saturday mornings it would turn around," Joe said, "So, after seeing that for a couple of Saturdays, I traced the wires down to a first floor apartment. I found the door to the apartment, knocked, and introduced myself." The man who answered the door was Jim Walden W2IEY, who went on to become Joe's "Elmer" and lifelong friend. It turned out that the "thing that went around" was a Mosley TA-33-JR triband beam and the wires went to Jim's Collins KWM1 transceiver.

Joe Walsh in New York City, age 12, at his ham station; a Heathkit DX-20 he had just built and a BC-348 military surplus receiver. His mother helped him learn CW with flash cards. (Courtesy: Joe Walsh)

Like most boys growing up in the 1950s, Joe was interested in radio. He remembers visiting his grandfather's house in Kansas where there was a small Zenith clock radio at the side of the bed. He would often stay up late into the night DXing the AM band. Now he had a chance to learn about ham radio. Jim Walden spent rest of that summer tutoring young Joe in the radio arts.

"Jim was my friend that summer. He taught me all about ham radio, and my mom helped me learn Morse code by using flash cards. About four months later I took my Novice exam and I've been a ham ever since; that was 1961."

On Stage and on the Air

It didn't take long for the ham radio bug to bite, and in no time Joe had set up a typical early '60s Novice station. "In those days, the Novice ticket was only good for a year. You were limited to 70 watts and CW only. I built a Heath Kit DX-20 for my transmitter and my receiver was an old military surplus BC-348. I set up on 40 meters and that's all I did. Sometimes I stayed up all night working 40 meters.

"My parents didn't really understand the hobby because I was always on the roof or busy doing something. They were kind of leery of it because it affected my homework. I didn't really get a lot of homework done that first month after I got my license. But, Jim Walden saved my life, he really did, because there I was in New York from big fields to an apartment – nothing to do, no friends – and I guess I could have gone in various ways, and this was a really constructive way to use my brain."

On his many trips to the roof of their apartment building, Joe discovered other antennas, and it wasn't long before he met other hams in the neighborhood. But, the most fun was being on the air. "I was trying to work all states, which I finally did. I never really thought I could work DX, but one night, all of a sudden, there was G3EMT, that was my first DX. Working Canada was fun and once in a while South America, but I was always speechless anytime I would work out of the country. It was just unimaginable that little me with a DX-20 could accomplish anything like that."

That sense of accomplishment, building his own station, was a big deal for Joe. "My antenna was a 40 meter dipole I made with TV lead-in wire with a balun down in the window. After building the transmitter, it didn't work the first time I turned it on. There was something in the oscillator I had screwed up, so I went back and fixed it. That the thing that I had put together at age 12 actually worked, did so much for my self-esteem."

High school put a big dent in his ham radio hobby. "By the time I had graduated from high school in 1965 I had discovered girls and guitar. But, shortly after going to college I re-took the exam and got my General ticket." By the time he had finally earned voice privileges, a lot had changed in the hobby. "By then AM was pretty much gone and people were trading in those beautiful old radios for the very first Yaesu and Kenwood transceivers that were just coming out. Single-sideband took over from AM and that allowed for a lot smaller radios; you didn't need all those tubes and all that power."

From college, Joe launched a musical career, gaining national prominence first with the James Gang, Barnstorm, and then the Eagles. In between these bands Joe enjoyed a very successful solo career. All the while he cut a meandering path through the various call sign districts, holding 2, 8, 0 and 6 area calls. Wherever he was, there was a station on the air.

During the early years with the Eagles in the 1970s, tours were done by bus. "I took some radio gear out on the road when we would tour. I put a Hustler antenna on top of the tour bus, but I had to get a whole bunch of them because every time we'd go through a toll booth it'd knock the Hustler down, the bus was so high. I had to get five or six extra radiators and stick another one in when it got hit." Mostly Joe would operate during the down time between when the band would do a sound check and the actual show. "I did pretty good from the back of the bus. I used a Kenwood TS-50, which was a great mobile rig, and Hustler as well as Outback antennas."

As a record producer and studio sideman, Joe met other musician/hams including Ronnie Milsap WB4KCG and the late Chet Atkins. "I knew Chet well, and when we would see each other it was mostly ham talk not music talk. There were also a bunch of people around the music business like Bob Heil K9EID. We've been friends forever. He used to do our PA system in the very early days. Whatever band I was in, he'd supply the PA system, and it wasn't

long after we first met that we found out we were both hams."

Operating at Home

Joe still has a soft spot for the old tube-fired AM gear. "I've collected some of the old tube stuff, the earlier stuff, and I rotate it in and out of my home station. I have an Icom 746 and I have a beam and a dipole up, so I have a modern station. Then I have an AM station including some old broadcast transmitters, but the one I'm proud of is a Collins KW-1 which is an AM amateur transmitter from around 1948. But, they only made 500 and I believe there are only about 50 of them left, and that's my pride and joy for AM.

"Luckily, where I live, I'm up pretty high and I have enough property where I can put up a full length dipole tuned to 3870 kHz [the west coast AM net frequency]. We don't have restrictive covenants where I live but, when I was first setting it up it was hilarious because, with a couple hundred watts on AM, which is continuous duty, I was getting into my neighbor's intercom system, their TVs and telephones. They didn't know exactly what it was, but it was somebody talking; they had no idea that it was me next door. They really were thinking that their house was haunted, because these voices would just come out of their intercom and they didn't know what to do.

"So, they called me up and said, 'By chance, do all those wires have anything to do with our house?' I said, 'Yes, absolutely, it's me,' and I apologized and I had to go in and put toroids on everything, but they know I'm crazy and they love the Eagles, so I get exempt from the neighborhood."

"Right now my favorite mode is AM. We've got about 350 AM hams here on the west coast from San Diego to Alaska and out to Colorado. The single sidebanders don't like it so much, because they think it's obsolete and they think we're all nuts, but getting the old stuff going again, getting on 3870 AM, well, it's a great community and I've met all kinds of people I'd have never come across otherwise."

"I haven't been real active in the last four or five years, aside from working AM. For some reason people keep coming to the Eagles' shows and much to my amazement we're still out there doing it. I'm 62 now and it's kind of uncharted waters for us old rock and roll guys; we never planned on living this long, so everyday's an adventure!

"But, when I get home from a tour and get on the air, I'm just some guy named Joe on the other end and it helps me get grounded, it really does. To talk to some, well, I want to say normal people, but hams aren't normal people. But, I'm just an ordinary average guy on the radio and I really value that to take the edge off. It's really relaxing for me."

Building a Ham Legacy

His musical legacy assured, Joe has been quietly working behind the scenes to help bring young people into the radio hobby. Years ago he went to the ARRL with a question, "What's important to you guys and what do you need help with?" The answer became, in part, the ARRL's Education and Technology Program [see "Amateur Radio and Education in America" *MT* September, 2010]. "So, I went ahead and helped them get their education drive funded, to get it in some schools and now they've got a really good program in place.

"The thing I want to push is the kindness of Jim Walden and the time he took, unselfishly, to plant a seed in me and get it to sprout. It's a tradition and an important part of ham radio. I've got a kid now who's in junior high school and he's asked me for help. He heard some people talking on the radio and that's all he wants to know about so, I'm really trying to mentor him.

"You just have to keep an open eye for kids who want to come in and give it a try. It doesn't take too much to get them on a repeater. It's a great feeling. I'll never forget that it was the only thing that mattered when I was twelve. It really was. And you never forget the spark in a new ham's eye. Because once it's got you, it's got you! The radio can really get you! And, make sure they don't lose interest because they've felt alone, or can't get anywhere in the manual, or it's too hard. That doesn't have to happen. I really think that keeping the tradition of help to the newcomer is important."

"It's kind of uncharted waters for us old rock and roll guys; we never planned on living this long, so every day's an adventure!"

You can learn more about the musical side to WB6ACU by visiting his official web site: www.joewalsh.com. And, if somehow you've missed his solo work, click on "Joe Walsh Radio" on that site. Special thanks to Joe Walsh's tour manager, Smokey Wendell, for his help in arranging the interview.

Joe Walsh WB6ACU at his vintage home station in southern California that includes a Collins KW1. His neighbors wondered why they could hear someone talking through their TV and intercom. They asked, "By chance, do all those wires have anything to do with our house?" (Courtesy: Joe Walsh)

Joe Walsh WB6ACU at his more modern home station. Though he likes his Icom 746 and Flex SDR radios, he's never far from the vintage gear. (Courtesy: Joe Walsh)

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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www.signalharbor.com

OpenSky and Medical Dispatching

November is the traditional month for giving thanks. This year we can be thankful for many things, including modern scanners that are able to monitor activity in our local area. Many times in the past, significant technological changes made monitoring difficult or impossible: agencies moved to 800 MHz before consumer-grade receivers could tune that high; trunked radio systems operated before hobbyist trunk-tracking existed; and digitized voice appeared before inexpensive vocoders were on the market.

All of these challenges proved temporary, having eventually been overcome by clever individuals and enterprising companies. We can be thankful for them and the capabilities they bring.

However, not all is rosy. New challenges appear that call for the same spirit of innovation and smart thinking.

❖ OpenSky

Dear Dan

I live in Oakland County, Michigan. My city of South Lyon changed to this OpenSky crap the beginning of July.

I listened to the South Lyon Police on my scanner for the last 20 years. Now I can't because of this Open Sky CRAP. My taxes paid for this system. I truly believe my 1st Amendment rights are being violated, not being able to listen anymore. I can still hear our Fire Department, so I guess that is something.

Do you by chance know how to get past this OpenSky technology, or have the frequencies or codes? Just asking. I am very disappointed I can no longer listen to the police in my town.

P.S. I have heard bad things about OpenSky from ex-officers and current ones as well. What do you think about OpenSky?

Thanks for listening,
Bobby in Michigan

South Lyon is a town of about 10,000 located in southwest Oakland County, about 40 miles west of Detroit. Back in 2002, Oakland County contracted with M/A-COM for a $33 million trunked radio system based on a technology called OpenSky, to be paid for through an "E911" surcharge on local telephone bills. The new system was planned to connect more than 80 agencies and 6,000 users via a digital, Internet Protocol-based network of voice and data services. It was originally scheduled to be complete by 2004.

However, after a series of delays and setbacks, by the middle of 2008 only a handful of municipalities had been successfully switched over. In June of this year, county officials said the system would be fully implemented by the end of the year, along with a final price tag closer to $45 million.

There are a few holdouts, including Southfield police and fire departments, as well as the Orion Township Fire Department, which will remain on the current radio equipment. Several other agencies will make the switch but retain their old equipment, just in case the new system doesn't work out as well as they were told.

Orion Township Fire will stay on 154.430 MHz, and Southfield can be heard on the following frequencies:

Frequency	Description
423.000	Parks and Recreation
423.350	Public Works
423.625	Fire (Dispatch)
423.675	Neighborhood Watch
423.825	Police (Car-to-Car)
423.975	Police (Secondary)
424.025	Police (Detectives)
424.325	Police (Dispatch)
424.375	Police (Tactical)
425.300	Police/Fire (Tactical)
425.375	Police/Fire (Mutual Aid)
460.600	Fire (Operations)

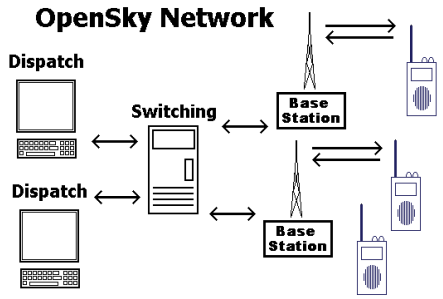
❖ OpenSky Problems

Milwaukee is still trying to get their $17 million OpenSky system fully up and running, after seven years of trying. The city police were operational as of February, but there are continuing complaints from officers about dead zones, garbled transmissions, and a general lack of confidence in the new equipment.

The State of New York never let it get that far. In 2004 they awarded a $2 billion contract to M/A-COM for a statewide OpenSky system. After four years of construction and installation in two western counties, a series of acceptance tests showed more than a dozen problems of such a serious nature that the state cancelled the entire contract.

Lancaster County in Pennsylvania came to the same conclusion, cancelling their $35 million contract in 2008 after more than seven years of trial and error.

There are some apparent bright spots for OpenSky. Cumberland County in Pennsylvania and Newton County in Georgia are both using



the technology for their public safety operations. Continental Airlines recently went live at the Intercontinental Airport in Houston, Texas. A dozen or more other systems across the country are under construction and going through testing.

❖ OpenSky Overhaul

Two recent developments may also affect the course and pace of OpenSky installations. First, OpenSky is now owned by Harris Corporation, a Florida-based radio and technology company, having paid $675 million last year for Tyco Electronics, which previously owned M/A-COM. Harris is a respected and generally well-run company and they are actively supporting OpenSky, so it is possible that the technical problems may eventually get solved. However, it may not be soon enough for many current and potential customers.

Interestingly, Harris also sells Project 25 (P25) radio equipment, so from a certain point of view it looks like they're hedging their bets.

Second, in August Harris announced a series of upgrades in a product called OpenSky2. This follow-on (Harris calls it "next generation") aims to fix many of the complaints levied against OpenSky by promising better voice quality, improved operation in noisy areas, faster and more consistent signal handoffs between repeater sites (called *roaming*), and more efficient data transmission.

It will be interesting to see whether these improvements will work well enough and be enticing enough to customers to make a difference in keeping old customers and capturing new ones.

❖ Albuquerque, New Mexico

Dear Dan,

After years of not monitoring medical channels, I decided to have a listen because the

ambulance comes to our apartments so often. I was surprised to hear lots of activity and that the communications had not been moved to a trunking system.

Here is what I found:

462.975	Albuquerque Ambulance Service (AAS) dispatch
462.950	AAS mobile data terminal digital signal
463.000	MED 1 to University of New Mexico Hospital
463.025	MED 2 to AAS. Out-of-town ambulances call AAS on MED 2 to be assigned a hospital MED channel.
463.050	MED 3 to Veterans Administration hospital
463.075	MED 4 to unidentified hospital
463.100	MED 5 to Kaseman hospital
463.125	MED 6 to Lovelace Downtown hospital *
463.150	MED 7 to Presbyterian Downtown and Kaseman hospitals *
463.700	AAS paging

** = no repeater. Listen to the mobiles 5 MHz higher.*

Is there a published list of EMS (Emergency Medical Service) dispatch codes? For example, the dispatcher may say "respond to a 29D1 at ---". Are the codes standard across the nation, or does each region have its own set of codes?

I always find the "Scanning Report" column very useful and interesting.

William in Albuquerque

The records I have show the following additions and clarifications to your list of medical frequencies:

Frequency	Description
462.9750	MED 10 (AAS Dispatch)
463.1750	MED 8
451.3750	Lifeguard Paging

❖ Emergency Medical Dispatch Codes

The Emergency Medical Dispatch (EMD) codes you mention are standardized, but a public safety agency is free to choose whether to use them or not.

The Medical Priority Dispatch System (MPDS) was the brainchild of Dr. Jeff Clawson, who worked as an Emergency Medical Technician before becoming a doctor. In the late 1970s, he put together a set of flip cards to help prioritize patients in a standardized way according to the type of injury and how serious the injury appeared. His cards eventually became the basis for MPDS and now provide a systematic method of classifying medical emergencies and dispatching the proper personnel with the appropriate level of urgency. This process allows dispatchers to make rapid, consistent decisions about how to handle a request for help.

For agencies using MPDS, calls to "911" arriving at a Public Safety Answering Point (PSAP) are classified using a coding system (sometimes called "Clawson Codes") made up of two numbers separated by a letter.

The first number indicates the primary medical condition or event. For example, "3" is an animal bite and "10" is chest pain. The letter indicates the severity of the condition, where "A" is minor, "B" is more severe, progressing up to "E" indicating seriously life-threatening.

The second number provides more detail about the specific condition or cause. The "29D1" code in your example breaks out to an event of "29" (Traffic Accident), severity "D" (Serious Threat to Life), and detail "1" (Multiple Victims). In this case, the dispatcher would most likely tone out more than one ambulance and the crews would use lights and sirens while enroute to the scene.

Code	Description
1	ABDOMINAL PAIN
1-A-1	Abdominal pain
1-C-1	Fainting (age greater than 50)
1-C-2	Female with fainting (ages 12 to 50)
1-C-3	Male with pain (age greater than 45)
1-C-4	Female with pain (age greater than 45)
1-D-1	Not alert
2	ALLERGIES / HIVES / MEDICAL REACTIONS / STINGS
2-A-1	No difficulty breathing or swallowing
2-A-2	Spider bite
2-B-1	Unknown symptoms (3rd party caller)
2-C-1	Difficulty breathing or swallowing
2-C-2	Special medications or injections used
2-D-1	Severe respiratory distress
2-D-2	Not alert
2-D-3	Condition worsening
2-D-4	Swarming attack
2-D-5	Snake bite
2-E-1	Ineffective breathing
3	ANIMAL BITES / ATTACKS
3-A-1	Not dangerous body area
3-A-2	Non-recent injuries
3-A-3	Superficial or minor bites
3-B-1	Possible dangerous body area
3-B-2	Serious hemorrhage
3-B-3	Unknown injuries (3rd party caller)
3-D-1	Unconscious or cardiac arrest
3-D-2	Not alert
3-D-3	Dangerous body area
3-D-4	Large animal
3-D-5	Exotic animal
3-D-6	Attacks by multiple animals
4	ASSAULT
4-A-1	Not dangerous injuries
4-A-2	Non-recent injuries (six hours or more)
4-B-1	Possibly dangerous injuries
4-B-2	Serious injuries
4-B-3	Unknown injuries (3rd party caller)
4-D-1	Unconscious or cardiac arrest
4-D-2	Not alert
4-D-3	Abnormal breathing
4-D-4	Dangerous injuries
4-D-5	Multiple victims
5	BACK PAIN
5-A-1	Non-traumatic back pain
5-A-2	Non-recent traumatic back pain (six hours or more)
5-C-1	Fainting (age 50 or greater)
5-D-1	Not alert
6	BREATHING PROBLEMS
6-C-1	Difficulty breathing
6-C-2	Asthma
6-C-3	Cardiac history
6-D-1	Severe respiratory distress
6-D-2	Not alert
6-D-3	Sweaty, clammy or changing color
6-E-1	Ineffective breathing
7	BURNS / EXPLOSION
7-A-1	Small burns (less than 18 percent)
7-A-2	Sunburn or minor burns (hand size or less)
7-B-1	Unknown extent (3rd party caller)
7-C-1	Difficulty breathing
7-C-2	Large burns (18 percent or greater)
7-D-1	Multiple victims
7-D-2	Severe respiratory distress
7-D-3	Not alert
7-D-4	Explosion
8	CARBON MONOXIDE / INHALATION / HAZMAT
8-B-1	Alert and breathing normally
8-C-1	Alert with abnormal breathing
8-D-1	Multiple victims
8-D-2	Not alert
8-D-3	Hazardous materials
8-D-4	Unknown status (3rd party caller)

9	CARDIAC / RESPIRATORY ARREST
9-B-1	Obvious death situation
9-D-1	Suspected cardiac arrest
9-D-2	Suspected respiratory arrest
10	CHEST PAIN
10-A-1	Normal breathing (age less than 35)
10-C-1	Normal breathing (age 35 or older)
10-C-2	Abnormal breathing
10-C-3	Cocaine
10-C-4	Cardiac history
10-D-1	Severe respiratory distress
10-D-2	Not alert
10-D-3	Sweaty or changing color
11	CHOKING
11-A-1	Not choking now
11-D-1	Choking
11-D-2	Abnormal breathing
11-D-3	Not alert
12	CONVULSIONS / SEIZURES
12-A-1	Breathing now physically verified by caller
12-B-1	Breathing regularly (age less than 35) but not verified
12-C-1	Pregnancy
12-C-2	Trauma
12-C-3	Diabetic
12-C-4	Cardiac history
12-D-1	Continuous or multiple seizures
12-D-2	Age 35 and older (breathing not verified)
12-D-3	Not breathing (verified)
13	DIABETIC PROBLEMS
13-A-1	Conscious and alert
13-C-1	Conscious but not alert
13-C-2	Conscious with abnormal breathing
13-D-1	Unconscious
14	DROWNING / DIVING ACCIDENT
14-A-1	Alert and breathing normally (no injuries and out of water)
14-B-1	Alert and breathing normally (injuries and/or in water)
14-B-2	Unknown status (3rd party caller)
14-C-1	Alert with abnormal breathing
14-D-1	Unconscious
14-D-2	Not breathing or underwater
14-D-3	Not alert and/or abnormal breathing
14-D-4	Suspected neck injury
14-D-5	Diving or SCUBA accident
15	ELECTROCUTION
15-C-1	Alert and breathing normally
15-D-1	Unconscious
15-D-2	Not disconnected from power
15-D-3	Power not off / hazard present
15-D-4	Not alert
15-D-5	Abnormal breathing
15-D-6	Long fall (six feet or more)
15-D-7	Unknown status (3rd party caller)
16	EYE INJURIES
16-A-1	Moderate eye injuries
16-A-2	Minor eye injuries
16-B-1	Severe eye injuries
16-D-1	Not alert
17	FALLS
17-A-1	Not dangerous injuries
17-A-2	Non-recent injuries (six hours or more)
17-B-1	Possibly dangerous injuries
17-B-2	Serious hemorrhage
17-B-3	Unknown injuries (3rd party caller)
17-D-1	Dangerous injuries
17-D-2	Long fall (six feet or more)
17-D-3	Not alert
17-D-4	Abnormal breathing
18	HEADACHE
18-A-1	Headache only (without priority symptoms)
18-C-1	Not alert
18-C-2	Numbness or paralysis
18-C-3	Speech or movement problems
18-C-4	Sudden onset of severe pain
18-C-5	Recent head injury (24 hours or less)
19	HEART PROBLEMS
19-A-1	Heart rate less than 130 (without priority symptoms)
19-B-1	Unknown symptoms (3rd party caller)
19-C-1	Not alert
19-C-2	Cardiac history
19-C-3	Heart rate 130 or greater (without priority symptoms)
19-C-4	Cocaine
19-D-1	Firing of implanted defibrillator
20	HEAT / COLD EXPOSURE
20-A-1	Alert (without priority symptoms)
20-B-1	Change in skin color
20-B-2	Unknown symptoms (3rd party caller)
20-C-1	Cardiac history
20-D-1	Not alert
21	HEMORRHAGE / LACERATIONS
21-A-1	Not dangerous hemorrhage
21-B-1	Possibly dangerous hemorrhage
21-D-1	Dangerous hemorrhage
21-D-2	Not alert
21-D-3	Severe respiratory distress
22	INDUSTRIAL / MACHINERY ACCIDENTS
22-B-1	Unknown illness or injuries (not caught in machinery)
22-D-1	Multiple victims
22-D-2	Trapped or caught in machinery (unknown injuries)
22-D-3	Life status questionable
23	OVERDOSE / INGESTION / POISONING
23-B-1	Conscious and alert (age less than 1 or 12 or older)
23-C-1	Not alert
23-C-2	Abnormal breathing
23-C-3	Antidepressants
23-C-4	Cocaine
23-C-5	Acid or lye
23-C-6	Violent
23-D-1	Unconscious
23-D-2	Severe respiratory distress
24	PREGNANCY / CHILDBIRTH / MISCARRIAGE
24-A-1	1st trimester bleeding or miscarriage
24-A-2	Illness during pregnancy (without priority symptoms)
24-B-1	Labor (delivery not imminent -- 2nd and 3rd trimester)
24-B-2	Unknown pregnancy problem (3rd party caller)
24-C-1	2nd trimester bleeding or miscarriage
24-D-1	Baby born
24-D-2	Baby's head visible (crowning)
24-D-3	Imminent delivery (3rd trimester)
24-D-5	Breech presentation
25	PSYCHIATRIC / SUICIDE ATTEMPT
25-A-1	Non-violent and non-suicidal
25-B-1	Unknown symptoms (3rd party caller)
25-C-1	Not alert
25-C-2	Violent
25-C-3	Suicidal (threatening)
25-D-1	Hanging, strangulation, or suffocation
26	SICK PERSON
26-A-1	No priority symptoms
26-B-1	Unknown symptoms (3rd party caller)
26-C-1	Not alert
26-C-2	Cardiac history
27	STAB / GUNSHOT WOUND
27-A-1	Non-recent single peripheral wound (six hours or more)
27-B-1	Known single peripheral wound
27-B-2	Non-recent single central wound (six hours or more)
27-B-3	Unknown situation (3rd party caller)
27-D-1	Central wounds
27-D-2	Multiple victims
27-D-3	Not alert
27-D-4	Multiple wounds
28	STROKE (CEREBROVASULAR ACCIDENT)
28-A-1	Alert and breathing normally
28-B-1	Unknown symptoms (3rd party caller)
28-C-1	Not alert
28-C-2	Abnormal breathing
29	TRAFFIC ACCIDENT
29-A-1	1st party caller with not dangerous injuries
29-B-1	Injuries
29-B-2	Unknown situation (3rd party caller)
29-D-1	Multiple victims
29-D-2	Auto versus pedestrian / motorcycle / bike
29-D-3	Hazardous materials
29-D-4	Trapped victim
29-D-5	Ejected victim
29-D-6	Not alert
29-D-7	Severe respiratory distress
30	TRAUMATIC INJURIES
30-A-1	Not dangerous injuries
30-A-2	Non-recent injuries (six hours or more)
30-B-1	Possibly dangerous injuries
30-B-2	Serious hemorrhage
30-D-1	Dangerous injuries
30-D-2	Severe respiratory distress
30-D-3	Not alert
31	UNCONSCIOUS / FAINTING
31-A-1	Single fainting episode and alert (age less than 35)
31-A-2	Near fainting episode and alert (age less than 35)
31-C-1	Single or near fainting episode and alert (age 35 or older)
31-C-2	Multiple fainting episodes
31-C-3	Females with abdominal pain (age 12 through 50)
31-C-4	Conscious with abnormal breathing
31-C-5	Cardiac history
31-D-1	Unconscious (at end of interrogation)
31-D-2	Severe respiratory distress
31-D-3	Not alert
32	UNKNOWN PROBLEM (MAN DOWN)
32-B-1	Standing, sitting up, moving or talking
32-B-2	Medical alert notifications
32-B-3	Unknown situation (3rd party caller)
32-D-1	Life status questionable
33	TRANSFER
33-A-1	No priority symptoms
33-C-1	Not alert (acute change)
33-C-2	Abnormal breathing
33-C-3	Significant hemorrhage or shock
33-C-4	Possible acute heart problems or MI
33-C-5	Acute severe pain
33-C-6	Emergency response requested
33-D-1	Suspected cardiac or respiratory arrest

Despite the effort at standardization, some agencies have customized the system for their own needs by modifying the meaning of the second number for certain codes. This is generally not a problem, as long as the dispatchers and responders work under the same public safety agency. In practice, you'll often hear paramedics calling dispatch for further details about the patient to clarify or enhance the information they received from the code.

Interestingly, the use of codes has been discouraged over the past few years in favor of plain English, in order to make interoperability easier. The concern is that when two different agencies are accustomed to always using their own codes, if they ever have to work together on a major incident or emergency, personnel from one agency would be unfamiliar with codes used by the other agency and confusion would ensue.

Since 2006, the Federal Emergency Management Agency (FEMA) has required plain English be used for multi-agency, multi-jurisdiction and multi-discipline events, like major disasters, in order to qualify for federal preparedness grant funding. This has led to a "speak plainly" campaign in some larger cities (Dallas, for example) for police and firefighters to minimize the use of 10-codes and other departmental shorthand. An increase in the use of understandable phrases rather than cryptic codes can only help scanner listeners to understand the activity taking place around them.

That's all for this month. More information is available on my web site at **www.signalharbor.com**, including detailed scanner information and brevity codes. Please send your questions, comments and frequency lists to me at *danveeneman@monitoringtimes.com* . Until next time, enjoy the holiday and happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *Is Armed Forces Radio still heard via shortwave USB broadcasts? If so, are these feeders to distant points intended for rebroadcast rather than direct reception? (J.J. Owens, NC)*

A. Now known as American Forces Radio and Television Service (AFRTS), they are still heard on their USB feeders – I'm presently listening to a transmission on 7811 kHz. These are actually links for the elaborate American Forces Network (AFN) which distributes its programming to cable, satellite, TV, and FM radio to commands around the world. When received by their intended targets, these feeds are retransmitted at low power levels from Navy ships and ground stations for local reception by American troops. Check with the Shortwave Guide right here in *MT* for currently-active frequencies and schedules.

Q. *Weak-signal operators use horizontal beams to take advantage of something called "ground gain." What is this? (Robert, KB7AQD, Phoenix, AZ)*

A. By tilting a horizontally-polarized, tower-mounted beam antenna slightly downward at the correct angle(s), a ground-reflected signal may combine in phase with the direct wave (space wave) to create an increase in signal strength, sometimes as high as 5-6 dB under ideal, flat-ground conditions.

Q. *Sometimes, while listening to shortwave broadcasters in the evening or early morning, the signals flutter up and down very rapidly. What causes this? (email)*

A. Such flutter, called "rapid QSB" by hams, is an ionospheric instability, most likely caused by solar radiation either just starting to hit, or just finishing the daytime/nighttime region that you are listening to. The instability in that reflective part of our upper atmosphere results in variations in the path of the returning signal.

Q. *I hear a continuous siren transmission on one part of the shortwave spectrum. What would this be? (Ted via email)*

A. If you are listening to an international broadcasting band, it's very likely a deliberate jammer. Political rivals do this to prevent their own citizens from hearing propaganda from other countries. (It might get them to think for themselves, and you know how bad that would be!)

Q. *While tuning through shortwave, I came across a signal that just slowly sent different-pitched tones in succession. It reminded me of a Nintendo video game. What could it be?*

A. Most likely a diplomatic transmission using an encoded technique called "Piccolo," whereby coded letters or numbers are transmitted as specific tones.

Q. *What the heck is "P-25?" I've learned that our local police department is going to those radios (Dave via email)*

A. That's the new digital voice standard that's spreading nationwide in law enforcement communications. A test program was started years ago by the Associated Police Communications Officers (APCO), now calling themselves the Association of Public-Safety Communications Officials. The particular standard they finally adopted was called P(Project)-25. The P-25 system does have higher digital levels that are encrypted, thus excluding scanner monitoring, but they are rarely selected during routine communications.

Q. *Decades ago, police transmissions to patrol cars could be heard just above the AM broadcast band. When did they cease? (J.J. Owens, NC)*

A. I used to listen to these in the 1600-1700 kHz range until they disappeared by the early 1950s.

Q. *The roof of our clubhouse is metallic; could that be why our cell phones don't work well in there? I thought that cell phone signals were FM and not subject to that sort of degradation. (MB, Terre Haute, IN)*

A. Since FM analog cell phones no longer exist, it's more likely the fact that digitized voice is a little trickier to receive. If all of the digits aren't delivered properly, the voice on cell phones (or picture on digital TV) will break up or be discontinued. That's why folks watching new digital television complain that they don't get quite the distance they used to in the old analog days.
It is possible that the metal roof has something to do with it, but it would be even worse if the walls were metal, too!

Q. *I have an outdoor antenna connected to my portable multiband radio by TV-style coax which should be well shielded, but when I run the coax near a fluorescent light fixture, even with the outdoor antenna disconnected, the electrical noise from the light is picked up. How can this be? (James via email)*

A. A properly shielded system requires that not only the center conductor of the cable is shielded by the braid or foil, but that the receiver components are shielded as well. It also assumes that the coax cable is terminated by a suitable load.

When the far end of the cable is simply open (unterminated), and the receiver itself is in a non-shielded plastic box, the entire length from the far end of the cable, through the radio, and on down the power cord, becomes one giant antenna, vulnerable to intrusion by conducted electrical noise.

Another very real possibility is line-conducted noise coming in through the power cord. You can verify this by unplugging the radio from AC and running it with batteries.

And one final thought: Don't run the coax near the fluorescent light!

Q. *A friend of mine has a flashlight that recharges itself by shaking it. What's inside to make it work? (Mark Burns, Terre Haute, IN)*

A. The plastic barrel of the flashlight is internally wound with a coil of wire. When the flashlight is shaken, a strong magnet slides back and forth, inducing current into the coil. That current is used to charge a battery. Essentially, the flashlight is a crude magneto form of generator like the old crank-telephone ringers.

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

UTILITY WORLD

HF COMMUNICATIONS

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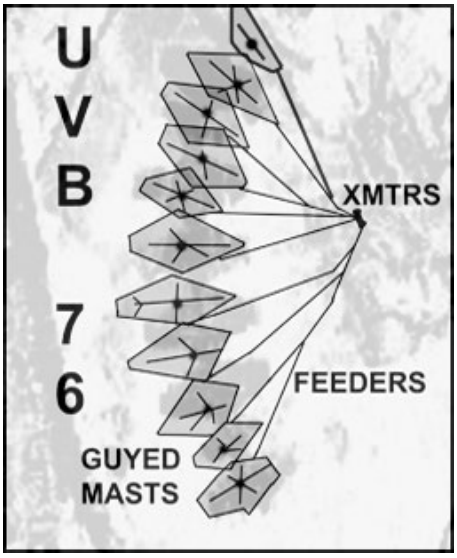
UVB-76: Is the "Dead Hand" Station Dead?

Nothing gets the Internet rumors flying faster than a scary conspiracy theory. It's fitting, therefore, that the biggest buzz in the summer of 2010 came from a short wave radio station long known to utility fans as "The Buzzer."

The Buzzer's call sign may or may not be UVB-76. These figures, or something sounding like them, have begun all of its confirmed voice messages – all three of them. Nothing is ever for sure with this station, and extreme skepticism is strongly advised. A sense of humor is also desirable. So put on your tinfoil brain-protection hat, and let's go.

For a start, most of the buzzer buzz comes from what's almost certainly an urban legend. As the story goes, UVB-76's continuous carrier is an all's-well signal for a Soviet-era "fail-deadly" doomsday machine given names such as "Dead Hand" or "Perimeter." Any interruption would quickly bring global thermonuclear war.



UVB-76 might conceivably be part of the Russian defense, but everything after that, however, is never-never land. It is not known for sure whether the USSR ever actually built "Dead Hand." Some Cold War historians have argued for its existence, saying that it was designed to enable massive retaliation after a first strike vaporized the chain of command. It's even less clear where radio fit into all this, or if it did at all.

Even so, the speculation has made UVB-76 go viral on the Internet. It has its own Facebook fan page, with 1500 members, at **www.facebook.com/pages/UVB-76/258065513772**. A receiver 900 kilometers away is streamed, continuously, at **uvb-76.blogspot.com/.** Wikipedia has a long article at **en.wikipedia.org/wiki/UVB-76.** "Adult Swim," a US TV program, has done jokes about it.

The Station

The name "Buzzer" comes from its weird channel marker. For most of its 28-year existence, it has run pretty much continuously. The frequency is usually 4625 kilohertz (kHz), though occasional parallels have been heard on 3842 and 3877. It's a very distinctive, electronic-sounding "baaaaap." Each burst lasts just under a second, with 25 bursts per minute.

The transmission mode sounds like amplitude modulation (AM), but it has a greatly suppressed lower sideband. Therefore, a more accurate description is upper sideband, full carrier. The international designation for this type of emission is H3E.

Originally, ENIGMA (the European Numbers Information Gathering and Monitoring Association) designated it XB, for Buzzer Oddity. This was changed to S28, meaning the 28th Slavic language station on their list, following discovery of the rare voice transmissions.

The first voice message was heard on Christmas Eve of 1997. In a format that persists to this day, the marker stopped for the UVB-76 callup, followed by a tactical call or code word spelled in a variation of Russian radio phonetics. Number groups were also present. Similarly formatted messages were heard on December 9, 2002, and February 21, 2006.

UVB-76's transmitter location is usually said to be in a wooded area northwest of Moscow, between the villages of Povarovo and Lozhki. Google Earth coordinates are 56.08278 North by 37.08944 East.

Even the Google Earth image gets the conspiracy people going, because the current picture (from 2009) puts a very dark cloud shadow right over the transmitter building in what's obviously a massive antenna farm. It's easy to assume censorship. However, it's just another dark, cloudy, Moscow day. The whole area is gloomier than an old Russian novel. Fortunately, Google Earth now comes with a history button for showing previous images. Use it.

What's it all REALLY about? Well, along with the "Dead Hand" conjecture, several other theories have been put forth for UVB-76:

1. An ionospheric sounder run by the Borok Geophysical Observatory. A Russian web site describes a Doppler system operating on 4625 kHz.
2. A backup command-control voice net, tested every four years, for broadcasting emergency strategic codes. This theoretically includes other strange, Russian markers such as The Pip and The Squeaky Wheel.
3. A last-resort Civil Defense alerting system for the greater Moscow area.
4. Sensitive communications related to activities in the Barents Sea.
5. A diversion to keep radio amateurs (that's us) occupied and away from the real radio stations. This was proposed by someone on the BBC. Is this a joke?

The Buzz

Tinfoil hats went on worldwide in 2010, when The Buzzer got strange. In April, our own Ary Boender discovered that it had suddenly developed spurious emissions that drifted and changed frequency. At least 13 frequencies were logged, sometimes 10 at a time.

In early June, XB/S38 briefly stopped transmitting altogether. This greatly alarmed proponents of the fail-deadly theory. However, the station and the human race both survived. Since the spurs largely stopped, this could have been transmitter maintenance.

On August 23, the following voice message was sent, in Russian: "UVB-76, UVB-76. 93, 882, Naimina. 74, 14, 35, 74. 9, 3, 8, 8, 2. Nikolai, Anna, Ivan, Mikhail, Ivan, Nikolai, Anna. 7, 4, 1, 4, 3, 5, 7, 4.

As listeners waited anxiously for something further to happen, it did. Around zero Zulu on the first of September, The Buzzer again ceased transmitting, except for an intermittent, weak carrier.

Once again, the human race survived. The precise timing of the cutoff greatly suggests either additional transmitter maintenance, or the initial phase of a shut-down. Only time will tell.

As word spread over the Internet, the 4625 kHz pirate weirdness set in. This included music from "Swan Lake," Russian test counts, sick-sounding buzzer noises, fake off-mike chatter, and even a rebroadcast of Israeli "numbers" messages.

CW (continuous-wave) Morse code signals appeared in bunches. One greeted Ary Boender by name. Another mentioned a known numbers list user in conjunction with a famous four-letter "F" word.

Discussion is ongoing whether real Russian military stations have used the frequency. Regular CW character strings 3 kHz off frequency might be one of those weird, automated air defense stations. "RJP99" might be Russian Navy hydrographic codes using military proce-

dure. Or, it might just as easily be some joker retransmitting the text of an earlier genuine intercept.

As we go to press, the mystery continues. Currently, a 560-Hertz tone jumps erratically to around 570 Hz exactly once per minute, then drifts slowly back down.

While the buzz remains silent, the Internet doesn't. Various lurid conspiracy "revelations" proclaim the impending New World Order. Whether or not The Buzzer is dead, we haven't heard the end of good old UVB-76.

❖ Unraveling the "German Coast Guard"

Many listeners have been confused by published reception reports of Germany's relatively new "Coast Guard" radio system. This uses Automatic Link Establishment (ALE), with follow-on communication in what might be a Rohde & Schwarz data or secure-voice modem.

It's confusing because Germany does not technically have a single, unitary Coast Guard service. It's really a collection of independent, civilian, Federal agencies. Their large, impressive vessels do have *Küstenwache* (Coast Guard) on their hulls. But look higher up, and there's usually another prominent sign identifying who they really are.

A couple of years ago, much of what we hear on the radio started coming out of a joint center in Cuxhaven, near Hamburg on the North Sea. One user is the Offshore Security division of the Federal Police (*Bundespolizei*). Its ALE calls usually begin with BP. If a number follows, it's a vessel.

The police net control station identifies as BPLEZS (*Bundespolizei Lage & Einsatzzentrum, See*). This translates as Federal Police Location and Operations Center, Marine. Another frequently heard call is LEZSEE, essentially a different abbreviation for the same name.

This police net is also used by the Water Security Police (*Wasserschutzpolizei*) of Lower Saxony. Its vessels usually have ALE addresses beginning in "W," though some exceptions have been heard.

Another active net uses ALE calls beginning in "Z." This stands for *Zoll*, or Customs. The control station is ZLST, *Zoll-Leitstelle*, or Customs Control Center, at the Cuxhaven facility. Other 4-letter calls are Customs vessels (*Zollboots*).

The Customs net is also used by Fishery Protection Vessels (*Fischereischutzboots*, or FSBs). There are three of these, but only the FSB *Seeadler* has been heard so far. Its ALE call is BSEA. The others are BMEK, the *Meerkatze*; and BSFA, the *Seefalke*.

The following upper-sideband (USB) ALE frequencies (in kHz) have been discovered for the police net: 1904, 2070, 2142.5, 2151.5, 2219, 2505, 2559, 2673, 2767.5, 3200, 3831, 3850, 4537.5, 4618, 5022, 5208, 5258, 5803, 6890, 7597, and 8132.

The following USB ALE frequencies (in kHz) have been discovered for Customs: 2142.5, 2322, 2673, 3595, 3831, 4553.5, and 4618.

Here's a list of monitored ALE addresses with associated stations. Until next month, fair winds and following seas.

Federal Police:	
BPLEZS	Net Control, Cuxhaven
LEZSEE	Net Control?, Cuxhaven
BP21	Police Boat (BP) Bredstedt
BP22	BP Neustrelitz
BP23	BP Duben
BP24	BP Bad Bramstedt
BP25	BP Bayreuth
BP26	BP Eschwege

Customs:	
ZLST	Control Center, Cuxhaven
ZBOR	ZB Borkum
ZEMD	ZB Emden
ZHEL	ZB Helgoland
ZHID	ZB Hiddensee
ZHOH	ZB Hohwacht
ZKNI	ZB Kniepsand
ZPRI	ZB Priwall
ZRUE	ZB Rügen
ZSHO	ZB Schleswig-Holstein

ABBREVIATIONS USED IN THIS COLUMN

ALE ..... Automatic Link Establishment
AM..... Amplitude Modulation
ARQ..... Automatic Repeat reQuest
AWACS ..... Airborne Warning and Control System
COTHEN..... US Customs Over-The-Horizon Enforcement Network
CROSS..... French acronym for Regional Surveillance & Rescue Center
CW..... On-off keyed "Continuous Wave" Morse telegraphy
DHFCS..... UK Defence High Frequency Communications Service
DSC..... Digital Selective Calling
E10..... Israeli female phonetic voice, 5-letter groups
EAM..... Emergency Action Message
FAX..... Radiofacsimile
G11..... German version of "Strich" family
HFDL ..... High-Frequency Data Link
HF-GCS ..... High-Frequency Global Communication System
LDOC ..... Long-Distance Operational Control
LSB ..... Lower Sideband
M51..... French Morse code training net, 5-letter groups
M89..... Chinese military 4-figure changing CW calls
MARS..... US Military Auxiliary Radio System
Meteo ..... Meteorological Office
MFA..... Ministry of Foreign Affairs
MX..... Generic for Russian single-letter CW beacons/markers
NAT ..... North Atlantic air route control, families A-F
PR..... Puerto Rico
RTTY ..... Radio Teletype
Selcal..... Selective Calling
SITOR..... Simplex Telex Over Radio, modes A & B
UK..... United Kingdom
Unid ..... Unidentified
US ..... United States
USAF..... US Air Force
USCG ..... US Coast Guard
V13..... New Star, music and female w/ Chinese numbers
VHF ..... Very High Frequency (30-300 MHz).
VOLMET..... Aviation weather broadcasts ("Flying Weather").

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

518.0 FRC-CROSS Corsen, France, two NAVTEX (Navigational Telex) bulletins in SITOR-B, at 1603 (MPJ-UK).
2187.5 LYRR-Lithuanian flag vessel Serenada, DSC safety test with Piraeus, Greece via SVO, Olympia Radio, at 1948 (MPJ-UK).
2680.0 IDC-Cagliari Radio, Italy, weather in Italian, at 2100 (MPJ-UK).
2872.0 Gander Radio-NAT-C, Canada, position from Alitalia 63V, at 0510 (Allan Stern-FL).
3297.0 Q7NW-Chinese military automated messages (M89), calling GKVZ, CW at 1210 (Ary Boender-Hong Kong). [Via Global Tuners Hong Kong receiver. -Hugh]
3327.0 WOXN-M89, calling QPZM, parallel 5310, CW at 1721 (Boender-Hong Kong).
3357.0 UWM2-M89, calling ZKT5, parallel 4532, CW at 1747 (Boender-Hong Kong).
3455.0 Corsair 943-Corse Air, cleared by New York Radio to LFPO (Orly Airport, Paris France), at 0444 (Stern-FL).
3641.0 3A7D-M89, calling DKG6, CW at 1732 (Boender-Hong Kong).
4225.0 QV5B-M89, calling 7NPE, parallel 5500, CW at 1206 (Boender-Hong Kong).
4718.5 HBM46-Swiss Army, SITOR-B "Voyez le brick" test loop, parallel 5038.5, at 0932 (ALF-Germany).
4860.0 NYZ-M89, calling Q2M, parallel 6840, CW at 1323 (Boender-Netherlands).
5135.0 SEMOHQ-NY State Emergency Management Headquarters, Albany, ALE sounding at 1000 (Eddy Waters-Australia).
5147.7 DRFN-German Navy Minesweeper Ensdorf, orderwire with DHJ58, Wilhelmshaven, at 0815 (ALF-Germany).
5153.7 "D"-Russian Navy single-letter CW cluster beacon (MX), Odessa/Sevastopol, also on 10871.7 and 13527.7, at 2153 (MPJ-UK).
5153.8 "P"-MX, Kaliningrad, also on 7038.8, CW at 2153 (MPJ-UK).
5153.9 "S"-MX, Severomorsk, also on 7038.9 and 10871.9, CW at 2047 (MPJ-UK).
5258.6 OK1IF-Czech 60-meter amateur experimental beacon, CW identifier and information at 1238 (ALF-Germany).
5268.5 XPZ-Unknown UK DHFCS, ALE and modem traffic with XSS, control at Forest Moor, at 2206 (MPJ-UK).
5286.0 TZSC2-Spanish Guardia Civil, Cadiz, working TWBA1, Barcelona, also 5352 and 5379, ALE at 2214 (MPJ-UK).
5334.0 035-Hungarian Army, working 082, ALE at 2219 (MPJ-UK).
5399.5 AEM1SLC-US Army MARS bulletin board system, Germany, identifying in Pactor-I at 0853 (ALF-Germany).
5403.0 Fritzlar-Unknown German government or military, working Lauterbach in German, at 1034 (ALF-Germany).
5456.0 RGR35-Russian Navy, working RMP in CW, at 0503 (PPA-Netherlands).
5517.0 Mogadishu-African air control, Somalia, working El Al 081, at 2345 (ALF-Germany).

5526.0 VDA 1642-Volga-Dnepr Airlines, position for Cayenne (French Guiana), at 0107 (ALF-Germany).
5532.0 Praha Radio-Czech Airlines company LDOC, Prague, working OK-XGB, a B737, in Czech at 2033 (ALF-Germany).
5534.0 RJI57-Russian Navy, calling RJCC66, CW at 2020 (MPJ-UK).
5583.0 05-HFDL ground station, Auckland, New Zealand, uplinks and squitters at 1105 (Waters-Australia).
5598.0 Cargolux 860-Cargolux Airlines B747 freighter, getting oceanic entry clearance from New York, at 0150 (ALF-Germany).
5616.0 Avalon 34-USAF transport, working unknown ground station at 0615 (Patrice Privat-France).
5649.0 Shanwick Radio-NAT-C, Shannon, Ireland, position from Condor 197 (Condor Flugdienst), at 0544 (Stern-FL).
5680.0 Rescue 193-UK Sea King helo, working Kinloss Rescue, Scotland, at 0948 (MPJ-UK).
5682.0 YA6X-M89, calling MB3R, CW at 1803 (MPJ-UK).
5774.5 FAV22-French CW training (M51), numbered drill messages, also on 6956, at 2136 (MPJ-UK).
5815.0 Unid-"Strich" family numbers in German (G11), callup V70/00, no message, "Ende" at 1207 (ALF-Germany).
6224.0 ZLM-Taupo Maritime, New Zealand, weather forecast at 1347 (Waters-Australia).
6391.0 AQP4-Karachi Wireless, Pakistan, CW marker at 1937 (MPJ-UK).
6586.0 Air Canada 091-Boeing 767 registration C-FCAB, answered selcal EJ-CM from New York, at 0630 (Privat-France). New York, handing Continental 1878 to San Juan (PR) on VHF, at 0709 (Stern-FL).
6622.0 Connie 625-Kalitta Air B747 freighter, registration N746CK, position for Gander at 0237 (ALF-Germany).
6691.0 XSS-UK DHFCS control, Forest Moor, ALE sounding at 2122 (MPJ-UK).
6696.5 HBM46-Swiss military, "Voyez le brick" test loop in SITOR-B, at 1243 (MPJ-UK).
6730.0 DHJ78-German Naval Air, Nordholz Air Base, position from "5-K-0," for relay to "B-0-Q," at 1025 (ALF-Germany).
6767.0 MSAE-Russian military, CW traffic for IYC3 and YWJ3, at 1911(MPJ-UK).
6814.9 SV1TEST-Greek pirate beacon, CW identifier at 0227 (ALF-Germany).
6851.7 PRV-Unknown pirate beacon, CW identifier at 0226 (ALF-Germany). PRV, CW identifier every 10 seconds, at 2237 (MPJ-UK).
7039.0 "C"-MX, Moscow, also on 10872 and 13528, CW at 2047 (MPJ-UK).
7039.2 "F"-Russian Navy single-letter CW cluster beacon (MX), Vladivostok, also on 13528.2, 16332.2, and 20048.2; at 1753 (Boender-Hong Kong).
7039.3 "K"- MX, Petropavlovsk, CW, also on 8495.3 and 16332.3, at 1753 (Boender-Hong Kong).
7039.4 "M"-MX, Magadan, also 8495.4, 13528.4, 16332.4, and 20048.4; CW at 1753 (Boender-Hong Kong).
7602.0 3A7D-M89, calling DKG6, CW at 1938 (PPA-Netherlands).
7637.0 Unid-Unknown military net using trigraph call signs, at 0556 (Mike-West Sussex, UK).
7758.0 Unid-Egyptian MFA, Cairo, ARQ selcal to TVVX (Algiers, Algeria), at 2027 (ALF-Germany).
7906.0 XVS-Ho Chi Minh Ville Radio, Viet Nam, weather warnings at 1705 (PPA-Netherlands).
7978.0 WIE028-Polish Army, working POL027, ALE at 1659 and 1701 (MPJ-UK).
7993.5 141001-Unknown Turkish emergency station, calling 106001, ALE at 2050 (PPA-Netherlands).
8022.0 SSE-Egyptian MFA, Cairo, ARQ selcal to TVVK (Rabat, Morocco), at 2041 (ALF-Germany).
8084.0 HLG-Seoul Radio, Korea, CW marker at 1913 (MPJ-UK).
8086.0 CNC-Algerian Air Force, calling CM3 in ALE, at 2020 (PPA-Netherlands).
8225.0 5JL1-Venezuelan Navy Frigate Mariscal Sucre, text message to T5L1, Naval Base Agustín Armario, LSB ALE at 2250 (ALF-Germany).
8333.0 T54W-Venezuelan Navy, text message to 8DV7, LSB ALE at 0039 (ALF-Germany).
8414.5 HO3278-Panamanian flag tug Botany, DSC safety test with Lyngby Radio, Denmark, at 1209 (Michel Lacroix-France).
8431.0 TAH-Istanbul Radio, Turkey, SITOR-B weather at 2009 (Lacroix-France).
8776.0 SVO-Olympia Radio, Greece, maritime information in Greek, at 1957 (Lacroix-France).
8788.0 Unid-Russian Navy, possible hydrographic data in CW 5-figure groups, at 2110 (MPJ-UK).
8810.5 LBJ-Royal Norwegian Navy, Reitan, orderwire with unknown trigraph station, at 2015 (ALF-Germany).
8864.0 Gander-NAT-B, Canada, selcal AG-JQ and position from bizjet N404VL, a Bombardier BD-700-1A10, at 1723 (MDMonitor-MD).
8879.0 Express India 811-Air India Express B737 registration VT-AX, position and selcal P BH-CE for Mumbai, at 1702 (ALF-Germany).
8888.0 Novosibirsk Volmet, formatted aviation weather in Russian, at 1344 (Waters-Australia). Syktyvkar Volmet, weather in Russian for Arkhangelsk, Chatanga, and Surgut, at 1901 (Lacroix-France).
8906.0 Air Canada 837-B767 registration C-GHLT, cleared into oceanic route by Shanwick (NAT-A), at 1214 (ALF-Germany).
8912.0 D07-US Customs Bombardier Q400, registration N807MR, calling EST (COTHEN Eastern Node) and OPB (US Drug Enforcement Agency, Bahamas), then voice as Omaha 7MR with Panther, at 0105 (ALF-Germany).
8918.0 New York-Caribbean air route control, selcal HM-DR and position from Westjet 2527, B737 registration C-GUWJ, at 2202 (Stern-FL). New York, position from Glacial Energy bizjet N509GE, a Bombardier Challenger 604, at 2240 (MDMonitor-MD).
8930.0 Kestrel 787K-Thomas Cook Airlines, working Stockholm LDOC, at 1302 (ALF-Germany).
8971.0 Fiddle-USN, FL, clear and secure voice checks with Fighting Tiger, a P-3C, at 1950 (MDMonitor-MD).
8992.0 Sigonella-USAF HF-GCS, Italy, patch for Reach 637 at 2013 (PPA-Netherlands).
9022.0 200201-UK Royal Air Force C-17, calling XSS, DHFCS control, at 2218 (PPA-Netherlands).
9025.0 170038-USAF C-5B number 87-0038, ALE sounding at 2048 (PPA-Netherlands).
9031.0 Snapshot 01-UK Royal Air Force, possible Sentinel R1, working Tascomm (Tactical Air-Sea Communication), Forest Moor, at 0937 (ALF-Germany).
9130.0 EZI-Israeli Phonetic Alphabet Station (E10), callup and message at 2032 (PPA-Netherlands).
9179.4 Unid-North Korean MFA, Pyongyang, encrypted text in 600/600 ARQ, also on 12534.4, 14373.4, 16006.4, and 16348.4, at 1134 (PPA-Netherlands).
9200.0 FREDGAS-Washington Gas Light Company (WGL), Frederick, MD, LSB ALE sounding at 0032 (ALF-Germany).
10024.0 Mexico Radio-Unknown aeronautical station, working another ground station in Spanish, at 2155 (MDMonitor-MD).
10066.0 "06"-HFDL ground station, Hat Yai, Thailand, uplink to RPC8611, Philippine Airlines, at 1803 (PPA-Netherlands).
10087.0 "14"-HFDL ground station, Krasnoyarsk, Russia, uplink to PK-GPJ, a Garuda Indonesia A330, at 1742 (PPA-Netherlands). B-6122-China Eastern Airlines A330, flight CES219, HFDL position for Krasnoyarsk, at 1913 (MPJ-UK).
10096.0 Piarco-Caribbean air route control, position from Air France 3507, a B777 enroute to Orly, at 2210 (MDMonitor-MD).
10475.0 RQS-Russian military, Samara, encrypted RTTY message, then listening, at 0700 (PPA-Netherlands).
10522.0 "New Star Radio Station"-Chinese numbers (V13), Taiwan, in progress at 1228 (Boender-Hong Kong).
10704.7 RBY72-Russian military, Yekaterinburg, slow reversals before scheduled 0600 RTTY transmission, at 0556 (PPA-Netherlands).
10722.0 Unid-Unknown Iranian station, Farsi voice coordination before modem traffic, at 1830 (PPA-Netherlands).
11090.0 KVM70-US Department of Defense, Honolulu, weak FAX weather chart at 0747 (Lacroix-France).
11175.0 Lajes-USAF HF-GCS, Lajes Field, Azores, checking several radios with Ash Cake, then went to 6739 where nothing was heard, at 2323 (MDMonitor-MD).
11226.0 ICZ-USAF, Sigonella, Italy, ALE sounding at 1756 (MPJ-UK).
11232.0 Canforce 4036-Canadian Forces CC-177, working unknown base at 1930 (Privat-France). Sentry 61-USAF E-3B AWACS, calling Trenton Military with no joy, at 2027 (MDMonitor-MD).
11256.5 Holloway-Ethiopian Airlines LDOC, working unknown flight at 1957 (Lacroix-France).
11300.0 New York, approving higher altitude for TSO554, Transaero Airlines (Russia), at 2020 (Stern-FL). Kenya 117-Kenya Airways, working Tripoli air control, Lebanon, at 2155 (Lacroix-France).
11345.0 Swiss 967-Swiss International Airlines, working Stockholm company LDOC, at 0801 (Lacroix-France).
12337.0 REA4-Russian Navy, RTTY idler (50/580), at 0906 (Waters-Australia).
12464.0 RHQ33-Russian Navy, calling RIW in CW, at 1934 (PPA-Netherlands).
12577.0 GBQV-Cunard/ Carnival cruise ship Queen Victoria, DSC safety test with Bilbao, Spain, at 0958 (MPJ-UK). 006010001-Cape Town Radio, South Africa, DSC call to 235216000, UK flag bulk carrier Britannia (ZNGS5), at 1745. 003160023-Canadian Coast Guard, Iqaluit, DSC safety test at 2017 (PPA-Netherlands).
12585.0 NRV-USCG, Guam, CW identifier in SITOR-A sync marker, at 1657 (Lacroix-France).
12586.0 UDK-Murmansk Radio, Russia, SITOR-A Autotelex message to UBAW, vessel Admiral Shabalin, duplex on 12483.5, at 1307 (MPJ-UK).
12593.0 TOFX-Russian military, calling LCZ9 in CW, then working DF4H with traffic, at 1304 (MPJ-UK).
12637.5 XSG-Shanghai Radio, China, CW in SITOR-A marker at 1742 (Lacroix-France).
13312.0 "02"-HFDL ground station, Molokai, HI, uplink to N450PA (Polar Air Cargo B747 freighter), and B-6592 (Shanghai Airlines A321), at 0633 (PPA-Netherlands).
13330.0 Kenya-Kenya Airways LDOC, Nairobi, selcal GH-PS to B737 registration 5Y-KYD, no joy at 1922 (PPA-Netherlands).
13527.8 "P"-MX, Kaliningrad, CW at 0615 (Boender-Netherlands).
13528.1 "A"-MX. Astrakhan, also 16332.1, CW at 0615 (Boender-Netherlands).
13927.0 AFA5RS-USAF MARS, IN, patch to homeplate for Bone 13, a B-1, at 2024 (Stern-FL).
14325.0 W9FX-Hurricane Watch Net control, taking Earl observations from New England amateurs, gave secondary frequency as 7181, at 2235 (Hugh Stegman-CA).
16128.5 Unid-North Korean MFA, Pyongyang, encrypted text in 600/600 ARQ, also on 16246.5, 16318.5, 16448.5, and 19241.5; at 0905 (Waters-Australia).
17000.5 Australian Defence Force, Riverina, New South Wales, encrypted text in 600/600 RTTY, at 0815 (Waters-Australia).
17146.4 Playa Ancha Radio-Chilean Navy, weak FAX Antarctic ice chart, at 2229 (Stegman-CA).
17405.0 Khabarovsk Meteo-Russian coastal station, SITOR-B weather in Russian, at 0734 (Waters-Australia).
17434.7 Unid-Egyptian MFA, Cairo, selcalling KKVZ (Uganda) and KKZU (Zimbabwe) for messages in SITOR-B, also on 18331.7 and 18451.7, at 0810 (Waters-Australia).
18328.0 RIW-Russian Navy, Moscow, CW message for RMXV, at 0818 (Waters-Australia).
18594.0 719-USCG HC-130, ALE sounding on COTHEN, at 0335 (Waters-Australia).
22225.5 668-Unknown station calling 808 for one hour, ALE at 0250 (Waters-Australia).

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Digital Beginners with SITOR

Back in the June 2010 issue of this column, we followed a reader's suggestion and explained how to begin copying simple RTTY digital signals using some inexpensive, soundcard-based decoder programs.

In this column, we're going to be using that basic setup to decode some slightly more complex modes, namely SITOR-A and SITOR-B. These are still widely used on HF and will provide some fun for the beginner, whether you are interested in shipping, the weather, or in diplomatic traffic.

If you missed the June 2010 issue, you can call the *MT* offices (1-800-438-8155 or email order@grove-ent.com) for back issues in either print or pdf format.

❖ Let's Get Ready: SITOR-B

If you are using a Windows PC, I suggested a program called TrueTTY, and for the Apple Mac, you can use either CocoaModem or MultiMode. Linux enthusiasts can use Fldigi, a program that is also available for all three platforms. You can use the same hook-ups that I suggested in the June 2010 column. The operating principles given here should work regardless of which software you are using.

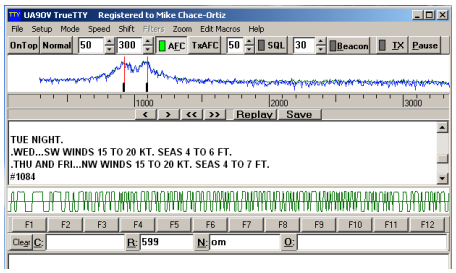
SITOR-B is probably the easier of the two modes to copy, because it's a continuous signal and easier to tune. The best places to start are the NAXTEX stations that transmit around the clock on the standard channels of 518 and 490 kHz (center of data) at the longwave end of the radio spectrum. Wherever you are in the world and whatever the time, you are almost guaranteed to be able to hear one within an hour or so of listening.

Note, however, that not all radios are capable of tuning this low or may not be very sensitive at these frequencies, even with a good antenna. However, don't despair, as there are several other stations higher in the spectrum that can be used.

The most popular NAVTEX channel is 518 kHz, so it's worth parking the receiver on that channel and listening for what you can hear. The alternative channel with activity in most areas is 490 kHz. SITOR-B has a soft, rapid, rhythmic signal not unlike standard RTTY, and you'll also easily be able to recognize when the signal idles between messages.

Here's what you'll need to do in order to decode the signal:

- Tune the radio to 517 kHz or 489 kHz and select USB mode. If you have different filters available, use a standard SSB width of 2.4 kHz.
- In TrueTTY, select Mode and then AMTOR-FEC with Normal Sync
- Once a signal is heard, you should see two peaks around 1000 Hz appear in the TrueTTY signal display at the top of the window.
- Click your mouse in the middle of the two peaks in the trace. You should see the two red bars move to align themselves with the two peaks in the signal. You should also see the middle oscilloscope display turn from a random noisy trace to one with sharp square waves (see Figure 1).



If you see all of this, you should also see text being received in the first text window!

If you don't have great reception on the global NAVTEX frequencies, here are other places where you can practice receiving SITOR-B:

8416.5 kHz - NMC, US Coast Guard from San Francisco
12603.5 kHz, 22387.5 kHz SVO - Olympia Radio from Greece
12566.7 kHz - Various two-letter callsigns like GW, GI, WB etc, Brazilian Navy
6314 kHz, 12579.0 kHz - NMN, US Coast Guard from Boston
7771.7, 8618.2, 12580.7 kHz - Prefectura Naval Argentina from Buenos Aires
4209.5, 5460, 12654 kHz - TAH, Istanbul Radio from Turkey

Note that all of the above stations are regularly scheduled but less active than NAVTEX. The frequencies above are center of data, so once again, you'll need to tune 1 kHz below the given channel and then follow the same method as above to decode the traffic.

❖ SITOR-A and Egyptian Diplomatic Service

Once you've successfully decoded SITOR-B traffic, the next challenge is SITOR-A. This signal is of the burst ARQ (Automatic Repeat Request) type, which makes it harder to find and tune. ARQ signals provide protection from errors in transmitted data by sending a short burst and waiting for an acknowledgment (ACK) from the receiving station.

If everything checks out at the receiving end, the receiving station sends the ACK burst and the process repeats. If there were errors, the receiver sends a non-acknowledgment (NACK) and the sending station tries again. This process happens in a half a second in the case of SITOR-A and gives the signal its characteristic chirp-chirp-chirp rhythm.

There are still some regular SITOR-A coastal stations that you can try to hear, but they are now becoming very rare, with the adoption of more modern systems run by Globe Wireless and others. Here are some recently heard SITOR-A stations to try:

12599.5 kHz UAT, Moscow Radio from Russia
16830.5 kHz SVO, Olympia Radio from Greece
16820.0 kHz IAR, Rome Radio from Italy
16809.0 kHz WLO, ShipCom Radio from Mobile, AL
16886.0 kHz TAH, Istanbul Radio from Turkey

Patience will be required when listening for these stations to send actual traffic because they are infrequently used by ships. Most of the time, you will hear them sending a "channel free" signal which consists of a short burrrrr-type burst (a SITOR-A tuning or phasing signal) and the station call sign in CW.

The method for decoding SITOR-A is exactly like SITOR-B above, with the exception that in Step 2, you select AMTOR-ARQ instead.

For those relishing a real challenge, SITOR-A is still being used by the Egyptian Diplomatic Service, heard on a daily basis throughout the world. It is a challenge to catch them, as schedules are hard to determine. However, patient tuning around some recently used frequencies will usually pay dividends. Here are some regularly active channels heard over the past year:

9046.7, 9229.7, 9106.7, 11116.7, 12221.7, 12222.7, 12226.7, 13441.7, 14445.7, 14881.7, 16009.7, 16141.7, 16341.7, 17434.7, and 18716.7 kHz (center of data)

For US-based listeners, the 9 and 12 MHz channels are frequently used in late evening (2000-2220 UTC) for communications between Havana, Washington DC and Cairo.

As you can see, MFA Cairo uses a +1700 Hz offset from the USB point and so you'll need to tune 1.7 kHz below the frequencies above for successful decoding. You should see the twin signal peaks in the spectrum display at 1700 Hz if you are correctly tuned.

Good luck, have fun with SITOR, and please don't hesitate to write or email me if you have any questions or have suggestions for future articles.

RESOURCES

TrueTTY: **www.dxsoft.com/en/products/truetty**
MultiMode: **www.blackcatsystems.com/download/multimode.html**
CocoaModem: **homepage.mac.com/chen/w7ay/cocoaModem/index.html**
Fldigi: **www.w1hkj.com/Fldigi.html**

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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More Power to You

As I put this column to bed, I am watching the track of Hurricane Earl. Should it come up the coast, life could get very interesting for folks in general, and for public-service-minded amateur radio operators in particular. Also, as we move into November, it becomes time to consider the relatively rough winter we had in these parts last year. Hurricanes and blizzards tend to have one significant thing in common: They both can knock the power out for a considerable length of time.

If you have been following my musings for any length of time, you know that I keep a portion of my radio shack "off the grid." I use a small solar panel and battery setup to give me the ability to operate at conservative power levels for several days. All hams, for the protection of their own home and hearth should give some consideration about how to keep communicating when the public power plug is pulled due to nature's fury or other catastrophe. But, if you plan to be part of the solution and not just part of the problem, you need to put a little more thought into matters related to keeping things going when the lights go out.

❖ Start with What You've Got

You don't need to open your wallet to begin looking at how you would keep amateur radio communications going during times of lost local power. If you are a typical ham (someday I'll figure out what that really means), a bit of prior planning can have you ready to rock with what you've got.

Battery Powered Gear

Let's start with the basic tool of modern amateur radio communication, the 2 meter handheld. Most of us have at least one around the shack. Start by asking yourself some basic questions.

What is the power rating of the rig's battery pack? You will probably find this in your manual or on the battery pack itself, but this is only a point of departure. Entropy creeps into everything. Repeated charging cycles and daily wear and tear are going to cause that battery pack to have a duty cycle that may be significantly less than what the factory documentation suggests.

If you are guilty of leaving your radio sitting uncharged for months at a time, you're probably in bigger trouble than you know. A couple of short exchanges through your local repeater will leave you with a very attractive paper weight. For this reason, you will want to give yourself an accurate, "real world" idea of how long your current setup will work before you need to search for other power sources.

This is not as hard as it sounds. Get in the habit of hanging your handheld on your belt on weekends, tuned to your local active repeater. Listen in and make a point of making a few contacts with the group. It's not only fun, but you will also get a sense of how long you can practically operate with your existing gear. Knowledge is power, and going into any emergency situation, the more you know, the less you need to worry about.

Care and feeding of battery packs should be part of your regular preventative maintenance practice. Find out what you need to keep your batteries healthy and get in the habit of taking care of business.

There are two things I have always included in the purchase decision of any handheld in my long ham history. First is the ability to operate with either rechargeable or "over the counter" cells. When the NiCad or NiMH battery pack gives out, I want to know that I can pull AA or AAA cells out of something else around the house and keep on operating. This may involve the purchase of a separate battery pack to handle the non-rechargables, but it is well worth having for just such emergencies.

Secondly, I always make sure I have the converter and/or cord setup to allow me to operate the radio by way of an automobile battery. I cannot fathom anyone purchasing a rig that does not allow for these two contingencies. No matter how crazy things may get, unless you are way out in the boondocks, you will always be able to find a car battery or a flashlight. You can take care of yourself and a lot of people around you if you can keep the juice going to your radio.

Really Really Really Really Read the Manual

I didn't just say that three times (thank you Robert A. Heinlein), I said it FOUR times. Perhaps one of the coolest things about most of the newer handhelds on the market (and even a few of the older ones) is that they have the capability of allowing you to turn off some number of the fancy bells and whistles that probably attracted you to buying the rig in the first place.

Look through your manual and learn how to turn off things such as display and keyboard lighting. See if you can adjust the power level down and still hit your local repeaters with full quieting. Shut down APRS and GPS functions. You're not going anywhere in weather like this anyway. Turn off anything that doesn't involve basic emergency communication.

You can always turn the various features back on if you need them, but for now, make the radio save every milliampere you can. You'll be able to operate longer before you need to scare up alternative sources of power.

What about Other Rigs?

Most local emergencies are going to lean heavily on VHF and perhaps UHF operation, both easily accomplished with basic handheld gear. But what about HF?

In emergencies, most states operate an HF net. You may not want to talk, but you can learn a lot by listening. Again, get to know your rig by spending some serious time grokking the manual. Can the rig operate off of DC power from a car battery? Transmitting may drain things rapidly at higher power levels, but can the transceiver be turned down to power saving QRP levels? Also again, can any power robbing feature such as display lighting be turned off to save energy? Even if you want to avoid transmitting, you can probably monitor the receiver for many hours, as this does not usually draw nearly as much power as transmitting does.

When you do need to transmit using significant power, you may need to have your car running. You may also find the need to charge up the car battery by periodically running the engine. It goes without saying that you will want to keep your vehicle's fuel tanks topped off ahead of any need to operate under emergency conditions. You may want to keep the gas can for the lawn mower filled as well.

Lose the Accessories

Take any external devices attached to your station out of the power circuit. Even a low power CMOS keyer draws a bit of precious power away from your needs. You're not operating a contest, you trying to keep body and soul together under bad circumstances. Break out the hand key and go "Old School" if you need to communicate via CW.

If you have directional (rotator operated) antenna systems, point them in logical directions *before* you lose local power. You're not going to want to climb a tower in a CAT 5 Hurricane to "Armstrong" your antenna into another position.

Automatic Antenna Tuners (ATUs) have become common tools in many shacks, but again, even the ones with latching relays draw

some power when they initially tune the antenna. I keep a manual tuner and SWR meter around the shack in case the lights go out. Taking the ATU out of the circuit is one more power saving solution.

❖ Taking the Next Steps

So far I've kept my nose out of your wallet. But now let's look at some possible solutions that may involve a financial investment on your part. They are not for everyone, but they are certainly worth considering as part of your personal emergency preparations.

Let the Sun Shine

I've already briefly mentioned the concept of a solar/ battery setup. This type of system can be as simple as the one I mentioned using here in my shack: a small, surplus solar panel charging an 18 Amp hour gel cell. With limited operation at low power on both VHF and HF, I can operate practically indefinitely so long as the sun comes out often enough to keep things topped off.

Careful shopping, swapping, and a bit of homebrewing brought this project in for well under $100. But, you can build systems that would allow you to operate at higher powers for reasonable lengths of time. All you need is a deeper wallet, enough south-facing surface area for bigger solar panels, and well-ventilated space for the bigger, deep-cycle batteries needed to support a more powerful system. Such an upgraded solar system would not just support your higher power amateur radio emergency communication needs, you could probably keep a few other devices and appliances running to keep hearth and home a bit more civilized until public power returns to normal. As the popularity of solar systems grows, prices are dropping, so this is an option well worth considering.

A small portable generator is a great source of emergency power.

Rev Things Up a Bit

While solar has its advantages, the most common source of emergency power used today remains the generator. Generators are a "good news bad news" sort of device. The good news is you can have significant quantities of electricity, rivaling what comes in off the public pole, in a relatively compact package. The bad news is that they require monitoring, refueling, and maintenance to make sure they are up to the task.

My own decision to add a generator to my personal power stack came as a result of the Kulpsville Winter SWL Fest, of all things. I was away at this event, speaking my usual words of wisdom to the assembled masses and hanging out with folks, when I got a call from my XYL that the power was out at my home QTH. Luckily, the power was only out for a few hours and the family fireplace kept everything cozy for that short period.

However, spring was only a few days along and temperatures were still hovering around freezing at night. Had the family gone powerless for much longer, our house heating system would have been out of commission for far longer than most folks would consider safe. It is a natural gas system, but the ignition and circulator pump require voltage. Bringing a generator into the mix assures that my family will have heat in the winter even if the mains are dead.

Adding a generator for heating support means that it can serve double duty to keep such things as the refrigerator and freezer going during power outages. The bonus is that it gives me enough power to kick out some significant wattage with my ham gear, should the need arise in such an emergency.

Picking a generator to meet your needs is similar in scope to getting a solar system up and running. You need to do a power audit to figure out how much juice you need to keep things going. Here's a money saving note: You do not need to buy into a generator large enough to run ALL your electrical stuff at one time. Figure out what your largest power-drain device is (in terms of Amps/Watts) and work down from that. For example, that refrigerator and freezer I mentioned: if you don't open them, they can usually hold their cold for up to about 8 hours. You can swap the cord back and forth between the two every few hours and not even notice the beer getting warm.

Generator Safety

A couple of important safety considerations must be noted if you are going the generator route. First and foremost: DO NOT USE THE GENERATOR INSIDE YOUR HOUSE! You need to pre-plan a power cord system that positions the generator far enough from your house to avoid any possibility of deadly exhaust gasses infiltrating your home.

Likewise, storing gasoline away from the house will also prevent you from hearing your home address broadcast over the fire frequencies on your scanner. If you use the generator in an area with a lot of plant life or other potentially combustible materials, you will want to choose a generator that has a "spark arrestor" on the muffler. You don't want stray sparks setting things alight and making life even more difficult than it already is in the emergency situation.

On an esthetic level, generators can be noisy. In an emergency situation this may not be of concern, but if you plan to have your generator pull duty at other events or while camping, pick out a unit that keeps the decibels well within the comfort zone.

Finally, having a generator will make you quite popular with your local ham club come Field Day. The thread throughout this month's discussion is that you need to think your emergency power needs through BEFORE you need to put them into practice, and that's what Field Day is all about. During an actual event, you may be faced with a number of urgent, even life threatening situations which need your attention. If you can get power matters off of the table, you will be able to devote yourself to other much more pressing concerns.

GETTING STARTED

THE BEGINNER'S CORNER

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HF On-Air Protocol

Not long ago I was talking with a couple of Extra Class hams who were trying to set up a schedule (referred to as a "sked") so that they could make on-air transmitter and microphone adjustments. Neither had any experience operating on the high-frequency (HF) ham bands.

You might think this is a little bizarre. How could anyone with an Extra Class license not be familiar with what seem to be rudimentary on-air operating procedures? But, it's simple: One had gotten his Extra nearly 10 years ago but had not actually been on the air, while the other had gone from Tech to Extra in just six months and, besides some 2 meter work, had virtually no experience operating HF.

This situation is not nearly as rare as you might imagine. With the dropping of the Morse code requirement, availability of on-line study programs, and practice exams, many get their licenses without the benefit of a teacher (known affectionately as an "Elmer") or anyone else to explain the ins and outs of HF operating. There's no requirement for actually doing any on-air operating to get any level ticket and, aside from the basic no-swearing-no-advertising-and-stay-in-band admonishment from the FCC, many hams are hitting HF without a clue.

Big deal, you might say: A couple of weeks on the air and they'll know all there is to know.

Not quite. With the rising solar cycle, more and more hams will be doing less EchoLink operating and more actual HF operating. If you've not been on HF during the peak of a solar cycle, you have no idea what on-air crowding is like. It's more important than ever for hams of every class license to know where they should and should not operate.

❖ What's the Frequency?

The FCC has a long-standing history of keeping its hands off the ham bands. Other than the above warnings regarding content and the requirement to stay strictly within the frequencies authorized by your license, the FCC has allowed hams a free hand at how they use their frequencies.

But, that doesn't mean you're actually free to use the frequencies as you see fit. Over the decades, official and unofficial rules have been adopted by various national and international amateur radio organizations, spelling out how the "considerate operator" should behave.

Of course, to get any class license you have to know where the various transmitting modes are allowed. But knowing only this could get you into a lot of trouble on HF where special operating modes and frequencies are jealously guarded by those who use them.

Here's a quick example. If you would like to earn an instant international reputation as a "lid" (poor operator) just tune up on 14.195 MHz in the 20 meter band any time of day and start calling CQ. Before you've let up the mic switch, someone (usually with a 1.5 kilowatt signal) will tell you (usually in the most annoyed tone and usually without ID) that this is the international DX calling frequency and asking if you are in fact a rare DX station. This person is known derisively as a "frequency cop"; you'll hear many of them on frequency during DXpeditions.

So, you move up the band to 14.300 MHz and start calling there. Oops! That's the Maritime Mobile Net acting as a relay for maritime hams who keep the frequency open especially for water craft of any sort in distress.

OK, then maybe you'll try 14.238 MHz. Wrong again, lid! That's the Slow Scan TV (SSTV) calling frequency, don't you know anything? So, you move off that frequency a couple kHz to 14.233 MHz. Nope! That the *digital* SSTV calling frequency. OK, you set up on 14.286 MHz, anything wrong with that? Yes, that the AM calling frequency. Many hams like to keep the vintage gear alive and you'll hear some great old AM gear in action here.

It's true that the FCC doesn't issue frequency assignments on HF, but over the years hams have established what are called "voluntary band plans" – general agreements on what particular activities will be given priority on which particular frequency. It actually brings more order to the bands and even makes it easier to make contacts. The considerate ham learns what these frequencies are and works around them (see chart).

Dave Woolstrum K3ASI, Gastonia, North Carolina, has this 10 meter SSTV repeater on 28.69. Look for it! (Courtesy: K3ASI)

BEGINNER'S GUIDE TO HF FREQUENCIES

(From International Amateur Radio Union (IARU Region 2), the ARRL's FCC Rule Book, and Internet sources.)

160 Meters (kHz)

1800-1810	Digital modes
1810-1830	CW DX window
1840-1850	International SSB DX window
1910	SSB QRP center
1999-2000	Beacons

80 Meters

3500-3510	CW DX window
3510-3560	preferred CW contest
3555	QRS (slow-speed) CW
3560	QRP (low power) CW
3580-3590	digital modes
3590-3600	digital modes including automatic data stations
3600-3650	SSB contest preferred
3630	Digital voice center
3690	SSB QRP center
3735	Image (SSTV) center
3775-3800	SSB DX window
3845	Image (SSTV)

60 Meters

Only USB voice allowed maximum 50 watts PEP, 2.8 kHz wide transmission centered on 5332, 5348, 5368, 5373, and 5405

40 Meters

7000-7025	CW DX window
7025-7035	CW
7030	CW QRP center
7043	Image center
7170	Digital voice center
7171	Digital SSTV calling frequency
7275	AM calling frequency
7285	SSB QRP center

30 Meters

10116	CW QRP
10130-140	Narrowband digital modes
10140-150	Wideband digital modes

20 Meters

14000-025	CW DX window
14025-060	CW contest preferred
14055	CW QRS center
14060	CW QRP center
14070-089	Narrowband digital 500 Hz bandwidth. Includes CW, PSK31, and RTTY)
14099-101	International Beacon Project
14130	Digital voice center activity
14190-200	International DX window
14233	Digital SSTV calling frequency
14238	Analog SSTV calling frequency
14240-300	Many national/international nets
14285	SSB QRP center
14286	AM calling frequency
14300	Global emergency center

17 Meters

18068-095	CW
18086	CW QRP center
18095-105	Narrowband digital modes
18109-111	International Beacon Project
18130	SSB QRP center
18120-168	SSB

15 Meters

21000-070	CW
21055	QRS center
21060	CW QRP center
21070-090	Narrowband digital modes
21149-151	International Beacon Project
21180	Digital Voice center
21285	SSB QRP center
21340	SSTV including digital SSTV

12 Meters

24890-915	CW
24906	CW QRP center
24915-925	Narrowband digital modes
24929-931	International Beacon Project
24950	SSB QRP center

10 Meters

28000-070	CW
28055	CW QRS center
28060	CW QRP center
28070-120	Narrowband digital modes
28130	PropNET Project
28190-199	International Beacon Project
28.200-299	International beacons
28.330	Digital voice
28.360	SSB QRP center
28.380	10-10 International Net (daily 1800Z)
28.680	Digital SSTV
29000-200	AM preferred
29300-510	Satellite downlink
29510-520	Guard band no transmission allowed
29520-700	FM (10 kHz channels)
29520-590	FM repeater input only 10 kHz channels
29600	FM simplex calling frequency
29620-690	FM repeater outputs only 10 kHz channels

❖ Net Operation

There are hundreds of nets that operate on the HF bands. Most are friendly groups of hams who have a shared interest in a particular subject. These are more or less formal groups that meet on a particular frequency at particular times and days. To make such nets run smoothly, each net has a station designated as a Net Control Station (NCS) – usually a centrally located station with a decent power output and antenna array that can hear the weakest stations check-in and can be heard by all participating stations. While there are similarities among all nets, specific details can only be learned by *listening*.

Since most nets only operate for an hour or two, many find it necessary to stake their claim on a frequency ahead of net time. These are called "pre-nets" and are considerably less formal, sometimes only one station simply announcing the net and purpose. Once it's time for the net to begin, the NCS comes on frequency and announces their procedures. This is when it's really important to pay attention to the particular net's rules.

Large nets might ask for check-in by call district, as in, "Stations wishing to check in from the 1st call district come now." That's an invitation for stations with a 1 in their call sign, even if you're not actually in the 1st call district (Maine, New Hampshire, Connecticut, Massachusetts, Rhode Island, Vermont), to check in. So, if you have a 4 in your call sign, you'll have to wait until the 4 calls are announced. Smaller nets with few stations expected to check in may simply say, "Any stations with or without traffic come now." There follows a free-for-all of call signs with the NCS copying as many as possible and reading them back. He or she may say, "Did I miss anyone?" And, those stations not copied will call again. It's pretty simple and works well.

Some nets meet for the purpose of letting stations work DX (stations from other countries). This is a great way for stations operating low power or mobile, that might have a lot of difficulty breaking through a pile-up of high power stations, to work DX. But, these nets are a little trickier and require paying close attention to procedure in order not to irritate the NCS, the DX, or the dozens of other stations waiting patiently to work the DX.

Northern California DX Foundation operates many beacons on all bands; make room for them.

In order to prevent the DX station hearing the other station's full calls as announced by the NCS, and therefore not strictly counting as an official DX contact, the NCS may ask, for instance, for only the last two letters of each station's call. But, there's a problem. The FCC requires stations to give their full call sign when making contact. To get around that issue, the NCS may take a short list of call signs, say five stations only, to work the DX. Exchanges (call sign, signal report, name and location) are done quickly and everyone gets a chance to give their full call sign within the 10 minutes required by FCC rules.

It's actually pretty simple, and a fair amount of time spent listening and *not* checking in will give you a good background in this type of net operation.

❖ Setting up a Sked

Sometimes two or more individuals, like my friends mentioned earlier, will plan to meet on a frequency for a regular, informal chat, but it will help to figure out what band and frequency is best. For instance, if the group is located within the same town, virtually any band will work, since all stations will be able to hear each other via ground wave. But, depending on the time of day, they might find the bands crowded.

Since they'll be working ground wave and not depending on sky wave propagation, they might consider 10 meters. Even at night, they'll have interference-free contacts. Once the band starts to open during the peak of the season, however, they might find a lot of hams checking in from all over the world!

If you're trying to make a one-off contact with a friend or group of friends where ground wave is not possible, you'll have to pick a band that everyone will be able to operate easily. For instance, if two friends are in the same state but a third friend is across the country, you can rule out 160, 80 and (most of the time) 40 meters. Since 10 meters and 15 meters will require good band openings to allow such regular contacts, those band can be ruled out, too.

That will leave 20 meters, the all-around HF playground, provided the two in-state stations aren't too close and therefore in each other's "skip zone" – the area around a signal before it's refracted off a layer of the ionosphere back to Earth. In these cases, the distant station hears both the close-together stations but neither of them can hear each other.

It's no good just to pick a frequency and e-mail each other the time, date and frequency, because, when the time comes, the frequency might be already occupied. So, the usual method is to say, "14.255 and up, I'll call you." That tells your friends that at net time, if there's another QSO (conversation) happening on the proposed frequency, they should go up the band from 14.255 and listen for your call. You can also say, "14.255 and down." Either works well, but avoid saying "14.255 +/- the QRM (interference). "That might have you calling at 14.253 and your friends listening at 14.257 and no contact is made.

❖ Working HF Repeaters

One of the things that makes 10 meters the number one band on HF is that it's huge and there's enough room for every type of operating mode, including FM. When the propagation is good, it's *the* place to be. If you try the FM simplex calling frequency (29.600), the best practice is to move your QSO down the band and let someone else call on the simplex frequency. When your QSO is done you can go back and try again on the calling frequency.

There are FM repeaters on 10 meters as well. To work one, set your transceiver to duplex mode (transmitting on one frequency and listening on another). Your manual will tell you exactly how to do this. Working the FM repeaters, like their 2 meter and 440 counterparts, is the same, except that instead of being limited to local line-of-sight FM, you could be talking to other hams thousands of miles away, in full-quieting FM.

For added fun there are even 10 meter SSTV repeaters! Finally, there are many unwritten rules for working DX stations, whether voice, digital, or image, and I'll go into those in a later column.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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Spotlight on Music

This month we shine the *Programming Spotlight* on musical programs –great ones and unusual ones – from around the world!

A whole column could be written about the music programming available from the BBC alone, especially if combining on-air and online sources. Years ago, when we were limited to the output of the World Service (and we didn't think ourselves limited, did we?), listeners could get a taste of the British music scene by listening to programs hosted by legendary deejays such as Dave Lee Travis (host of **A Jolly Good Show** from the BBC "Wild Service" for 20 years) and John Peel, both of whom started out on the radio pirate ships.

In the 1980s, it was particularly interesting to listen to these programs because there would often be a considerable lag between a UK release and the song's appearance on the North American charts, and vice versa. It gave you the opportunity to hear songs weeks before they were released here, giving you a leg up on what was hot (or not).

Today's World Service features **Top of the Pops**, a weekly Top 20 countdown of what's hot in the UK. It's an opportunity to hear new releases and the top five selling singles in full. Kim Robson, who brings a lively and energetic style to her delivery, hosts the program. You can learn more about the program and hear the latest episode at **www.bbc.co.uk/worldservice/arts/2009/03/000000_top_of_the_pops.shtml**

Kanye West and Katy Perry not quite your cup of tea? No worries. All of the various BBC radio networks are available on air in the UK and online for those of us "across the pond".

Radio 1 features pop music with an emphasis on Dance, Hip Hop, R & B and Indie.

Radio 2, one of the most popular stations in the UK, presents a wide variety of styles of music and documentaries. This column has featured many Radio 2 programs over the years, including Mark LaMarr's **God's Juke Box** (despite the name, an eclectic mix of the best music of the past 70 years), **Shake Rattle and Roll** (LaMarr's occasional series of early rock and rockabilly), and **Sounds of the Sixties** hosted by Brian Matthew. Brian was often referred to as the "Fifth Beatle," because he hosted many of the BBC programs featuring The Beatles, before and just after they hit it big worldwide.

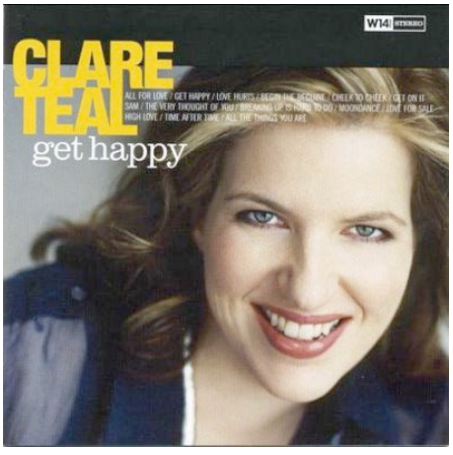
Radio 2 is home to many more programs,

such as **Johnny Walker's Sounds of the Seventies, Elaine Page on Sunday** and **Clare Teal**. **Walker** is one of those ex-radio pirates again. It's amusing that the BBC, which once disdained the pirates, now embraces their legacy.

Each week, **Johnny** presents a featured album (the most recent episode featured The Sex Pistols), a couple of interviews with artists of the era such as Ozzie Osbourne, and a lot of tracks from such diverse artists as Blondie, Rupert Holmes, Desmond Dekker and Eric Clapton. If you grew up in the 1970s (as I did), it's a flashback well worth hearing. **www.bbc.co.uk/programmes/b00jlwqd**

Elaine Page on Sunday features special guests, show tunes, movie music and requests, as well as entertainment news and the "Disney Double". **www.bbc.co.uk/programmes/b006wqwz**

Clare Teal has taken up the baton of the late **Malcolm Laycock**, playing the best of the Big Bands and Swing music of the '30s, '40s and '50s. Clare is an accomplished singer of this style of music in her own right and brings this experience to her duties as host. It makes for a highly entertaining program. **www.bbc.co.uk/programmes/b00tpvbs**



Before leaving **Radio 2**, one has to mention the incredible music documentaries that regularly appear in the schedule. Each week, one can hear documentaries on everything and everyone musical, from **The Carlos Santana Story**, to Priscilla Presley's recollections of Elvis – everything from The Beatles to the Big Bands.

And currently running is a 50 part series (!) called **Tim Rice's American Pie**. Each week for 50 weeks, **Sir Tim Rice** presents a one-hour program featuring the music of, or about one of the 50 states. Moving geographically from west to east, he should be east of the Mississippi by the time you read this. A fascinating listen! To keep up on Radio 2 documentaries, check out **www.bbc.co.uk/radio2/programmes/formats/documentaries** on a regular basis.

Do you prefer classical music and jazz? Then **Radio 3** is for you. It is the home of **the BBC Proms**, recitals from **The Edinburgh Festival**, and concerts. Also featured is the program **Composer of the Week** with **Donald McLeod**, which as the name implies, looks at a different composer each week. From Monday to Friday, in five one-hour episodes, **McLeod** explores in detail their life and work. It's almost like a university level course in music without feeling like one. Over the years, he has featured everyone from Palestrina to Bach to Beethoven to Duke Ellington and Aaron Copland! The focus is, however, mostly on classical composers. It's well worth hearing. **www.bbc.co.uk/programmes/b00tp971**

It's not all about classical music on **Radio 3**. There is a significant element of jazz as well, including **Jazz Library,** a program devoted to advice on building the listener's own collection of recordings; **Jazz Line-Up** (which discusses jazz in general); and **Jazz on 3** (featuring concerts and studio sessions). Your portal to **Radio 3 Jazz** is at **www.bbc.co.uk/radio3/jazz/**

Radio 6 is also a music station, featuring an eclectic mix of new music, classics and documentaries. Perhaps the jewel of the station is the 3am **Overnight Documentary**. Often it features one of those **Radio 2** documentaries from the

past. The beauty of the BBC online is that all of these programs are available online, on demand, so that you can listen to them any time, at your leisure, within 7 days of the broadcast. Many BBC programs are available as a podcast; however, due to rights issues, most music programs are not, or are only available inside the UK. To start, just go to **www.bbc.co.uk/radio** and dig in!

❖ The Sounds of French Canada

Canada is a bilingual country. Perhaps 25-30% of its people speak French as a first language. This is a legacy of the colonial period from the16th-18th centuries, when the British and the French fought a number of wars for control of the continent and its valuable resources. New France at one time encompassed most of modern Quebec, Ontario and significant portions of the modern United States. After the Seven Years War (as it is known in Canada, or the French and Indian War in the US) all of this territory was ceded to the British. But, this left the sizable French speaking population, which has fiercely defended its culture and language, in Quebec, New Brunswick and scattered parts of Canada.

Quebec and French Canada have a lively culture of their own. Radio helps to give us an opportunity to share this culture. Canada's French version of the **CBC, Radio-Canada** has an extensive network of stations throughout the country. In the evenings, you might want to try to hear **CJBC** in Toronto on 860 kHz, the 50kW **Radio-Canada** transmitter with a significant coverage area. It shares the same transmitter site as powerhouse **AM 740**. A number of **Radio-Canada** programs may be heard on the **CBC Northern Quebec Shortwave Service** daily on 9625 kHz as well. Or you can listen online at **www.radio-canada.ca/radio/** Some Quebec private stations also are widely heard, too, such as **CKAC** on 730.

On the English network, **CBC Radio One**, there is a terrific music program on Saturday nights called **A Propos**. Hosted by **Jim Corcoran**, a Quebec-based singer-songwriter, it brings an hour of the best music from Quebec, France, Belgium and Africa. Each show often includes interviews with artists, CD tracks and concert excerpts. It's a great opportunity to hear something a little different, and the beauty of music is that you don't have to be fully or even partially bilingual to understand and enjoy it. The program is heard Saturday nights at 11pm local time on **CBC Radio One**, and on Sundays at 4pm local time on **CBC Radio 2**. Go to **www.cbc.ca/local** to find a station in your preferred time zone.

Want to hear more really cool French music? There is an internet radio station out of Toronto, which plays a wonderful mix of French music from the 1960s (and a *bit* of the '50s and '70s) called **Radio Ye-Ye!** What is Ye-Ye, you ask? It is a style of music that emerged from Quebec and France in the 1960s and has spread worldwide in the French community. Ye-Ye! Is the French equivalent of Yeah Yeah! as in, "She loves you, yeah yeah yeah" immortalized by The Beatles.

Giving my admittedly poor high school French a workout, **Radio Ye-Ye!** is "the first internet radio station dedicated to the francophone music of the '50s, '60s and '70s. **Radio Ye-Ye!** is a radio station that broadcasts the songs of the Ye-Ye period from both sides of the Atlantic."

There is some really neat stuff to be heard here, songs that for the most part slipped under the radar of Top 40 radio in English speaking North America. The only exception is the notorious "Je t'aime," a rather steamy song banned in many markets. In 2010 it seems a bit tame, but in the sixties it was controversial.

It's also not unusual to hear French covers of well-known '60s pop songs. This was a big aspect of the Ye-Ye period, so you will hear Petula Clark sing "Downtown," only in French it becomes "Dans le Temps." Until I discovered this music via another internet program (**Treasure Island Oldies**), I had no idea it existed. Some discoveries include the fact that Petula Clark is fluently bilingual and had as big, if not a bigger career in France as she had in the English-speaking music scene. And Les Classels is a pretty cool band out of sixties Quebec; check them out on youtube. Kind of a sixties Paul Anka sound.

If you like music as I do, check out **Radio Ye-Ye**! online at **www.radioyeye.com/** and make some discoveries of your own! The website offers you the opportunity to listen using any player you wish, from Windows Media to Winamp. Give it a listen, it's a real trip!* (**Jaunty beret and baguette not included!*)

Staying with the French theme, one of the results of that British victory 250 years ago was a lot of disgruntled French people in what is modern day Nova Scotia and New Brunswick. They called themselves Acadians (the French name for the area was l'Acadie or Acadia). In 1755, the Acadians were given a choice: swear allegiance to the King or be expelled. Many chose the latter, a significant number of whom ended up in Louisiana, still French soil at the time. Over the years, the term Acadians became corrupted to "Cajuns."

Cajun culture is fantastic, holding on to its French roots, but assimilated into American society. It's the land of spicy hot food and hotter music. Zydeco music is a wonderful fusion of folk, country, rock and roll, and any number of styles. It's usually dominated by button accordions and fiddles, as well as guitars drums and bass. You can't hear this music and not move!

During Hurricane Katrina, I stumbled upon a little FM station in Louisiana (while looking for local news) called **KBON** or K-Bon (Bon being "good" in French). What a wonderful music mix: Great country and zydeco music, rock, "swamp pop" and blues. I used to like to listen to it off and on in the months after the Hurricane for its lively repertoire.

Some time ago they made the decision to charge their internet users for the right to listen online. It costs $70 a year to join the **KBON** Club, or $6 for a month. Perhaps this is the future of internet radio. I liked the station, but not enough to pay that much to hear it. I understand they have bills to pay and that this is their way of dealing with it – still, I wonder how successful they are. They are still there so it must be working out for them. If you want to check them out just go to **www.kbon.com**

❖ What's New

Sticking with our musical theme**, Radio Prague** has a new music program (debuting in August) called **Music Express**. The program is heard on alternate Tuesdays from 2230-2257 on 9440 kHz, 0000-0027 on 9790 kHz, 0100-0127 and 0300-0327 on 7345 kHz. The program promises to "(bring) you music and interviews with some of the Czech Republic's brightest young stars and biggest names."

The first programs have presented such Czech groups as Airfare, a hard rock band that performs in English; "New Pop" band Eddie Stoilow (whose first album was humorously titled The Best of Eddie Stoilow); and gypsy.cz., a mixture of hip-hop, rap and r& b, that includes traditional instruments such as the violin and cymbalo. They have an interesting and unique sound. Thanks to this new program from **Radio Prague**, we have a window into the world of Czech music. Oh, and you can always hear the program and past episodes at **www.radio.cz/en/current/music-express**

❖ Programming Advance Notice

So how does one figure out what's on the radio in the coming days to avoid missing something special? In the 1980s when all of this information came by postal mail, it was often problematic to get any advance programming information, because by the time it got to you, it was often out of date. Not so in today's connected internet world.

Many stations and programs will send you advance programming information weekly (or even daily), delivered right to your e-mail inbox. Each month we'll highlight one of these newsletters and tell you how to get it, so you don't miss out on a program of interest.

"If you'd like to learn more about what's on at **Radio New Zealand** we have launched a new email newsletter called Soundwaves.

"Soundwaves is a high quality html based eNewsletter giving you a taste of programmes to be broadcast on **Radio New Zealand** in the coming week. To view the latest email and subscribe use the following link. **www.radionz.co.nz/media/newsletter**" (*Forthcoming Insights* e-Newsletter, Radio New Zealand)

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

CONVERT YOUR TIME TO UTC

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

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

FIND THE STATION YOU WANT TO HEAR

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

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

CHOOSE PROMISING FREQUENCIES

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

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

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

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

Target Areas

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

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

MT MONITORING TEAM

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

BCL News; DX Asia; British DX Club; Cumbre DX; DSWCI-DX Window, Hard-Core DX; Radio Bulgaria DX Mix News 638-642; Media Broadcast, Play DX; WWDXC-BC DX-Top News; World DX Club/Contact, PTSW; World Radio TV Handbook.

Alokesh Gupta, New Delhi, India; Mike Barraclough, UK; Ivo Ivanov; Bulgaria; Sean Gilbert, UK; Rachel Baughn/MT; Rich D' Angelo/NASWA-Flash Sheet, NASWA-Journal; Tom Taylor, UK.

SHORTWAVE BROADCAST BANDS

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

Notes

Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.

Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.

Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007

Note 4 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

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

0000	0004		Canada, Radio Canada International			6100na
0000	0015	mtwhf	Moldova, (Transnistria) Radio PMR			6240na
0000	0027		Czech Republic, Radio Prague			9790na
0000	0030		Egypt, Radio Cairo	11590na		
0000	0030	vl	Guyana, Voice of Guyana	3290va		
0000	0030		Thailand, Radio Thailand World Service			15275na
0000	0030		USA, Voice of America	7555af		
0000	0045		India, All India Radio	6055as		7305as
			9705as	9950as	11645as	13605as
0000	0056		Romania, Radio Romania International			7385na
			9580na			
0000	0057		Canada, Radio Canada International			11700as
0000	0100		Anguilla, Worldwide Univ Network			6090am
0000	0100		Australia, ABC NT Alice Springs			4835do
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek			4910do
0000	0100		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	17715pa
			17750as	17795pa		
0000	0100		Bahrain, Radio Bahrain	6010me		
0000	0100		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St Johns NF	6160na		
0000	0100		Canada, CKZU Vancouver BC			6160na
0000	0100		China, China Radio International			6020eu
			6075as	6180as	7350eu	7415as
			9570eu	11790as	11885as	13750as
0000	0100		Germany, Deutsche Welle	9885as		15595as
			17525as			
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100		New Zealand, Radio NZ International			15730pa
0000	0100	DRM	New Zealand, Radio NZ International			15720pa
0000	0100		Russia, Voice of Russia	5900na		9665na
0000	0100		Spain, Radio Exterior de Espana			6055na
0000	0100		Sri Lanka, SLBC	6005as	9770as	15745as
0000	0100		UK, BBC World Service	5970as		6195as
			7395as	9740as	12095as	13725as
0000	0100		Ukraine, Radio Ukraine International			7440na
0000	0100		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0000	0100		USA, WBCQ Monticello ME	7415am		9330am
0000	0100	sm	USA, WBCQ Monticello ME	5110am		
0000	0100		USA, WEWN Vandiver AL	11520af		
0000	0100	m	USA, WHRI Cypress Creek SC			7315am
0000	0100	Sun	USA, WHRI Cypress Creek SC			5875am
			5920am			
0000	0100		USA, WINB Red Lion PA	9265ca		
0000	0100		USA, WRMI Miami FL	9955ca		
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WTWW Lebanon TN	9479va		
0000	0100		USA, WWCR Nashville TN	4840na		7465na
			9980na			
0000	0100		USA, WWRB Manchester TN	3185va		3215na
			6890va			
0000	0100		USA, WYFR/Family Radio Worldwide			5950na
			6985na	7360sa	7520sa	9505na
			15440na			
0005	0100	twhfa	Canada, Radio Canada International			6100na
0030	0045	twhfas	Albania, Radio Tirana	9860na		
0030	0100		China, China Radio International			11730as
0030	0100	mtwhfa	Serbia, International Radio of Serbia			9675na
0030	0100		Thailand, Radio Thailand World Service			15275na
0030	0100	fas	UK, Bible Voice Broadcasting Network			7405as
0030	0100		USA, Voice of America/Special English			7430as
			9715as	9780va	11725va	15205va
			15290va	15560va	17820va	
0045	0100	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
0045	0100	Sun	Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			

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

0100	0105	twhfa	Canada, Radio Canada International			6100na
0100	0125		Vietnam, Voice of Vietnam	6175na		
0100	0127		Czech Republic, Radio Prague			7345na
0100	0130		China, China Radio International			11730as
0100	0130		Slovakia, Radio Slovakia International			5930na
			9440sa			
0100	0157		North Korea, Voice of Korea	9345as		9730as
			11735sa	13760as	15180as	
0100	0159		Canada, Radio Canada International			9620as
0100	0200		Anguilla, Worldwide Univ Network			6090am
0100	0200		Australia, ABC NT Alice Springs			4835do
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek			4910do
0100	0200		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	17715pa
			17750pa	17795pa		
0100	0200		Bahrain, Radio Bahrain	6010me		
0100	0200		Canada, CFRX Toronto ON	6070na		
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St Johns NF	6160na		
0100	0200		Canada, CKZU Vancouver BC			6160na
0100	0200		China, China Radio International			6020eu
			6175eu	9410eu	9470eu	9535eu
			9570eu	9580na	9790na	11870as
			15785as			
0100	0200	DRM	China, China Radio International			6080na
0100	0200		Cuba, Radio Havana Cuba	5970na		6000na
0100	0200	vl	Guyana, Voice of Guyana	3290va		
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200		New Zealand, Radio NZ International			13730pa
0100	0200	DRM	New Zealand, Radio NZ International			15720pa
0100	0200		Russia, Voice of Russia	5900na		9665na
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, Radio Taiwan International			11875as
0100	0200		Uganda, UBC Radio	4975do		
0100	0200		UK, BBC World Service	5970as		6195as
			7395as	9410as	9740as	11750as
			12095as	13725as	15310as	15335as
			15360as	17615as		
0100	0200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0100	0200		USA, KJES Vado NM	7555na		
0100	0200		USA, Voice of America	7430va		9780va
			11705va			
0100	0200		USA, WBCQ Monticello ME	7415am		9330am
0100	0200	sm	USA, WBCQ Monticello ME	5110am		
0100	0200		USA, WEWN Vandiver AL	11520af		
0100	0200	twhfa	USA, WHRI Cypress Creek SC			5920am
			7315am			
0100	0200		USA, WINB Red Lion PA	9265ca		
0100	0200		USA, WRMI Miami FL	9955ca		
0100	0200		USA, WRNO New Orleans LA			7505am
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WTWW Lebanon TN	5755va		
0100	0200		USA, WWCR Nashville TN	3215na		4840na
			9980na			
0100	0200		USA, WWRB Manchester TN	3145va		3185va
			6980va			
0100	0200		USA, WYFR/Family Radio Worldwide			6985na
			9505na	15440na		
0130	0200		Iran, VOIRI/IRIB	7245na		9495na
0130	0200	twhfa	USA, Voice of America/Special English			7465ca
			9820ca			
0140	0200		Vatican City State, Vatican Radio			7335va
			9580as	9650va	11850va	
0145	0200	twhfas	Albania, Radio Tirana	7425na		

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

0200	0215		Croatia, Croatian Radio	3985eu		7375am
0200	0227		Iran, VOIRI/IRIB	7245na	9495na	
0200	0230		Thailand, Radio Thailand World Service			15275na
0200	0230		USA, KJES Vado NM	7555na		
0200	0245		USA, WYFR/Family Radio Worldwide			11835na
0200	0257		North Korea, Voice of Korea	13650as		15100as
0200	0300		Anguilla, Worldwide Univ Network			6090am
0200	0300	twhfa	Argentina, Radio Nacional RAE			11710am
0200	0300		Australia, ABC NT Alice Springs			4835do
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek			4910do
0200	0300		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0200	0300		Bahrain, Radio Bahrain	6010me		
0200	0300		Bulgaria, Radio Bulgaria	9700na		11700na
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St Johns NF	6160na		
0200	0300		Canada, CKZU Vancouver BC			6160na
0200	0300		China, China Radio International			11770as
			13640as			
0200	0300		Cuba, Radio Havana Cuba	5970na		6000na
0200	0300		Egypt, Radio Cairo	6270na		
0200	0300	vl	Guyana, Voice of Guyana	3290va		
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		New Zealand, Radio NZ International			13730pa
0200	0300	DRM	New Zealand, Radio NZ International			15720pa

0200	0300		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	15510me		
0200	0300		Russia, Voice of Russia	7440na		15425na
0200	0300		South Korea, KBS World Radio			9580sa
0200	0300		Taiwan, Radio Taiwan International			5950na
			9680ca			
0200	0300		UK, BBC World Service	6005af		6195as
			9410as	12095as	15310as	
0200	0300		Ukraine, Radio Ukraine International			7440na
0200	0300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0200	0300		USA, WBCQ Monticello ME	7415am		9330am
0200	0300	m	USA, WBCQ Monticello ME	5110am		
0200	0300		USA, WEWN Vandiver AL	11520af		
0200	0300	twhfa	USA, WHRI Cypress Creek SC			5875na
			7315am			
0200	0300		USA, WINB Red Lion PA	9265ca		
0200	0300		USA, WRMI Miami FL	9955ca		
0200	0300		USA, WRNO New Orleans LA			7505am
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WTWW Lebanon TN	5755va		
0200	0300		USA, WWCR Nashville TN	3215na		4840na
			5890na			
0200	0300		USA, WWRB Manchester TN	3145va		3185va
			5050va	6890va		
0200	0300		USA, WYFR/Family Radio Worldwide			5985ca
			6100sa	6985na	9385ca	9505na
0215	0230		Nepal, Radio Nepal	5005as		
0215	0300		Uganda, UBC Radio	4975do		
0230	0300	twhfas	Albania, Radio Tirana	7425na		
0230	0300		Vietnam, Voice of Vietnam	6175na		
0245	0300		Australia, HCJB Global Voice Australia			15400as
0245	0300		India, All India Radio	3945do		
0250	0300		Vatican City State, Vatican Radio			7305am
			9610am			

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

0300	0315	Sun	Swaziland, TWR Swaziland	3200af		
0300	0327		Czech Republic, Radio Prague			7345na
0300	0330		Egypt, Radio Cairo	6270na		
0300	0330		Myanmar, Myanmar Radio	9730do		
0300	0330		Philippines, PBS/ Radyo Pilipinas			11880me
			15285me	15510me		
0300	0330		Sri Lanka, SLBC	6005as	9770as	15745as
0300	0330		Vatican City State, Vatican Radio			7360af
			9660af			
0300	0355		South Africa, Channel Africa	6135af		
0300	0356		Romania, Radio Romania International			7335na
			9645na	11895as	15340as	
0300	0357		North Korea, Voice of Korea	7200as		9345as
			9730as			
0300	0400		Anguilla, Worldwide Univ Network			6090am
0300	0400		Australia, ABC NT Alice Springs			4835do
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek			4910do
0300	0400		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0300	0400		Bahrain, Radio Bahrain	6010me		
0300	0400	twhfas	Canada, CBC NQ SW Service			9625na
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St Johns NF	6160na		
0300	0400		Canada, CKZU Vancouver BC			6160na
0300	0400		China, China Radio International			9690na
			9790na	11770as	15110as	15120eu
			15785as			
0300	0400		Cuba, Radio Havana Cuba	5970na		6000na
0300	0400		Germany, Deutsche Welle	12005as		15595as
0300	0400	vl	Guyana, Voice of Guyana	3290va		
0300	0400		Malaysia, RTM/Traxx FM	7295do		
0300	0400		New Zealand, Radio NZ International			13730pa
0300	0400	DRM	New Zealand, Radio NZ International			15720pa
0300	0400		Oman, Radio Sultanate of Oman			15355af
0300	0400		Russia, Voice of Russia	15425na		15585as
0300	0400	DRM	Russia, Voice of Russia	15735as		
0300	0400		South Africa, Channel Africa	3345af		
0300	0400		Taiwan, Radio Taiwan International			5950na
			15320as			
0300	0400		Turkey, Voice of Turkey	5975va		6165va
0300	0400		Uganda, UBC Radio	4975do		
0300	0400		UK, BBC World Service	3255af		6005af
			6145af	6190af	6195va	7255af
			9750af	11945af	12035as	12095as
			15310as	17790as		
0300	0400		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0300	0400		USA, Voice of America	4930af		6080af
			9885af	15580af		
0300	0400		USA, WBCQ Monticello ME	7415am		9330am
0300	0400		USA, WEWN Vandiver AL	9455af		
0300	0400	Sat	USA, WHRI Cypress Creek SC			7315am
0300	0400		USA, WINB Red Lion PA	9265ca		
0300	0400		USA, WRMI Miami FL	9955ca		
0300	0400		USA, WRNO New Orleans LA			7505am
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WTWW Lebanon TN	5755va		
0300	0400		USA, WWCR Nashville TN	3215na		4840na
			5890na			
0300	0400		USA, WWRB Manchester TN	3145va		3185va
			5050va	6890va		
0300	0400		USA, WYFR/Family Radio Worldwide			6985na
			9505na	11740sa	15255sa	
0315	0330		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0330	0357		Czech Republic, Radio Prague			9445me
0330	0400	twhfas	Albania, Radio Tirana	7425na		
0330	0400	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0330	0400		UK, BBC World Service	11945af		
0330	0400		Vietnam, Voice of Vietnam	6175na		
0340	0400		Vatican City State, Vatican Radio			15460va
0345	0400	vl/Sat/Sun	Uganda, UBC Radio	4975do		

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

0400	0430	mtwhf	France, Radio France Internationale			7425af
			9805af			
0400	0430	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0400	0430		USA, Voice of America	4930af		4960af
			6080af	9885af	15580af	
0400	0445		USA, WYFR/Family Radio Worldwide			6985na
			9505na			
0400	0458		New Zealand, Radio NZ International			13730pa
0400	0458	DRM	New Zealand, Radio NZ International			15720pa
0400	0500		Anguilla, Worldwide Univ Network			6090am
0400	0500		Australia, ABC NT Alice Springs			4835do
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek			4910do
0400	0500		Australia, Radio Australia	9660pa		12080pa
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0400	0500		Bahrain, Radio Bahrain	6010me		
0400	0500	twhfas	Canada, CBC NQ SW Service			9625na
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St Johns NF	6160na		
0400	0500		Canada, CKZU Vancouver BC			6160na
0400	0500		China, China Radio International			6020na
			6080na	13750as	15120eu	15785as
			17730af	17855af		
0400	0500		Cuba, Radio Havana Cuba	5970na		6000na
0400	0500		Germany, Deutsche Welle	6180af		7240af
			12045af	15400af		
0400	0500	vl	Guyana, Voice of Guyana	3290va		
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Russia, Voice of Russia	13775na		
0400	0500		South Africa, Channel Africa	3345af		
0400	0500		Sri Lanka, SLBC	6005as	9770as	15745as
0400	0500		Uganda, UBC Radio	4975do		
0400	0500	DRM	UK, BBC World Service	3995eu		
0400	0500		UK, BBC World Service	3255af		6055af
			6190af	7255af	7310af	9410eu
			12035af	12095as	13675eu	15310as
			15360as	17790as		
0400	0500		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0400	0500		USA, WEWN Vandiver AL	9455af		
0400	0500	Sun	USA, WHRI Cypress Creek SC			7365eu
0400	0500	Sat	USA, WHRI Cypress Creek SC			9825me
0400	0500		USA, WRMI Miami FL	9955ca		
0400	0500		USA, WRNO New Orleans LA			7505am
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WTWW Lebanon TN	5755va		
0400	0500		USA, WWCR Nashville TN	3215na		4840na
			5890na			
0400	0500		USA, WWRB Manchester TN	3185na		
0400	0500		USA, WYFR/Family Radio Worldwide			9680na
0400	0500		Zambia, 1 Africa-CVC Africa	5925af		
0430	0500	Sat/Sun	Greece, Voice of Greece	11645eu		

0430	0500	mtwhf	Swaziland, TWR Swaziland	3200af	4775af	
0430	0500		USA, Voice of America	4930af	4960af	
			6080af	9885af	15580af	
0455	0500		Nigeria, Voice of Nigeria/External Service			
			15120eu			
0459	0500		New Zealand, Radio NZ International		11725pa	
0459	0500	DRM	New Zealand, Radio NZ International		11675pa	

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

0500	0507	twhfas	Canada, CBC NQ SW Service		9625na	
0500	0520		Vatican City State, Vatican Radio		4005eu	
			5965eu	7250eu	9660af	11625af
			13765af			
0500	0530		China, CNR-11/Holy Tibet	9530do	11685do	
			15570do			
0500	0530		Czech Republic, Radio Prague		9955ca	
0500	0530	mtwhf	France, Radio France Internationale		11995af	
			13680af			
0500	0530		Germany, Deutsche Welle	6180af	7430af	
			9700af	9825af		
0500	0530		Japan, NHK World/ Radio Japan		5975eu	
			6110na	11970as	15205as	17810as
0500	0530	Sun	UK, BBC World Service		15420af	
0500	0555		Sri Lanka, SLBC	6005as	9770as	15745as
0500	0600		Anguilla, Worldwide Univ Network		6090am	
0500	0600		Australia, ABC NT Alice Springs		4835do	
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek		4910do	
0500	0600		Australia, Radio Australia	9660pa	12080pa	
			13630as	15160pa	15230pa	15415as
			17750as			
0500	0600		Bahrain, Radio Bahrain	6010me		
0500	0600		Bhutan, Bhutan Broadcasting Service		6035as	
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St Johns NF	6160na		
0500	0600		Canada, CKZU Vancouver BC		6160na	
0500	0600		China, China Radio International		6020na	
			6190na	11710me	11895as	15350as
			15465as	17505af	17540as	17730af
			17855af			
0500	0600		Cuba, Radio Havana Cuba	5970na	6010na	
			6060na			
0500	0600	DRM	Germany, Deutsche Welle	17525as		
0500	0600	mtwhf	Greece, Voice of Greece	11645eu		
0500	0600	vl	Guyana, Voice of Guyana	3290va		
0500	0600		Kuwait, Radio Kuwait	15110as		
0500	0600		Liberia, Star Radio	3900do	3955al	
0500	0600		Malaysia, RTM/Traxx FM	7295do		
0500	0600		New Zealand, Radio NZ International		11725pa	
0500	0600	DRM	New Zealand, Radio NZ International		11675pa	
0500	0600		Nigeria, Voice of Nigeria/External Service			
			15120eu			
0500	0600		Russia, Voice of Russia	13775na		
0500	0600	mtwh	Slovakia, IRRS/Euro Gospel Radio		5990va	
0500	0600		South Africa, Channel Africa	7230af		
0500	0600		Swaziland, TWR Swaziland	3200af	6120af	
			9500af			
0500	0600		Taiwan, Radio Taiwan International		5950na	
0500	0600		Uganda, UBC Radio	4975do		
0500	0600		UK, BBC World Service	3995eu	7255af	
			7310af	9410eu	11945af	12095va
			15310as	15360as	15560eu	17640af
			17790as			
0500	0600	mtwhf	UK, BBC World Service	15420af		
0500	0600		Ukraine, Radio Ukraine International		9840na	
0500	0600		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0500	0600		USA, Voice of America	4930af	6080af	
			12080af	15580af		
0500	0600		USA, WEWN Vandiver AL	6890va		
0500	0600	Sun	USA, WHRI Cypress Creek SC		11565pa	
0500	0600		USA, WRMI Miami FL	9955ca		
0500	0600		USA, WTJC Newport NC	9370na		
0500	0600		USA, WTWW Lebanon TN	5755va		
0500	0600		USA, WWCR Nashville TN	3215na	4840na	
0500	0600		USA, WWRB Manchester TN	3185na		
0500	0600		USA, WYFR/Family Radio Worldwide		9680na	
0500	0600		Zambia, 1 Africa-CVC Africa	9430af		
0515	0530		Rwanda, Radio Rwanda	6055do		
0530	0556		Romania, Radio Romania International		9655eu	
			21500pa	17760pa		
0530	0600	DRM	Romania, Radio Romania International		7305eu	
0530	0600		Thailand, Radio Thailand World Service		17655eu	

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

0600	0630	Sat/Sun	Australia, Radio Australia	15290as		
0600	0630		China, Xizang PBS/Holy Tibet	4905do	4920do	
			5240do	6110do	6130do	6200do
			9490do	9580do		
0600	0630	mtwhf	France, Radio France Internationale		11615af	
			15160af	17800af		
0600	0630		Germany, Deutsche Welle	7325af	15275af	
0600	0630	Sat/Sun	Greece, Voice of Greece/Radio Filia		11645eu	
0600	0645	mtwhf	South Africa, TWR Africa	11640af		
0600	0658		New Zealand, Radio NZ International		11725pa	
0600	0658	DRM	New Zealand, Radio NZ International		11675pa	
0600	0700		Anguilla, Worldwide Univ Network		6090am	
0600	0700		Australia, ABC NT Alice Springs		4835do	
0600	0700		Australia, ABC NT Katherine	5025do		
0600	0700		Australia, ABC NT Tennant Creek		4910do	
0600	0700		Australia, Radio Australia	9660pa	12080pa	
			13630as	13690pa	15160pa	15230pa
			17750as			
0600	0700		Bahrain, Radio Bahrain	6010me		
0600	0700		Canada, CFRX Toronto ON	6070na		
0600	0700		Canada, CFVP Calgary AB	6030na		
0600	0700		Canada, CKZN St Johns NF	6160na		
0600	0700		Canada, CKZU Vancouver BC		6160na	
0600	0700		China, China Radio International		11710me	
			11870af	11895as	13660as	15140af
			15350as	15465as	17505af	17540as
0600	0700		Cuba, Radio Havana Cuba	5970na	6010na	
			6060na			
0600	0700	DRM	Germany, Deutsche Welle	3995eu	6130eu	
0600	0700	vl	Guyana, Voice of Guyana	3290va		
0600	0700		Kuwait, Radio Kuwait	15110as		
0600	0700		Liberia, Star Radio	3900do	3955al	
0600	0700		Malaysia, RTM/Traxx FM	7295do		
0600	0700		Malaysia, RTM/Voice of Malaysia		6175as	
			9750as	15295as		
0600	0700		Nigeria, Voice of Nigeria/External Service			
			15120eu			
0600	0700		Papua New Guinea, Radio Wantok Light		7325do	
0600	0700		Russia, Voice of Russia	15405pa		
0600	0700		South Africa, Channel Africa	7230af		
0600	0700		Swaziland, TWR Swaziland	4775af	6120af	
			9500af			
0600	0700		Uganda, UBC Radio	4975do		
0600	0700		UK, BBC World Service	3995eu	6005af	
			6190af	7310af	9860af	12015af
			12095as	15105af	15310as	17640af
			17790as			
0600	0700	Sat/Sun	UK, BBC World Service	15420af		
0600	0700	DRM	UK, BBC World Service	3995eu		
0600	0700		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0600	0700		USA, Voice of America	6080af	12080af	
			15580af			
0600	0700		USA, WEWN Vandiver AL	6890va		
0600	0700	Sun	USA, WHRI Cypress Creek SC		7365eu	
0600	0700		USA, WRMI Miami FL	9955ca		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WTWW Lebanon TN	5755va		
0600	0700		USA, WWCR Nashville TN	3215na	4840na	
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR/Family Radio Worldwide		5850ca	
			7520va	9680na	11530af	11580va
0600	0700		Zambia, 1 Africa-CVC Africa	13590af		
0600	0700	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
0600	615	Sat/Sun	South Africa, TWR Africa	11640af		
0630	0645		Vatican City State, Vatican Radio		4005eu	
			5965eu	7250eu	9645af	11740eu
			15595eu			
0630	0700		Bulgaria, Radio Bulgaria	9600eu	11600eu	
0630	0700		Vatican City State, Vatican Radio		11625af	
			13765af	15570af		
0645	0700	Sun	Germany, TWR Europe	6105eu		
0645	0700	Sun	Monaco, TWR Europe	9800eu		
0659	0700		New Zealand, Radio NZ International		6170pa	
0659	0700	DRM	New Zealand, Radio NZ International		7440pa	

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

0700	0727		Czech Republic, Radio Prague		9880eu	
0700	0730	mtwhf	France, Radio France Internationale		13675af	
0700	0730		Myanmar, Myanmar Radio	9730do		
0700	0730		Slovakia, Radio Slovakia International		9440va	
			11650va			

0700	0730	Sun	UK, Bible Voice Broadcasting Network			5945eu
0700	0745		USA, WYFR/Family Radio Worldwide			7520va
0700	0750	mtwhf	Germany, TWR Europe	6105eu		
0700	0750	mtwhf	Monaco, TWR Europe	9800eu		
0700	0800		Anguilla, Worldwide Univ Network			6090am
0700	0800		Australia, ABC NT Alice Springs			4835do
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek			4910do
0700	0800		Australia, Radio Australia	9475as		9660pa
			9710as	11945pa	12080pa	
0700	0800		Bahrain, Radio Bahrain	6010me		
0700	0800	m/DRM	Belgium, TDP Radio	6015eu		
0700	0800		Canada, CFRX Toronto ON	6070na		
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St Johns NF	6160na		
0700	0800		Canada, CKZU Vancouver BC			6160na
0700	0800		China, China Radio International			11895as
			13660as	13710eu	15125me	15350as
			17710as			
0700	0800	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0700	0800	DRM	Germany, Deutsche Welle	5790eu		9545eu
0700	0800	Sun	Germany, TWR Europe	6105eu		
0700	0800	vl	Guyana, Voice of Guyana	3290va		
0700	0800		Kuwait, Radio Kuwait	15110as		
0700	0800		Liberia, Star Radio	3900do		3955al
0700	0800		Malaysia, RTM/Traxx FM	7295do		
0700	0800		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0700	0800		Myanmar, Myanmar Radio	9730do		
0700	0800		New Zealand, Radio NZ International			6170pa
0700	0800	DRM	New Zealand, Radio NZ International			7440pa
0700	0800		Papua New Guinea, Radio Wantok Light			7325do
0700	0800		Russia, Voice of Russia	15405pa		17495va
0700	0800		South Africa, Channel Africa	7230af		
0700	0800		Swaziland, TWR Swaziland	4775af		6120af
			9500af			
0700	0800		Uganda, UBC Radio	4975do		
0700	0800		UK, BBC World Service	5790eu		6190af
			9860af	11760me	11765af	13830af
			15400af	15575as	17790as	17830af
0700	0800	Sat/Sun	UK, BBC World Service	15420af		
0700	0800	Sat	UK, Bible Voice Broadcasting Network			5945eu
0700	0800		Ukraine, Radio Ukraine International			11620eu
0700	0800		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0700	0800		USA, WEWN Vandiver AL	6890va		
0700	0800	Sun	USA, WHRI Cypress Creek SC			11565pa
0700	0800		USA, WRMI Miami FL	9955ca		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WTWW Lebanon TN	5755va		
0700	0800		USA, WWCR Nashville TN	3215na		4840na
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		USA, WYFR/Family Radio Worldwide			5950na
			5985na	6875na	9385af	9505ca
0700	0800		Zambia, 1 Africa-CVC Africa	13590af		
0700	0800	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
0715	0750	Sat	Germany, TWR Europe	6105eu		
0715	0750	Sat	Monaco, TWR Europe	9800eu		
0730	0800		Australia, HCJB Global Voice Australia			11750as
0730	0800		Clandestine, Cotton Tree News			15220af

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

0800	0815	Sat	UK, Bible Voice Broadcasting Network			5945eu
0800	0820	Sun	Germany, TWR Europe	6105eu		
0800	0830		Australia, ABC NT Alice Springs			4835do
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek			4910do
0800	0830		Myanmar, Myanmar Radio	9730do		
0800	0845		USA, WYFR/Family Radio Worldwide			5950na
			5985na	9385af		
0800	0900		Anguilla, Worldwide Univ Network			6090am
0800	0900		Australia, HCJB Global Voice Australia			11750pa
0800	0900		Australia, Radio Australia	5995pa		9475as
			9580pa	9590pa	9710pa	11945pa
			12080pa	13630as		
0800	0900		Bahrain, Radio Bahrain	6010me		
0800	0900	t/DRM	Belgium, TDP Radio	6015eu		
0800	0900		Bhutan, Bhutan Broadcasting Service			6035as
0800	0900		Canada, CFRX Toronto ON	6070na		
0800	0900		Canada, CFVP Calgary AB	6030na		
0800	0900		Canada, CKZN St Johns NF	6160na		
0800	0900		Canada, CKZU Vancouver BC			6160na
0800	0900		China, China Radio International			11620as
			11895as	13710eu	15350as	15465as
			15625me	17540as		
0800	0900	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0800	0900	DRM	Germany, Deutsche Welle	12095as		
0800	0900	vl	Guyana, Voice of Guyana	3290va		
0800	0900		Liberia, Star Radio	3900do		3955al
0800	0900		Malaysia, RTM/Traxx FM	7295do		
0800	0900		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0800	0900		New Zealand, Radio NZ International			6170pa
0800	0900	DRM	New Zealand, Radio NZ International			7440pa
0800	0900		Papua New Guinea, Radio Wantok Light			7325do
0800	0900	DRM	Russia, Voice of Russia	12060eu		
0800	0900	Sun	South Africa, Amateur Radio Mirror Intl			7205af
			17570af			
0800	0900		South Africa, Channel Africa	9625af		
0800	0900		South Korea, KBS World Radio			9570as
0800	0900		Swaziland, TWR Swaziland	4775af		6120af
			9500af			
0800	0900		Uganda, UBC Radio	4975do		
0800	0900		UK, BBC World Service	6190af		9860af
			11760me	15310as	15400af	15575as
			17640af	17790as	17830af	21470af
0800	0900		Ukraine, Radio Ukraine International			11620eu
0800	0900		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0800	0900		USA, KNLS Anchor Point AK	11765as		
0800	0900		USA, WEWN Vandiver AL	6890va		
0800	0900	smtwhf	USA, WHRI Cypress Creek SC			11565pa
0800	0900		USA, WRMI Miami FL	9955ca		
0800	0900		USA, WTJC Newport NC	9370na		
0800	0900		USA, WTWW Lebanon TN	5755va		
0800	0900		USA, WWCR Nashville TN	3215na		4840na
0800	0900		USA, WWRB Manchester TN	3185na		
0800	0900		USA, WYFR/Family Radio Worldwide			5985na
			6875na			
0800	0900		Zambia, 1 Africa-CVC Africa	13590af		
0800	0900	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
0815	0825		Nepal, Radio Nepal	5005as		
0820	0900	smtwhf	Guam, KTWR/TWR	15170as		
0830	0900		Australia, ABC NT Alice Springs			2310do
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek			2325do
0830	0900	mtwhfa	Guam, KTWR/TWR	11840pa		
0845	0900	mtwhf	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			

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

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa		
0900	0915	mtwhf	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0900	0927		Czech Republic, Radio Prague			17650af
0900	0930		Australia, HCJB Global Voice Australia			11750pa
0900	0930	DRM	Bulgaria, Radio Bulgaria	11900eu		
0900	0959		Germany, Deutsche Welle	15640as		17820as
0900	1000		Anguilla, Worldwide Univ Network			6090am
0900	1000		Australia, ABC NT Alice Springs			2310do
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, Radio Australia	9475as		9580pa
			9590pa	11945pa		
0900	1000		Bahrain, Radio Bahrain	6010me		
0900	1000	w/DRM	Belgium, TDP Radio	6015eu		
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		
0900	1000		Canada, CKZN St Johns NF	6160na		
0900	1000		Canada, CKZU Vancouver BC			6160na
0900	1000		China, China Radio International			11620as
			13790pa	15210as	15270eu	15350as
			17490eu	17570eu	17750as	
0900	1000	mtwhf	Equatorial Guinea, Radio Africa # 2			15190af
0900	1000	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
0900	1000	2nd Sun	Germany, Blue Star Radio	6140eu		
0900	1000	3rd Sun	Germany, European Music Radio			6140eu
0900	1000	4th Sun	Germany, Radio Gloria International			6140eu
0900	1000	vl	Guyana, Voice of Guyana	3290va		
0900	1000		Malaysia, RTM/Traxx FM	7295do		
0900	1000		Malaysia, RTM/Voice of Malaysia			6175as
			9750as	15295as		
0900	1000		New Zealand, Radio NZ International			6170pa

0900	1000	DRM	New Zealand, Radio NZ International	7440pa		
0900	1000		Nigeria, Voice of Nigeria/External Service 9690af			
0900	1000		Papua New Guinea, Radio Wantok Light	7325do		
0900	1000		Russia, Voice of Russia	17495pa		
0900	1000	DRM	Russia, Voice of Russia	12060eu		
0900	1000	3rd Sat	Slovakia, IRRS/Radio City	9510va		
0900	1000	1st Sat	Slovakia, IRRS/Radio Joystick	9510va		
0900	1000		Tajikistan, Voice of Tajik/External Service	7245va		
0900	1000		Uganda, UBC Radio	4975do		
0900	1000	DRM	UK, BBC World Service	9610eu	13810eu	
0900	1000		UK, BBC World Service	6190af	6195as	
			9740as	9860af	11760me	15105as
			15285as	15310as	15400af	15575as
			17640as	17760as	17830af	21470af
			21660as			
0900	1000		Ukraine, Radio Ukraine International	11620na		
0900	1000		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0900	1000		USA, WEWN Vandiver AL	11520va		
0900	1000	Sun	USA, WHRI Cypress Creek SC	11565pa		
0900	1000		USA, WRMI Miami FL	9955ca		
0900	1000		USA, WTJC Newport NC	9370na		
0900	1000		USA, WTWW Lebanon TN	5755va		
0900	1000		USA, WWCR Nashville TN	4840na	9985na	
0900	1000		USA, WWRB Manchester TN	3185na		
0900	1000		USA, WYFR/Family Radio Worldwide	5985na		
			6875na	9465as	9755na	
0900	1000		Zambia, 1 Africa-CVC Africa	13590af		
0900	1000	vl	Zambia, Radio Christian Voice/The Voice Africa 6065af			
0930	1000		Saudi Arabia, BSKSA/Saudi Radio	15250af		
0930	1000	Sun	Slovakia, IRRS/Euro Gospel Radio	9515va		

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

1000	1030		Czech Republic, Radio Prague	9955na		
1000	1030		Japan, NHK World/ Radio Japan	9605as		
			9625pa	9825pa	11780as	
1000	1030	fa	Philippines, FEBC	15325as		
1000	1030		Vietnam, Voice of Vietnam	9840as	12020as	
1000	1057		Netherlands, R Netherlands Worldwide	11895as		
			12065as	15110as		
1000	1057		North Korea, Voice of Korea	11710sa	11735sa	
			13650as	15180sa		
1000	1058		New Zealand, Radio NZ International	6170pa		
1000	1100		Anguilla, Worldwide Univ Network	11775am		
1000	1100		Australia, ABC NT Alice Springs	2310do		
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek	2325do		
1000	1100		Australia, Radio Australia	9475as	9580pa	
			9590pa	11945pa		
1000	1100		Bahrain, Radio Bahrain	6010me		
1000	1100	h/DRM	Belgium, TDP Radio	6015eu		
1000	1100		Canada, CFRX Toronto ON	6070na		
1000	1100		Canada, CFVP Calgary AB	6030na		
1000	1100		Canada, CKZN St Johns NF	6160na		
1000	1100		Canada, CKZU Vancouver BC	6160na		
1000	1100		China, China Radio International	6040na		
			11610as	11635eu	13590as	13620as
			13720as	13790pa	15190as	15350as
			17490eu			
1000	1100	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
1000	1100	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1000	1100	DRM	Germany, Deutsche Welle	9545eu	13810eu	
1000	1100		India, All India Radio	7270as	13695pa	
			15020as	15260as	15410pa	17800pa
			17895pa			
1000	1100		Indonesia, Voice of Indonesia	9526va	11785al	
1000	1100		Malaysia, RTM/Traxx FM	7295do		
1000	1100	DRM	New Zealand, Radio NZ International	7440pa		
1000	1100		Nigeria, Voice of Nigeria/External Service 9690af			
1000	1100	mt	Palau, T8WH/WHRI/Sound of Hope Radio	9930as	15725as	
1000	1100	hfa	Palau, T8WH/WHRI/Sound of Hope Radio 9930as			
1000	1100		Papua New Guinea, Radio Wantok Light	7325do		
1000	1100		Saudi Arabia, BSKSA/Saudi Radio 15470af	15250af		
1000	1100	Sun	Slovakia, IRRS/Euro Gospel Radio	9515va		
1000	1100		Uganda, UBC Radio	4975do		
1000	1100	DRM	UK, BBC World Service	9545eu	13810eu	
1000	1100	Sat/Sun	UK, BBC World Service	15400af	17830af	
1000	1100		UK, BBC World Service	6190af	6195as	
			9545eu	9740as	9860af	11760me
			15285as	15310as	15575as	17640af
			17790as	21470af	21660as	
1000	1100		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1000	1100		USA, KNLS Anchor Point AK	11765as		
1000	1100		USA, WEWN Vandiver AL	11520va		
1000	1100		USA, WINB Red Lion PA	9265ca		
1000	1100		USA, WRMI Miami FL	9955ca		
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WTWW Lebanon TN	5755va		
1000	1100		USA, WWCR Nashville TN	4840na	9985na	
1000	1100		USA, WWRB Manchester TN	3185na		
1000	1100		USA, WYFR/Family Radio Worldwide	5950na		
			5985na	6875na	9450as	9465as
			9755na			
1000	1100		Zambia, 1 Africa-CVC Africa	13590af		
1000	1100	vl	Zambia, Radio Christian Voice/The Voice Africa 6065af			
1030	1057		Czech Republic, Radio Prague	9880eu		
1030	1100		Iran, VOIRI/IRIB	15600as	17660as	
1030	1100		Mongolia, Voice of Mongolia	12085as		
1059	1100		New Zealand, Radio NZ International	9655pa		

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

1100	1105		Pakistan, PBC/Radio Pakistan	15100as	17720as	
1100	1127		Iran, VOIRI/IRIB	15600as	17660as	
1100	1130	f/DRM	Japan, NHK World/ Radio Japan	9760eu		
1100	1130	Sat/DRM	South Korea, KBS World Radio	9760eu		
1100	1130	mtwhf	UK, BBC World Service	15400af		
1100	1130		Vietnam, Voice of Vietnam	7285as		
1100	1145		USA, WYFR/Family Radio Worldwide	6875na		
			9550sa	9755na		
1100	1156		Romania, Radio Romania International	15210eu		
			15430eu	17510af	17670af	
1100	1158	DRM	New Zealand, Radio NZ International	7440pa		
1100	1200		Anguilla, Worldwide Univ Network	11775am		
1100	1200		Australia, ABC NT Alice Springs	2310do		
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek	2325do		
1100	1200		Australia, Radio Australia	5995pa	6020pa	
			9475as	9580pa	9590pa	9965as
			11945pa			
1100	1200	DRM	Australia, Radio Australia	12080pa		
1100	1200		Bahrain, Radio Bahrain	6010me		
1100	1200	f/DRM	Belgium, TDP Radio	6015eu		
1100	1200	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1100	1200		Canada, CFRX Toronto ON	6070na		
1100	1200		Canada, CFVP Calgary AB	6030na		
1100	1200		Canada, CKZN St Johns NF	6160na		
1100	1200		Canada, CKZU Vancouver BC	6160na		
1100	1200		China, China Radio International	5955as		
			6040na	11650as	11660as	11750na
			11795as	13590as	13645as	13650eu
			13720as	17490eu		
1100	1200	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
1100	1200	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1100	1200		Malaysia, RTM/Traxx FM	7295do		
1100	1200		New Zealand, Radio NZ International	9655pa		
1100	1200		Nigeria, Voice of Nigeria/External Service 9690af			
1100	1200		Papua New Guinea, Radio Wantok Light	7325do		
1100	1200		Saudi Arabia, BSKSA/Saudi Radio 15470af	15250af		
1100	1200	Sun	Slovakia, IRRS/Euro Gospel Radio	9515va		
1100	1200		Taiwan, Radio Taiwan International 11715as	7445as		
1100	1200		Uganda, UBC Radio	4975do		
1100	1200		UK, BBC World Service	6190af	6195as	
			9545eu	9740as	9860af	11760me
			15280as	15310as	15575as	17640af
			17790as	17830af	21470af	
1100	1200		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1100	1200		USA, WEWN Vandiver AL	11520va		
1100	1200		USA, WINB Red Lion PA	9265ca		
1100	1200		USA, WRMI Miami FL	9955ca		
1100	1200		USA, WTJC Newport NC	9370na		
1100	1200		USA, WTWW Lebanon TN	5755na		
1100	1200		USA, WWCR Nashville TN	4840na	5890na	
			15825na			
1100	1200		USA, WWRB Manchester TN	3185na		

1100	1200		USA, WYFR/Family Radio Worldwide				5950na
			5985na	7730sa	9625sa		15560as
1100	1200		Zambia, 1 Africa-CVC Africa				13590af
1100	1200	vl	Zambia, Radio Christian Voice/The Voice Africa				
			6065af				
1130	1150	f	Vatican City State, Vatican Radio				15595as
			17765as				
1130	1200	Sat/Sun	Australia, HCJB Global Voice Australia				15400as
1130	1200	f	Vatican City State, Vatican Radio/Mass				15595me
			17765me				
1130	1200		Vietnam, Voice of Vietnam		9840as		12020as
1145	1200	Sat/Sun	UK, Bible Voice Broadcasting Network				7245as

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

1200	1215		Nepal, Radio Nepal		5005as		
1200	1215	Sat/Sun	UK, Bible Voice Broadcasting Network				7245as
1200	1230	mtwhf	France, Radio France Internationale				21620af
1200	1230		Japan, NHK World/ Radio Japan				6120na
			9625pa	9695as	9790eu		
1200	1230		Saudi Arabia, BSKSA/Saudi Radio				15250af
			15470af				
1200	1230	mtwhfa	Vatican City State, Vatican Radio				9830am
1200	1245		USA, WYFR/Family Radio Worldwide				5950na
			5985na				
1200	1258		New Zealand, Radio NZ International				9655pa
1200	1259		Poland, Polskie Radio Warsaw				11675eu
			11980eu				
1200	1300		Anguilla, Worldwide Univ Network				11775am
1200	1300		Australia, ABC NT Alice Springs				2310do
1200	1300		Australia, ABC NT Katherine		2485do		
1200	1300		Australia, ABC NT Tennant Creek				2325do
1200	1300	Sat/Sun	Australia, HCJB Global Voice Australia				15400as
1200	1300		Australia, Radio Australia		6020pa		9475as
			9580pa	9965as	11945pa		
1200	1300	DRM	Australia, Radio Australia		5995pa		
1200	1300		Bahrain, Radio Bahrain		6010me		
1200	1300	a/DRM	Belgium, TDP Radio		6015eu		
1200	1300	Sat/Sun	Canada, CBC NQ SW Service				9625na
1200	1300		Canada, CFRX Toronto ON		6070na		
1200	1300		Canada, CFVP Calgary AB		6030na		
1200	1300		Canada, CKZN St Johns NF		6160na		
1200	1300		Canada, CKZU Vancouver BC				6160na
1200	1300		China, China Radio International				5955as
			9460as	9660as	9730as	9760pa	
			11650as	11660as	11690me	11760pa	
			11980as	13645as	13650eu	13790eu	
			17490eu				
1200	1300	Sat/Sun	Equatorial Guinea, Radio East Africa				15190af
1200	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service				
			5990do	7110do	9705do		
1200	1300	DRM	Germany, Deutsche Welle		9545eu		13810eu
1200	1300		Malaysia, RTM/Traxx FM		7295do		
1200	1300		Nigeria, Voice of Nigeria/External Service				
			9690af				
1200	1300		Papua New Guinea, Radio Wantok Light				7325do
1200	1300		Russia, Voice of Russia		11500as		
1200	1300		South Korea, KBS World Radio				9650na
1200	1300		Uganda, UBC Radio		4975do		
1200	1300		UK, BBC World Service		5875as		6190af
			6195as	9545eu	9740as		9860af
			11750as	11760me	15310as		15575as
			17640af	17790as	17830af		
1200	1300		USA, American Forces Network				4319usb
			5446usb	5765usb	7812usb		12133usb
			12759usb	13362usb			
1200	1300		USA, KNLS Anchor Point AK		7355as		9680as
1200	1300		USA, Voice of America		7575va		9510va
			9760va	12075va			
1200	1300		USA, WEWN Vandiver AL		11520va		
1200	1300		USA, WHRI Cypress Creek SC				7315na
1200	1300	Sun	USA, WHRI Cypress Creek SC				9410na
1200	1300		USA, WINB Red Lion PA		9265ca		
1200	1300		USA, WRMI Miami FL		9955ca		
1200	1300		USA, WTJC Newport NC		9370na		
1200	1300		USA, WTWW Lebanon TN		9479na		
1200	1300		USA, WWCR Nashville TN		7490af		9980na
			13845na	15825na			
1200	1300		USA, WWRB Manchester TN		3185na		
1200	1300		USA, WYFR/Family Radio Worldwide				17555sa
			17795na				
1200	1300		Zambia, 1 Africa-CVC Africa		13590af		
1200	1300	vl	Zambia, Radio Christian Voice/The Voice Africa				
			6065af				
1215	1300		Egypt, Radio Cairo		17870as		
1215	1300	mtwhyf	UK, BBC World Service		9410ca		11860ca
1230	1300	mtwhf	Australia, HCJB Global Voice Australia				15400as
1230	1300		Bangladesh, Bangladesh Betar				7250as
1230	1300		Saudi Arabia, BSKSA/Saudi Radio				15470af
1230	1300		Thailand, Radio Thailand World Service				9890va
1230	1300		Turkey, Voice of Turkey		15450eu		15520as
1230	1300		Vietnam, Voice of Vietnam		9840as		12020as

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

1300	1327		Czech Republic, Radio Prague				11600eu
1300	1330		Australia, HCJB Global Voice Australia				15400as
1300	1330		Egypt, Radio Cairo		17870as		
1300	1330		Japan, NHK World/ Radio Japan				11985as
1300	1330		Laos, Lao National Radio		7145as		
1300	1330		Turkey, Voice of Turkey		15450as		15520eu
1300	1330	Sat/Sun	USA, WHRI Cypress Creek SC				9840na
1300	1357		North Korea, Voice of Korea		9335eu		11710na
			13760as	15245eu			
1300	1400		Anguilla, Worldwide Univ Network				11775am
1300	1400		Australia, ABC NT Alice Springs				2310do
1300	1400		Australia, ABC NT Katherine		2485do		
1300	1400		Australia, Radio Australia		6020pa		9580pa
			9590pa				
1300	1400	DRM	Australia, Radio Australia		5995pa		
1300	1400		Bahrain, Radio Bahrain		6010me		
1300	1400	s/DRM	Belgium, TDP Radio		6015na		
1300	1400	Sat/Sun	Canada, CBC NQ SW Service				9625na
1300	1400		Canada, CFRX Toronto ON		6070na		
1300	1400		Canada, CFVP Calgary AB		6030na		
1300	1400		Canada, CKZN St Johns NF		6160na		
1300	1400		Canada, CKZU Vancouver BC				6160na
1300	1400		China, China Radio International				5995as
			9570na	9650na	9730as	9765as	
			9870as	11660as	11760me	11980as	
			13610eu	13755as	15260na		
1300	1400	Sat/Sun	Equatorial Guinea, Radio East Africa				15190af
1300	1400		Indonesia, Voice of Indonesia		9526va		11785al
1300	1400		Malaysia, RTM/Traxx FM		7295do		
1300	1400		New Zealand, Radio NZ International				6170pa
1300	1400		Nigeria, Voice of Nigeria/External Service				
			9690af				
1300	1400		Palau, T8WH/WHRI/Sound of Hope Radio				
			9930as				
1300	1400		Papua New Guinea, Radio Wantok Light				7325do
1300	1400		South Korea, KBS World Radio				9770as
1300	1400		Tajikistan, Voice of Tajik/External Service				7245va
1300	1400		Uganda, UBC Radio		4975do		
1300	1400		UK, BBC World Service		5875as		6190af
			6195as	9545eu	9740as		9860af
			11760me	15310as	15420af		15575as
			17640af	17790as	17830af		21470af
1300	1400		USA, American Forces Network				4319usb
			5446usb	5765usb	7812usb		12133usb
			12759usb	13362usb			
1300	1400		USA, KJES Vado NM		11715na		
1300	1400	Sat/Sun	USA, Voice of America		7575va		9510va
			9760va				
1300	1400		USA, WBCQ Monticello ME		9330am		
1300	1400		USA, WEWN Vandiver AL		13835eu		
1300	1400		USA, WINB Red Lion PA		9265ca		
1300	1400		USA, WRMI Miami FL		9955ca		
1300	1400		USA, WTJC Newport NC		9370na		
1300	1400		USA, WTWW Lebanon TN		9479na		
1300	1400		USA, WWCR Nashville TN		7490af		9980na
			13845na	15825na			
1300	1400		USA, WWRB Manchester TN		9385na		
1300	1400		USA, WYFR/Family Radio Worldwide				11520as
			11560as	11830na	11910na		12155as
			13820as	17795na			
1300	1400		Zambia, 1 Africa-CVC Africa		13590af		
1300	1400	vl	Zambia, Radio Christian Voice/The Voice Africa				
			6065af				
1305	1400	Sun	Greece, Voice of Greece		9420va		15630va
1330	1400	mta	Guam, KSDA/AWR		11860as		
1330	1400		India, All India Radio		9690as		11620as
			13710as				
1330	1400		Vietnam, Voice of Vietnam		9840as		12020as

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

1400	1415	Sun	Germany, Pan American Broadcasting				15205as
1400	1425	mh	Guam, KTWR/TWR		9975as		
1400	1430		China, CNR-11/Holy Tibet		6010do		7350do
			9480do				
1400	1430	`	Japan, NHK World/ Radio Japan				11705as
			11985as	21560va			
1400	1430		Thailand, Radio Thailand World Service				9575va

1400	1430	Sun	United Arab Emirates, FEBA Radio	12025as
1400	1435	twfas	Guam, KTWR/TWR	9975as
1400	1500		Anguilla, Worldwide Univ Network	11775am
1400	1500		Australia, ABC NT Alice Springs	2310do
1400	1500		Australia, ABC NT Katherine	2485do
1400	1500		Australia, ABC NT Tennant Creek	2325do
1400	1500		Australia, Radio Australia 6080pa 7240pa 9590pa	
1400	1500		Bahrain, Radio Bahrain 6010me	
1400	1500	DRM	Belgium, TDP Radio/Disco Palace	6015eu
1400	1500		Bhutan, Bhutan Broadcasting Service	6035as
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na
1400	1500		Canada, CFRX Toronto ON 6070na	
1400	1500		Canada, CFVP Calgary AB 6030na	
1400	1500		Canada, CKZN St Johns NF 6160na	
1400	1500		Canada, CKZU Vancouver BC	6160na
1400	1500		China, China Radio International 9765as 9870as 11665as 11675as 11765eu 13710as 13740na 13790eu 17630as	5955as
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
1400	1500		India, All India Radio 9690as 13710as	11620as
1400	1500		Libya, LJBC Voice of Africa 17725af	21695af
1400	1500		Malaysia, RTM/Traxx FM 7295do	
1400	1500		Netherlands, R Netherlands Worldwide 15745as	11835as
1400	1500		New Zealand, Radio NZ International	6170pa
1400	1500		Nigeria, Voice of Nigeria/External Service 9690af	
1400	1500		Palau, T8WH/WHRI/Sound of Hope Radio 9930as	
1400	1500		Papua New Guinea, Radio Wantok Light	7325do
1400	1500		Russia, Voice of Russia 4975va 11500as	9455as
1400	1500	DRM	Russia, Voice of Russia 9750eu	
1400	1500		South Africa, Channel Africa 9625af	
1400	1500		Uganda, UBC Radio 4975do	
1400	1500		UK, BBC World Service 5790eu 6190af 6195as 7230af 11920as 12095as 15310as 17830af 21470af	5875as 9740as 17640af
1400	1500	DRM	UK, BBC World Service 9545eu	13590eu
1400	1500	Sat	UK, Bible Voice Broadcasting Network	15265as
1400	1500		United States, Overcomer Ministries	13810me
1400	1500		USA, American Forces Network 5446usb 5765usb 7812usb 12759usb 13362usb	4319usb 12133usb
1400	1500		USA, KJES Vado NM 11715am	
1400	1500		USA, KNLS Anchor Point AK 11765as	
1400	1500		USA, Voice of America 6080af 13570af 15530af 15580af 17740af	12080af 17585af
1400	1500	mtwhf	USA, Voice of America 7540va 9760va	7575va
1400	1500		USA, WBCQ Monticello ME 9330am	
1400	1500	Sat	USA, WBCQ Monticello ME 15420am	
1400	1500		USA, WEWN Vandiver AL 13835as	
1400	1500	Sat	USA, WHRI Cypress Creek SC	9840na
1400	1500		USA, WINB Red Lion PA 9265ca	
1400	1500		USA, WJHR International Milton FL	15550na
1400	1500		USA, WRMI Miami FL 9955ca	
1400	1500		USA, WTJC Newport NC 9370na	
1400	1500		USA, WTWW Lebanon TN 9479na	
1400	1500		USA, WWCR Nashville TN 7490af 13845na 15825na	9980na
1400	1500		USA, WWRB Manchester TN 9385na	
1400	1500		USA, WYFR/Family Radio Worldwide 9615as 9865as 11560as 11830na 11910na 13695na	9365as 11725as 17795na
1400	1500		Zambia, 1 Africa-CVC Africa	13590af
1400	1500	vl	Zambia, Radio Christian Voice/The Voice Africa 6065af	
1415	1430		Germany, Pan American Broadcasting	15205as
1415	1430		Nepal, Radio Nepal 5005as	
1415	1500	Sun	UK, Bible Voice Broadcasting Network	15265as
1425	1455	mtwhf	Swaziland, TWR Swaziland 6065af	
1430	1445	Sun	Germany, Pan American Broadcasting	15205as
1430	1459		China, CNR-2/Business Radio 6155do 7245as 7315as 7375as 9820as	6055do 7335as
1430	1500	mtwhfa	Albania, Radio Tirana	13625na
1430	1500		Australia, Radio Australia 9475as	11660as
1430	1500		China, China Radio International 11695as 12110as	7325as
1430	1500	Sat	UK, Bible Voice Broadcasting Network	15265as
1445	1500	Sat/Sun	Australia, HCJB Global Voice Australia	15340as

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi	5015eu
1500	1515	Sun	UK, Bible Voice Broadcasting Network	13740as
1500	1530		Australia, HCJB Global Voice Australia	15340as
1500	1530	Sun	China, Voice of the Strait 4940do	9505do
1500	1530		Clandestine, Sudan Radio Service/ SRS	17745af
1500	1530		Guam, KSDA/AWR 11720as	
1500	1530		UK, BBC World Service 7405af 15420af	11860af
1500	1530		Vietnam, Voice of Vietnam 7285as 12020as	9840as
1500	1545		USA, WYFR/Family Radio Worldwide	15770sa
1500	1550		New Zealand, Radio NZ International	6170pa
1500	1557		Canada, Radio Canada International 15125as	11675as
1500	1557		Libya, LJBC Voice of Africa 17725af	21695af
1500	1557		Netherlands, R Netherlands Worldwide 15745as	11835as
1500	1557		North Korea, Voice of Korea 9335eu 13760na 15245eu	11710na
1500	1600		Anguilla, Worldwide Univ Network	11775am
1500	1600		Australia, ABC NT Alice Springs	2310do
1500	1600		Australia, ABC NT Katherine 2485do	
1500	1600		Australia, Radio Australia 5995pa 7240pa 9475as 9590pa	6080pa 11660as
1500	1600		Bahrain, Radio Bahrain 6010me	
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na
1500	1600		Canada, CFRX Toronto ON 6070na	
1500	1600		Canada, CFVP Calgary AB 6030na	
1500	1600		Canada, CKZN St Johns NF 6160na	
1500	1600		Canada, CKZU Vancouver BC	6160na
1500	1600		China, China Radio International 6095me 7325as 7410as 9720me 9870as 9800as 11965eu 13640eu 13740na 17630as	5955as
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
1500	1600		Malaysia, RTM/Traxx FM 7295do	
1500	1600		Myanmar, Myanmar Radio 5985as	
1500	1600		Nigeria, Voice of Nigeria/External Service 15120af	
1500	1600		Papua New Guinea, Radio Wantok Light	7325do
1500	1600		Russia, Voice of Russia 4975va 9735me 11985va 12040eu 11985af	9455as 13855af
1500	1600		South Africa, Channel Africa 9625af	
1500	1600	vl	Uganda, Dunamis Shortwave 4750af	
1500	1600		Uganda, UBC Radio 4975do	
1500	1600		UK, BBC World Service 5790eu 6190af 6195as 7230af 9740as 11920as 12095eu 15310as 15400af 17640af 17830af 21470af	5875as
1500	1600	DRM	UK, BBC World Service 5790eu	13590eu
1500	1600		United States, Overcomer Ministries	17485af
1500	1600		USA, American Forces Network 5446usb 5765usb 7812usb 12759usb 13362usb	4319usb 12133usb
1500	1600		USA, Voice of America 4930af 7575va 12080af 12150va 15530va 15580af 17895af	7540va 13750va
1500	1600		USA, Voice of America/Special English 7520va 9485va 9760va	6140va
1500	1600		USA, WBCQ Monticello ME 9330am	
1500	1600	Sat	USA, WBCQ Monticello ME 15420am	
1500	1600		USA, WEWN Vandiver AL 13835as	
1500	1600	Sat	USA, WHRI Cypress Creek SC	17510af
1500	1600	Sun	USA, WHRI Cypress Creek SC 15195eu	9840na
1500	1600	smtwhf	USA, WINB Red Lion PA 13570ca	
1500	1600	Sat	USA, WINB Red Lion PA 9265ca	
1500	1600		USA, WJHR International Milton FL	15550na
1500	1600		USA, WRMI Miami FL 9955na	
1500	1600		USA, WTJC Newport NC 9370na	
1500	1600		USA, WTWW Lebanon TN 9479na	
1500	1600		USA, WWCR Nashville TN 7490af 13845na 15825na	9980na
1500	1600		USA, WWRB Manchester TN 9385na	
1500	1600		USA, WYFR/Family Radio Worldwide 11605as 11830na 11910na 17580af 17795na	6280as 15520na
1500	1600		Zambia, 1 Africa-CVC Africa	13590af
1500	1600	vl	Zambia, Radio Christian Voice/The Voice Africa 6065af	
1505	1600	DRM	Canada, Radio Canada International	9800na
1505	1600		Canada, Radio Canada International	9515as
1515	1530		Vatican City State, Vatican Radio 13765as 15235as	11850as

1515	1545	Sat	UK, Bible Voice Broadcasting Network			13740as
1525	1600	Sat/Sun	Swaziland, TWR Swaziland	6025af		
1530	1545		India, All India Radio	7255do		9820do
			9910do			
1530	1558	Sat	Vatican City State, Vatican Radio			11850as
			13765as	15235as		
1530	1600		China, Xizang PBS/Holy Tibet	4905do		4920do
			5240do	6110do	6130do	6200do
			7255do	7385do		
1530	1600		Germany, AWR Europe	15255as		
1530	1600		Iran, VOIRI/IRIB	7305as	9600as	
1530	1600		Mongolia, Voice of Mongolia	9665as		12085as
1530	1600	h	UK, Bible Voice Broadcasting Network			13740as
1530	1600	Sun	UK, Bible Voice Broadcasting Network			13590me
1545	1600	mtwha	UK, Bible Voice Broadcasting Network			13590me
1551	1600		New Zealand, Radio NZ International			7440pa
1551	1600	DRM	New Zealand, Radio NZ International			6170pa

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

1600	1605	Sun	Croatia, Croatian Radio	6165eu		
1600	1615	mtwhfa	Croatia, Croatian Radio	6165eu		
1600	1615		Pakistan, PBC/Radio Pakistan	7530me		11565af
			11585va			
1600	1615	f	UK, Bible Voice Broadcasting Network			13590me
1600	1620	t	UK, Bible Voice Broadcasting Network			13590me
1600	1625	Sat/Sun	Swaziland, TWR Swaziland	6025af		
1600	1627		Czech Republic, Radio Prague			9740eu
1600	1627		Iran, VOIRI/IRIB	7305as	9600as	
1600	1630	Sun	Germany, Pan American Broadcasting			13830me
1600	1630		Guam, KSDA/AWR	11720as		11805as
1600	1630		Myanmar, Myanmar Radio	9730do		
1600	1630		Vietnam, Voice of Vietnam	7220me		7280eu
			9550me	9730eu		
1600	1645	h	UK, Bible Voice Broadcasting Network			13590me
1600	1645		USA, WYFR/Family Radio Worldwide			11830na
			11865na			
1600	1657		North Korea, Voice of Korea	9990na		11545va
1600	1700		Anguilla, Worldwide Univ Network			11775am
1600	1700		Australia, ABC NT Alice Springs			2310do
1600	1700		Australia, ABC NT Katherine	2485do		
1600	1700		Australia, Radio Australia	5995pa		6080pa
			7240pa	9465as	9710pa	11660as
1600	1700		Bahrain, Radio Bahrain	6010me		
1600	1700	Sat	Canada, CBC NQ SW Service			9625na
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St Johns NF	6160na		
1600	1700		Canada, CKZU Vancouver BC			6160na
1600	1700		Canada, Radio Canada International			9515as
1600	1700	DRM	Canada, Radio Canada International			9800na
1600	1700		China, China Radio International			6060as
			7235as	7420af	9570af	11900af
			11940eu	11965eu	13760eu	
1600	1700		Egypt, Radio Cairo	12170af		
1600	1700		Ethiopia, Radio Ethiopia/External Service			7165va
			9560af			
1600	1700	mtwhf	France, Radio France Internationale			15605af
			17605af			
1600	1700		Germany, Deutsche Welle	6170as		9485as
			9540as	15410as		
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		New Zealand, Radio NZ International			7440pa
1600	1700	DRM	New Zealand, Radio NZ International			6170pa
1600	1700		Papua New Guinea, Radio Wantok Light			7325do
1600	1700		Russia, Voice of Russia	4975va		11985va
			11985af	12040eu	13855af	
1600	1700		South Korea, KBS World Radio			9515eu
1600	1700		Taiwan, Radio Taiwan International			11550as
			13840as			
1600	1700	vl	Uganda, Dunamis Shortwave	4750af		
1600	1700		Uganda, UBC Radio	4975do		
1600	1700		UK, BBC World Service	3255af		5790eu
			5850as	5975as	6190af	9695as
			12095eu	15400af	17640af	17795af
			17830af	21470af		
1600	1700	DRM	UK, BBC World Service	3995eu		5790eu
1600	1700	Sat/Sun	UK, Bible Voice Broadcasting Network			13590me
1600	1700		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1600	1700		USA, Voice of America	4930af		6080af
			15580af			
1600	1700		USA, Voice of America/Special English			11890va
			12080va	13570va		
1600	1700		USA, WBCQ Monticello ME	9330am		
1600	1700	Sat	USA, WBCQ Monticello ME	15420am		
1600	1700		USA, WEWN Vandiver AL	15610va		
1600	1700	Sun	USA, WHRI Cypress Creek SC			9840na
1600	1700	has	USA, WHRI Cypress Creek SC			17520af
1600	1700	smtwhf	USA, WINB Red Lion PA	13570ca		
1600	1700	Sat	USA, WINB Red Lion PA	9265ca		
1600	1700		USA, WJHR International Milton FL			15550na
1600	1700		USA, WRMI Miami FL	9955na		
1600	1700		USA, WTJC Newport NC	9370na		
1600	1700		USA, WTWW Lebanon TN	9479na		
1600	1700		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385na		
1600	1700		USA, WYFR/Family Radio Worldwide			6010af
			6085ca	7270af	11850as	13695na
			17545af	17795na	18980va	21485eu
			21525af			
1600	1700		Zambia, 1 Africa-CVC Africa	13590af		
1600	1700	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1615	1630	mtwhf	Swaziland, TWR Swaziland	6130af		
1615	1630		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	15595eu	
1615	1700	Sun	UK, BBC World Service	7405af		11860af
			15420af			
1630	1700		Guam, KSDA/AWR	11740as		
1630	1700		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1630	1700		Slovakia, Radio Slovakia International			5920eu
			6055eu			
1630	1700	Sat/Sun	Swaziland, TWR Swaziland	6130af		
1630	1700	Sat	UK, BBC World Service	11860af		
1630	1700	mtwhf	UK, BBC World Service	15420af		
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi			4930eu

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

1700	1705		Canada, Radio Canada International			9515as
1700	1705	DRM	Canada, Radio Canada International			9800na
1700	1715	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
1700	1715	t	UK, Bible Voice Broadcasting Network			13590me
1700	1725		Vietnam, Voice of Vietnam			9725eu
1700	1727		Czech Republic, Radio Prague			9740eu
1700	1730	DRM	Romania, Radio Romania International			7350eu
1700	1730	Sat	UK, Bible Voice Broadcasting Network			13590me
1700	1730		USA, Voice of America	6080af		12015af
			15580af	17895af		
1700	1746		UK, BBC World Service	6005af		9410af
1700	1756	DRM	Romania, Radio Romania International			9535eu
1700	1756		Romania, Radio Romania International			11735eu
1700	1759		Canada, Radio Canada International			5850na
1700	1759		Poland, Polskie Radio Warsaw			9770eu
1700	1800		Anguilla, Worldwide Univ Network			11775am
1700	1800		Australia, ABC NT Alice Springs			2310do
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, Radio Australia	5995pa		6080pa
			9475as	9510pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me		
1700	1800	Sat	Canada, CBC NQ SW Service			9625na
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St Johns NF	6160na		
1700	1800		Canada, CKZU Vancouver BC			6160na
1700	1800		China, China Radio International			6090as
			6140as	6145eu	6165me	7235as
			7265af	7410as	7420as	9570af
			9695eu	11900af	13760eu	
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio Africa			7190af
			15190af			
1700	1800	DRM	Germany, Deutsche Welle	5790eu		
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		New Zealand, Radio NZ International			7440pa
1700	1800	DRM	New Zealand, Radio NZ International			6170pa
1700	1800		Nigeria, Voice of Nigeria/External Service			
			15120af			
1700	1800		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1700	1800		Papua New Guinea, Radio Wantok Light			7325do
1700	1800	DRM	Poland, Polskie Radio Warsaw			7265eu
1700	1800		Russia, Voice of Russia	4975va		11985va
			12040eu	13855af		
1700	1800		South Africa, Channel Africa	9675af		
1700	1800		Swaziland, TWR Swaziland	3200af		9500af
1700	1800		Taiwan, Radio Taiwan International			15690af
1700	1800		Tajikistan, Voice of Tajik/External Service			7245va
1700	1800	vl	Uganda, Dunamis Shortwave	4750af		
1700	1800		Uganda, UBC Radio	4975do		

1700	1800		UK, BBC World Service	3255af	5790eu	
			5850as	5875eu	5975as	6190af
			7405af	9810as	12095af	13675eu
			15400af	17795af	17830af	
1700	1800	DRM	UK, BBC World Service	3995eu		
1700	1800	Sat	UK, Bible Voice Broadcasting Network			9645me
1700	1800	Sat/Sun	UK, Bible Voice Broadcasting Network			13590me
1700	1800		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1700	1800		USA, WBCQ Monticello ME	9330am	15420am	
1700	1800		USA, WEWN Vandiver AL	15610va		
1700	1800	smtwhf	USA, WINB Red Lion PA	13570ca		
1700	1800	Sat	USA, WINB Red Lion PA	9265ca		
1700	1800		USA, WJHR International Milton FL			15550na
1700	1800		USA, WRMI Miami FL	9955ca		
1700	1800		USA, WTJC Newport NC	9370na		
1700	1800		USA, WTWW Lebanon TN	9479na		
1700	1800		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385na		
1700	1800		USA, WYFR/Family Radio Worldwide		7395af	
			7560af	11760as	11810af	13690na
			17545af	17795na	18980va	21485eu
1700	1800		Zambia, 1 Africa-CVC Africa	13590af		
1720	1740	Sat/Sun	USA, Voice of America/Studio 7			4930af
			11605af	15775af		
1730	1740		USA, Voice of America	4930af	11605af	
			15775af			
1730	1800		Bulgaria, Radio Bulgaria	5900eu	7400eu	
1730	1800	DRM	Bulgaria, Radio Bulgaria	9400eu		
1730	1800		Clandestine, Sudan Radio Service/ SRS			9590af
1730	1800		UK, Bible Voice Broadcasting Network			9645me
1730	1800		USA, Voice of America	12015af	15580af	
			17895af			
1730	1800	mtwhf	USA, Voice of America/Studio 7			4930af
			11605af	15775af		
1730	1800		Vatican City State, Vatican Radio			11625af
			13765af	15570af		
1745	1800		Bangladesh, Bangladesh Betar			7250as
1745	1800	DRM	India, All India Radio	9950eu		
1745	1800		India, All India Radio	6120eu	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	9940eu	11935af	
1745	1800	mtwhf	Moldova, (Transnistria) Radio PMR			6240na

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

1800	1800	Sat	USA, WINB Red Lion PA	9265ca		
1800	1815	Sun	UK, Bible Voice Broadcasting Network			13590me
1800	1815	1st Sun	UK, Bible Voice Broadcasting Network			9430me
1800	1830	w	Austria, AWR Europe	9755af		
1800	1830		South Africa, AWR3215af	3345af	9610af	
1800	1830		UK, BBC World Service	5875as	5975as	
1800	1830	Sun	UK, Bible Voice Broadcasting Network			9430me
1800	1830		USA, Voice of America	6080af	9850af	
			12015af	15580af		
1800	1830	Sat/Sun	USA, Voice of America	4930af		
1800	1835		New Zealand, Radio NZ International			7440pa
1800	1835	DRM	New Zealand, Radio NZ International			6170pa
1800	1845	Sat	UK, Bible Voice Broadcasting Network			6130eu
1800	1857		Netherlands, R Netherlands Worldwide			6020af
1800	1857		North Korea, Voice of Korea	13760af	15245eu	
1800	1859		Canada, Radio Canada International			9530af
			11765af	17735af	17810af	
1800	1900		Anguilla, Worldwide Univ Network			11775am
1800	1900	mtwhf	Argentina, Radio Nacional RAE			9690eu
			15345eu			
1800	1900		Australia, ABC NT Alice Springs			2310do
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia	6080pa	7240pa	
			9475as	9510pa	9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me		
1800	1900		Bangladesh, Bangladesh Betar			7250eu
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St Johns NF	6160na		
1800	1900		Canada, CKZU Vancouver BC			6160na
1800	1900		China, China Radio International			9600eu
			13760eu			
1800	1900		Equatorial Guinea, Radio Africa			7190af
			15190af			
1800	1900	DRM	Germany, Deutsche Welle	5790eu		
1800	1900	DRM	India, All India Radio	9950eu		
1800	1900		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1800	1900		Kuwait, Radio Kuwait	15540va		
1800	1900		Liberia, Star Radio	3900do	3955al	
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Netherlands, R Netherlands Worldwide			12045af
			15535af			
1800	1900		Nigeria, Voice of Nigeria/External Service			
			15120af			
1800	1900		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va	9955as		
1800	1900		Papua New Guinea, Radio Wantok Light			7325do
1800	1900		Russia, Voice of Russia	4975va	12040eu	
1800	1900		South Korea, KBS World Radio			7275eu
1800	1900		Taiwan, Radio Taiwan International			6155eu
1800	1900	vl	Uganda, Dunamis Shortwave	4750af		
1800	1900		Uganda, UBC Radio	4975do		
1800	1900		UK, BBC World Service	3255af	5790eu	
			5875eu	5950as	6190af	7405af
			11810af	12095af	13675af	15400af
			17795af			
1800	1900	Sat	UK, Bible Voice Broadcasting Network			9430me
1800	1900	Sun	UK, Bible Voice Broadcasting Network			6130eu
1800	1900		United States, Overcomer Ministries			9895me
1800	1900		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1800	1900		USA, KJES Vado NM	15385pa		
1800	1900		USA, WBCQ Monticello ME	7415am	9330am	
			15420am			
1800	1900		USA, WEWN Vandiver AL	15610va		
1800	1900	Sun	USA, WHRI Cypress Creek SC			17520af
1800	1900	hfas	USA, WHRI Cypress Creek SC			9840na
1800	1900	smtwhf	USA, WINB Red Lion PA	13570ca		
1800	1900		USA, WJHR International Milton FL			15550na
1800	1900		USA, WRMI Miami FL	9955ca		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WTWW Lebanon TN	9479na		
1800	1900		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385na		
1800	1900		USA, WYFR/Family Radio Worldwide		6180af	
			7395af	9600af	9770af	9830me
			9880af	9925af	13615na	13690na
			13750af	17795na	17845af	18980va
1800	1900		Yemen, Republic of Yemen Radio/Radio Sana'a			
			6005me	9780me		
1800	1900		Zambia, 1 Africa-CVC Africa	13590af		
1805	1810	Sat	Croatia, Croatian Radio	6165eu		
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu		
1810	1820	f	USA, Voice of America	4930af	11605af	
			15775af			
1815	1845	Sun	UK, Bible Voice Broadcasting Network			9430me
1830	1845		Rwanda, Radio Rwanda	6055do		
1830	1845	Sat	UK, Bible Voice Broadcasting Network			6130eu
1830	1900		Serbia, International Radio of Serbia			6100eu
1830	1900		Slovakia, Radio Slovakia International			5920eu
			6055eu			
1830	1900		Turkey, Voice of Turkey	9785eu		
1830	1900		UK, BBC World Service	5875as	6005af	
			9410af			
1830	1900	f	UK, Bible Voice Broadcasting Network			9430me
1830	1900		USA, Voice of America	4930af	6080af	
			9850af	12015af	15580af	
1836	1900		New Zealand, Radio NZ International			9615pa
1836	1900	DRM	New Zealand, Radio NZ International			9890pa
1845	1900	mtwhas	Albania, Radio Tirana	7520eu	13640na	
1845	1900	Sun	UK, Bible Voice Broadcasting Network			11830af
1859	1900		Netherlands, R Netherlands Worldwide			7425af
			11610af	11970af		

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

1900	1902	vl	Uganda, Dunamis Shortwave	4750af		
1900	1915	Sun	UK, Bible Voice Broadcasting Network			11830af
1900	1930		Germany, Deutsche Welle	6150af	11795af	
			17865af			
1900	1930		Turkey, Voice of Turkey	9785eu		
1900	1930		Vietnam, Voice of Vietnam	7280eu	9730eu	
1900	1935	DRM	New Zealand, Radio NZ International			9890pa
1900	1945	DRM	India, All India Radio	9950eu		
1900	1945		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1900	1945	mtwh	USA, WBCQ Monticello ME	7415am		
1900	1945		USA, WYFR/Family Radio Worldwide		6085ca	
1900	1950		New Zealand, Radio NZ International			9615pa
1900	1955		Netherlands, R Netherlands Worldwide			7425af
			12045af	15535af		

1900	1957		North Korea, Voice of Korea	7100eu	9975af	
			11535va	11910af		
1900	2000		Anguilla, Worldwide Univ Network		11775am	
1900	2000		Australia, ABC NT Alice Springs		2310do	
1900	2000		Australia, ABC NT Katherine	2485do		
1900	2000		Australia, Radio Australia	6080pa	7240pa	
			9500as	9510pa	9710pa	11880pa
1900	2000		Bahrain, Radio Bahrain	6010me		
1900	2000	DRM	Belgium, TDP Radio	15755na		
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St Johns NF	6160na		
1900	2000		Canada, CKZU Vancouver BC		6160na	
1900	2000		China, China Radio International		7295af	
			9435af			
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000		Equatorial Guinea, Radio Africa		7190af	
			15190af			
1900	2000	DRM	Germany, Deutsche Welle	3995eu	5875eu	
1900	2000		Kuwait, Radio Kuwait	15540va	17550va	
1900	2000		Liberia, Star Radio	3900do	3955al	
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Netherlands, R Netherlands Worldwide		11610af	
			11970af			
1900	2000		Nigeria, Voice of Nigeria/External Service			
			9690af	7255al		
1900	2000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1900	2000		Papua New Guinea, Radio Wantok Light		7325do	
1900	2000		Russia, Voice of Russia	12040eu		
1900	2000	mtwhf	Spain, Radio Exterior de Espana		9665af	
			11620eu			
1900	2000		Thailand, Radio Thailand World Service		7570eu	
1900	2000		Uganda, UBC Radio	4975do		
1900	2000		UK, BBC World Service	3255af	3995eu	
			5875eu	5950as	6005af	6155as
			6190af	9410af	11810af	12095af
			15400af	17795af		
1900	2000		Ukraine, Radio Ukraine International		7440na	
1900	2000		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1900	2000		USA, Voice of America	4930af	4940af	
			6080af	9850af	15580af	17895af
1900	2000		USA, Voice of America/Special English		7485va	
			9630va			
1900	2000	fas	USA, WBCQ Monticello ME	7415am		
1900	2000		USA, WBCQ Monticello ME	9330am	15420am	
1900	2000		USA, WEWN Vandiver AL	15610va		
1900	2000	mtwhfa	USA, WHRI Cypress Creek SC		9840na	
1900	2000	Sun	USA, WHRI Cypress Creek SC		15665af	
1900	2000	smtwhf	USA, WINB Red Lion PA	13570ca		
1900	2000	Sat	USA, WINB Red Lion PA	9265ca		
1900	2000		USA, WJHR International Milton FL		15550na	
1900	2000		USA, WRMI Miami FL	9955ca		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WTWW Lebanon TN	9479na		
1900	2000		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385na		
1900	2000		USA, WYFR/Family Radio Worldwide		3230af	
			6020af	7270af	7395af	9550af
			9610af	9775af	9830me	13615af
			13690na	17795na	17845af	18930va
			18980va			
1900	2000		Zambia, 1 Africa-CVC Africa	9540af		
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1905	2000	m	South Africa, Amateur Radio Mirror Intl		3215af	
1930	2000	Sun	Germany, Pan American Broadcasting		6175af	
1930	2000		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
1930	2000	vl	South Africa, RTE Radio Worldwide		6225af	
1936	2000	DRM	New Zealand, Radio NZ International		11675pa	
1945	2000	DRM	Vatican City State, Vatican Radio		9800am	
1950	2000		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu	9645eu	
1951	2000		New Zealand, Radio NZ International		11725pa	

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

2000	2005	m	South Africa, Amateur Radio Mirror Intl		3215af	
2000	2015	Sun	Germany, Pan American Broadcasting		6175af	
2000	2020		Vatican City State, Vatican Radio		4005eu	
			5885eu	7250eu	9645eu	
2000	2027		Czech Republic, Radio Prague		5930eu	
2000	2027		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu	13640na	
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030	Sat	Germany, Pan American Broadcasting		6175af	
2000	2030	vl	South Africa, RTE Radio Worldwide		6225af	
2000	2030		Swaziland, TWR Swaziland	3200af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	15580af		
2000	2030		Vatican City State, Vatican Radio		7365af	
			9755af	11625af		
2000	2030	DRM	Vatican City State, Vatican Radio		9800am	
2000	2045		USA, WYFR/Family Radio Worldwide		17750eu	
2000	2050	DRM	New Zealand, Radio NZ International		11675pa	
2000	2056		Romania, Radio Romania International		9690na	
			11880eu	11940na		
2000	2057		Germany, Deutsche Welle	6150af	11795af	
			11865af			
2000	2057		Netherlands, R Netherlands Worldwide		7425af	
			11610af	11970af		
2000	2059		Canada, Radio Canada International		15235af	
			17735af			
2000	2100		Anguilla, Worldwide Univ Network		11775am	
2000	2100		Australia, ABC NT Alice Springs		2310do	
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek		2325do	
2000	2100		Australia, Radio Australia	6080pa	11650pa	
			11660pa	11880pa		
2000	2100	Sat/Sun	Australia, Radio Australia	6080pa	7240pa	
			12080pa			
2000	2100		Bahrain, Radio Bahrain	6010me		
2000	2100		Belarus, Radio Belarus	7255eu	7360eu	
			7390eu			
2000	2100	DRM	Belgium, TDP Radio/Disco Palace		15755na	
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St Johns NF	6160na		
2000	2100		Canada, CKZU Vancouver BC		6160na	
2000	2100		China, China Radio International		5960eu	
			5985af	7285eu	7295af	7415eu
			9440af	9600eu		
2000	2100		Cuba, Radio Havana Cuba	11760ca		
2000	2100		Equatorial Guinea, Radio Africa		7190af	
			15190af			
2000	2100		Indonesia, Voice of Indonesia	9526va	11785al	
2000	2100		Kuwait, Radio Kuwait	15540va	17550va	
2000	2100		Liberia, Star Radio	3900do	3955al	
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100		New Zealand, Radio NZ International		11725pa	
2000	2100		Nigeria, Voice of Nigeria/External Service			
			15120af			
2000	2100		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2000	2100		Syria, Radio Damascus	9330eu	12085as	
2000	2100		Uganda, UBC Radio	4975do		
2000	2100		Uganda, UBC Radio	4975do		
2000	2100		UK, BBC World Service	3255af	5875eu	
			6005af	6190af	9410af	11810af
			12095af	13820af	15400af	
2000	2100		United States, Overcomer Ministries		6155eu	
2000	2100		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2000	2100		USA, WBCQ Monticello ME	7415am	9330am	
			15420am			
2000	2100		USA, WEWN Vandiver AL	15610va		
2000	2100	Sat	USA, WHRI Cypress Creek SC		15665af	
2000	2100	Sun	USA, WHRI Cypress Creek SC		13660af	
2000	2100	smtwhf	USA, WINB Red Lion PA	13570ca		
2000	2100	Sat	USA, WINB Red Lion PA	9265ca		
2000	2100		USA, WJHR International Milton FL		15550na	
2000	2100		USA, WRMI Miami FL	9955ca		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WTWW Lebanon TN	9479na		
2000	2100		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family Radio Worldwide		5975af	
			7430eu	9450af	9510af	9610af
			9740af	11690af	12055af	13615sa
			17725af	17795va	17845va	18980va
2000	2100		Zambia, 1 Africa-CVC Africa	9540af		
2030	2045		Thailand, Radio Thailand World Service		9680eu	
2030	2056	DRM	Romania, Radio Romania International		9765eu	
2030	2100		Laos, Lao National Radio	7145as		
2030	2100		Turkey, Voice of Turkey	7205va		
2030	2100		USA, Voice of America	4930af	6080af	

			7355af	7555af	15580af	
2030	2100	Sat/Sun	USA, Voice of America		4940af	
2030	2100		Vietnam, Voice of Vietnam		7280eu	9550me
2045	2100		India, All India Radio		6280eu	7550eu
			9445eu	9910pa	11620pa	11715pa
2045	2100	DRM	India, All India Radio		9950eu	

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

2100	2130		Australia, ABC NT Alice Springs			2310do
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek			2325do
2100	2130		Austria, AWR Europe		11955af	
2100	2130	Sat	Canada, CBC NQ SW Service			9625na
2100	2130		Serbia, International Radio of Serbia			6100eu
2100	2130		South Korea, KBS World Radio			3955eu
2100	2130		Turkey, Voice of Turkey		7205va	
2100	2145		USA, WYFR/Family Radio Worldwide			13615na
			13690na	17795na	18980va	
2100	2150		New Zealand, Radio NZ International			11725pa
2100	2150	DRM	New Zealand, Radio NZ International			11675pa
2100	2157		Germany, Deutsche Welle		9735as	11865af
			15640af			
2100	2157		North Korea, Voice of Korea		13760va	15245eu
2100	2200		Anguilla, Worldwide Univ Network			11775am
2100	2200		Australia, Radio Australia		9500as	9660pa
			11650pa	11660pa	11695as	12080pa
			13630pa	15515pa		
2100	2200		Bahrain, Radio Bahrain		6010me	
2100	2200		Belarus, Radio Belarus		7255eu	7360as
			7390eu			
2100	2200		Bulgaria, Radio Bulgaria		5900eu	7400eu
2100	2200		Canada, CFRX Toronto ON		6070na	
2100	2200		Canada, CFVP Calgary AB		6030na	
2100	2200		Canada, CKZN St Johns NF		6160na	
2100	2200		Canada, CKZU Vancouver BC			6160na
2100	2200	DRM	Canada, Radio Canada International			9800na
2100	2200		China, China Radio International			5960eu
			7205af	7285eu	7325af	7415eu
			9600eu			
2100	2200		Equatorial Guinea, Radio Africa			7190af
			15190af			
2100	2200		India, All India Radio		6280eu	7550eu
			9445eu	9910pa	11620pa	11715pa
2100	2200	DRM	India, All India Radio		9950eu	
2100	2200		Malaysia, RTM/Traxx FM		7295do	
2100	2200		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana			9650eu
2100	2200		Syria, Radio Damascus		9330va	12085va
2100	2200		Uganda, UBC Radio		4975do	
2100	2200	DRM	UK, BBC World Service		3995eu	
2100	2200		UK, BBC World Service		3255af	3915as
			5790eu	5875as	5905as	6005af
			6190af	6195as	7405af	9915af
			12095af			
2100	2200		Ukraine, Radio Ukraine International			6145na
2100	2200		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2100	2200		USA, Voice of America		6080af	7555af
			15580af			
2100	2200		USA, WBCQ Monticello ME		7415am	9330am
2100	2200		USA, WEWN Vandiver AL		15610va	
2100	2200	Sun	USA, WHRI Cypress Creek SC			9690na
2100	2200	Sat	USA, WHRI Cypress Creek SC			13660af
2100	2200		USA, WINB Red Lion PA		9265ca	
2100	2200		USA, WJHR International Milton FL			15550na
2100	2200		USA, WRMI Miami FL		9955ca	
2100	2200		USA, WTJC Newport NC		9370na	
2100	2200		USA, WTWW Lebanon TN		9479na	
2100	2200		USA, WWCR Nashville TN		7465na	9350na
			9980na	13845na		
2100	2200		USA, WWRB Manchester TN		3215na	6890va
2100	2200		USA, WYFR/Family Radio Worldwide			5975af
			7425af	9450eu	9715af	9740af
			12055af	17845af		
2100	2200		Zambia, 1 Africa-CVC Africa		9540af	
2115	2145		Egypt, Radio Cairo		6270eu	
2130	2157		Czech Republic, Radio Prague			9410af
2130	2200		Australia, ABC NT Alice Springs			4835do
2130	2200		Australia, ABC NT Katherine		5025do	
2130	2200	mtwhfa	Canada, CBC NQ SW Service			9625na
2130	2200		China, China Radio International			7365eu
2130	2200		Guam, KSDA/AWR		11850as	
2130	2200		Netherlands, R Netherlands Worldwide			7460af

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

2200	2210		Uganda, UBC Radio		4975do	
2200	2230		India, All India Radio		6280eu	7550eu
			9445eu	9910pa	11620pa	11715pa
2200	2230	DRM	India, All India Radio		9950eu	
2200	2245		Egypt, Radio Cairo		6270eu	
2200	2245		USA, WYFR/Family Radio Worldwide			15770af
2200	2256		Romania, Radio Romania International			5960as
			7435va	9790eu	11940as	
2200	2300		Anguilla, Worldwide Univ Network			6090am
2200	2300		Australia, ABC NT Alice Springs			4835do
2200	2300		Australia, ABC NT Katherine		5025do	
2200	2300		Australia, Radio Australia		9660pa	11695as
			11875as	12080pa	13630pa	15230pa
			15240as	15415as	15515pa	15560pa
2200	2300		Bahrain, Radio Bahrain		6010me	
2200	2300	smtwhf	Canada, CBC NQ SW Service			9625na
2200	2300		Canada, CFRX Toronto ON		6070na	
2200	2300		Canada, CFVP Calgary AB		6030na	
2200	2300		Canada, CKZN St Johns NF		6160na	
2200	2300		Canada, CKZU Vancouver BC			6160na
2200	2300		China, China Radio International			9590as
2200	2300		Equatorial Guinea, Radio Africa			7190af
			15190af			
2200	2300		Malaysia, RTM/Traxx FM		7295do	
2200	2300		New Zealand, Radio NZ International			13730pa
2200	2300	DRM	New Zealand, Radio NZ International			15720pa
2200	2300		Russia, Voice of Russia		5900na	
2200	2300		Syria, Radio Damascus		9330va	12085va
2200	2300		Turkey, Voice of Turkey		9830va	
2200	2300		UK, BBC World Service		3915as	5905as
			5935af	6195as	7490as	9440as
			9740as	9915af	12095af	
2200	2300	DRM	UK, BBC World Service		3995eu	
2200	2300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2200	2300	mtwhf	USA, Voice of America		5895va	5915va
			7460va	7575va	11955va	
2200	2300		USA, Voice of America		7555af	
2200	2300	Sat/Sun	USA, WBCQ Monticello ME		5110am	
2200	2300		USA, WBCQ Monticello ME		7415am	9330am
2200	2300		USA, WEWN Vandiver AL		11520va	
2200	2300	f	USA, WHRI Cypress Creek SC			11785na
2200	2300	Sun	USA, WHRI Cypress Creek SC			9785af
2200	2300		USA, WINB Red Lion PA		9265ca	
2200	2300		USA, WJHR International Milton FL			15550na
2200	2300		USA, WRMI Miami FL		9955ca	
2200	2300		USA, WTJC Newport NC		9370na	
2200	2300		USA, WTWW Lebanon TN		9479na	
2200	2300		USA, WWCR Nashville TN		7465na	9350na
			9980na	13845na		
2200	2300		USA, WWRB Manchester TN		3215na	6890va
2200	2300		USA, WYFR/Family Radio Worldwide			5950na
			11740na	15440na		
2215	2230		Croatia, Croatian Radio		3985eu	7375ca
2230	2257		Czech Republic, Radio Prague			9440na
2230	2300		China, Xizang PBS/Holy Tibet		4905do	4920do
			5240do	6110do	6130do	6200do
			7255do	7385do		
2230	2300		Guam, KSDA/AWR		15320as	
2230	2300		USA, Voice of America		11840as	
2230	2300		USA, Voice of America/Special English			9570va
			11840va	15145va		
2245	2300		India, All India Radio		6055as	7305as
			9705as	9950as	11645as	13605as

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

2300	0000		Anguilla, Worldwide Univ Network			6090am
2300	0000		Australia, ABC NT Alice Springs			4835do
2300	0000		Australia, ABC NT Katherine		5025do	
2300	0000		Australia, Radio Australia		9660pa	11875as
			12080pa	13690pa	15560pa	17750as
2300	0000		Bahrain, Radio Bahrain		6010me	
2300	0000		Bulgaria, Radio Bulgaria		9700na	11700na
2300	0000	smtwhf	Canada, CBC NQ SW Service			9625na
2300	0000		Canada, CFRX Toronto ON		6070na	
2300	0000		Canada, CFVP Calgary AB		6030na	
2300	0000		Canada, CKZN St Johns NF		6160na	
2300	0000		Canada, CKZU Vancouver BC			6160na
2300	0000		China, China Radio International			5915as
			5990ca	6145na	7350eu	7410as
			9610as	11690pa	11790as	11840na

2300	0000		Cuba, Radio Havana Cuba	5040na		
2300	0000		Egypt, Radio Cairo	11590na		
2300	0000	vl	Guyana, Voice of Guyana	3290va		
2300	0000		India, All India Radio	6055as	7305as	
			9705as	9950as	11645as	13605as
2300	0000		Malaysia, RTM/Traxx FM	7295do		
2300	0000		New Zealand, Radio NZ International		13730pa	
2300	0000	DRM	New Zealand, Radio NZ International		15720pa	
2300	0000		Russia, Voice of Russia	5900na	9665na	
2300	0000		UK, BBC World Service	3915as	6195as	
			7490as	9740as	9890as	11850as
			12010as			
2300	0000		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2300	0000		USA, Voice of America	5895va	5915va	
			7575va	11955va	13805as	
2300	0000	Sat/Sun	USA, WBCQ Monticello ME	5110am		
2300	0000		USA, WBCQ Monticello ME	7415am	9330am	
2300	0000		USA, WEWN Vandiver AL	11520va		
2300	0000	smtwhf	USA, WHRI Cypress Creek SC		5920ca	
2300	0000	Sat	USA, WHRI Cypress Creek SC		9690na	
2300	0000		USA, WINB Red Lion PA	9265ca		
2300	0000		USA, WRMI Miami FL	9955ca		
2300	0000		USA, WTJC Newport NC	9370na		
2300	0000		USA, WTWW Lebanon TN	9479na		
2300	0000		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN	3215na	6890va	
2300	0000		USA, WYFR/Family Radio Worldwide		5950na	
			11580sa	15655sa	15440na	
2300	2330		Australia, Radio Australia	11695as	15240as	
			17795pa			
2300	2330		USA, Voice of America/Special English		9570as	
			13805va	15145va		
2300	2330	DRM	Vatican City State, Vatican Radio		9755am	
2300	2345		USA, WYFR/Family Radio Worldwide		11740na	
2305	0000		Canada, Radio Canada International		6100na	
2330	0000		UK, BBC World Service	9580as		
2330	0000		USA, Voice of America/Special English		7460as	
			9570va	13805va	15145va	15340va
2330	0000		Vietnam, Voice of Vietnam	9840as	12020as	

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana ..... **http://rtsh.sil.at/**
Anguilla, Worldwide Univ Network ..... **www.worldwideuniversity network.com/**
Argentina, Radio Nacional RAE..... **www.radionacional.com.ar/**
Australia, ABC NT Alice Springs..... **www.abc.net.au/radio/**
Australia, ABC NT Katherine..... **www.abc.net.au/radio/**
Australia, ABC NT Tennant Creek ..... **www.abc.net.au/radio/**
Australia, HCJB Global Voice Australia..... **www.hcjb.org/**
Australia, Radio Australia ..... **www.abc.net.au/ra/**
Austria, AWR Europe **www.awr2.org/**
Bahrain, Radio Bahrain ..... **www.radiobahrain.fm/**
Bangladesh, Bangladesh Betar ..... **www.betar.org.bd/**
Belarus, Radio Belarus ..... **www.radiobelarus.tvr.by/eng/**
Belgium, TDP Radio ..... **www.airtime.be/schedule.html**
Belgium, TDP Radio/Disco Palace ..... **www.airtime.be/schedule.html**
Bhutan, Bhutan Broadcasting Service ..... **www.bbs.com.bt/**
Bulgaria, Radio Bulgaria ..... **www.bnr.bg/**
Canada, CBC NQ SW Service..... **www.cbc.ca/north/**
Canada, CFRX Toronto ON ..... **www.cfrb.com**
Canada, CFVP Calgary AB..... **www.classiccountryam1060.com**
Canada, CKZN St Johns NF ..... **www.cbc.ca/listen/index.html**
Canada, CKZU Vancouver BC..... **www.cbc.ca/bc**
Canada, Radio Canada International ..... **www.rcinet.ca/**
China, China Radio International ..... **www.cri.cn/**
China, Voice of the Strait..... **www.vos.com.cn**
Clandestine, Cotton Tree News..... **www.cottontreenews.org/**
Clandestine, Sudan Radio Service/ SRS .... **www.sudanradio.org/**
Croatia, Croatian Radio ..... **www.hrt.hr/**
Cuba, Radio Havana Cuba ..... **www.radiohc.cu/**
Czech Republic, Radio Prague ..... **www.radio.cz/**
Egypt, Radio Cairo..... **www.ertu.org**
Ethiopia, Radio Ethiopia/External Service.. **www.erta.gov.et**
France, Radio France Internationale..... **http://rfienglish.com**
Germany, AWR Europe..... **www.awr2.org/**
Germany, Blue Star Radio ..... **www.mvbalticradio.de**
Germany, Deutsche Welle ..... **www.dw-world.de/**
Germany, European Music Radio..... **www.emr.org.uk/**
Germany, Pan American Broadcasting .... **www.radiopanam.com/**
Germany, Radio Gloria International ..... **www.radiopanam.com/**
Germany, TWR Europe..... **www.twr.org**
Greece, Voice of Greece ..... **www.voiceofgreece.gr/**
Greece, Voice of Greece/Radio Filia..... **www.voiceofgreece.gr/**
Guam, KSDA/AWR **www.awr2.org/**
Guam, KTWR/TWR..... **www.twr.org/**
Guyana, Voice of Guyana ..... **www.voiceofguyana.com/**
India, All India Radio ..... **www.allindiaradio.org/**
Indonesia, Voice of Indonesia ..... **www.voi.co.id**
Iran, VOIRI/IRIB ..... **www.irib.ir/English/**
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Kuwait, Radio Kuwait..... **www.media.gov.kw/**
Laos, Lao National Radio ..... **www.lnr.org.la**
Liberia, Star Radio ..... **www.starradio.org.lr/**
Malaysia, RTM/Traxx FM..... **www.traxxfm.net/index.php**
Malaysia, RTM/Voice of Malaysia..... **www.rtm.gov.my**
Mali, ORTM Du Mali ..... **www.ortm.ml**
Monaco, TWR Europe ..... **www.twr.org/**
Mongolia, Voice of Mongolia..... **www.mnb.mn**
Nepal, Radio Nepal ..... **www.radionepal.org/**
Netherlands, R Netherlands Worldwide .... **www.radionetherlands.nl/**
New Zealand, Radio NZ International ..... **www.rnzi.com**
Nigeria, Voice of Nigeria/External Service **www.voiceofnigeria.org**
Oman, Radio Sultanate of Oman ..... **www.oman-tv.gov.om**
Pakistan, PBC/Radio Pakistan..... **www.radio.gov.pk**
Palau, T8WH/WHRI/Sound of Hope Radio **www.whr.org/**
Philippines, FEBC..... **www.febc.ph**
Philippines, PBS/ Radyo Pilipinas..... **www.pbs.gov.ph/**
Poland, Polskie Radio Warsaw ..... **www.polskieradio.pl**
Romania, Radio Romania International .... **www.rri.ro/**
Russia, Voice of Russia ..... **www.ruvr.ru/**
Rwanda, Radio Rwanda ..... **www.orinfor.gov.rw/radiorwanda.eng.html**
Saudi Arabia, BSKSA/Saudi Radio..... **www.saudiradio.net/**
Serbia, International Radio of Serbia..... **www.glassrbije.org**
Slovakia, IRRS/Euro Gospel Radio..... **www.nexus.org**
Slovakia, IRRS/Radio City ..... **www.nexus.org**
Slovakia, IRRS/Radio Joystick ..... **www.nexus.org**
Slovakia, Radio Slovakia International..... **www.rsi.sk**
South Africa, Amateur Radio Mirror Intl .... **www.sarl.org.za**
South Africa, AWR..... **www.awr2.org/**
South Africa, Channel Africa..... **www.channelafrica.org**
South Africa, RTE Radio Worldwide **www.rte.ie/radio1/**
South Africa, TWR Africa..... **www.twr.org/**
South Korea, KBS World Radio ..... **http://rki.kbs.co.kr/english/**
Spain, Radio Exterior de Espana ..... **www.ree.rne.es/**
Sri Lanka, SLBC ..... **www.slbc.lk**
Swaziland, TWR Swaziland ..... **www.twrafrica.org**
Syria, Radio Damascus..... **www.rtv.gov.sy/**
Taiwan, Radio Taiwan International ..... **http://english.rti.org.tw/**
Thailand, Radio Thailand World Service ... **www.hsk9.com/**
Turkey, Voice of Turkey..... **www.trt.net.tr**
Uganda, Dunamis Shortwave ..... **www.biblevoice.org/stations/east-africa**
Uganda, UBC Radio ..... **www.ubconline.co.ug**
UK, BBC World Service..... **www.bbc.co.uk/worldservice/**
UK, Bible Voice Broadcasting Network ..... **www.biblevoice.org/**
Ukraine, Radio Ukraine International ..... **www.nrcu.gov.ua/**
United Arab Emirates, FEBA Radio ..... **www.febaradio.info**
United States, Overcomer Ministries..... **www.overcomerministry.org/**
USA, American Forces Network ..... **http://myafn.dodmedia.osd.mil/**
USA, KNLS Anchor Point AK..... **www.knls.org/**
USA, Voice of America ..... **www.voanews.com/**
USA, Voice of America/Special English..... **www.voanews.com/**
USA, Voice of America/Studio 7..... **www.voanews.com/**
USA, WBCQ Monticello ME..... **www.wbcq.com/**
USA, WEWN Vandiver AL ..... **www.ewtn.com**
USA, WHRI Cypress Creek SC ..... **www.whr.org/**
USA, WINB Red Lion PA ..... **www.winb.com/**
USA, WRMI Miami FL..... **www.wrmi.net/**
USA, WRNO New Orleans LA ..... **www.wrnoworldwide.org/**
USA, WTJC Newport NC..... **www.fbnradio.com/**
USA, WTWW Lebanon TN..... **www.wtww.us**
USA, WWCR Nashville TN..... **www.wwcr.com**
USA, WWRB Manchester TN..... **www.wwrb.org/**
USA, WYFR/Family Radio Worldwide ..... **www.familyradio.com/**
Vatican City State, Vatican Radio..... **www.vaticanradio.org**
Vatican City State, Vatican Radio/Mass..... **www.vaticanradio.org**
Vietnam, Voice of Vietnam..... **www.vov.org.vn**
Yemen, Republic of Yemen Radio/Radio Sana'a **www.yemenradio.net**
Zambia, 1 Africa-CVC Africa..... **www.1africa.tv**
Zambia, Radio Christian Voice/
The Voice Africa..... **www.1africa.tv**

SHORTWAVE GUIDE

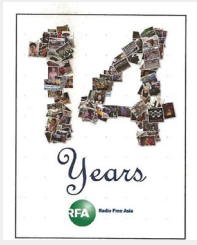
THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Fourteen Years and Counting

Radio Free Asia has announced the release of their 14th Anniversary QSL card. The colorful anniversary card will be available for all RFA broadcast to December 31, 2010. The design is a photo collage made from a small sample of many stories RFA has covered in the past 14 years, affecting the countries to which it broadcast including; Burma, Cambodia, China, Laos, North Korea and Vietnam. A complete non-English, by-hour schedule is available from *MT EXpress.*



Reception reports may be submitted at **www.techweb.rfa.org** by following the *QSL Reports* link or to: *qsl@rfa.org.* Postal reports: Reception Reports, Radio Free Asia, 2025 M. Street NW, Suite 300, Washington, DC 20036 USA. Visit their English website at **www.rfa.org** to learn more about Radio Free Asia.

A Greek Touch from Australia

Radio Symban (Radio Universe), a New South Wales-based Greek culture station, is being heard regularly on 2,368.5 kHz. Reported as a 24-hour broadcaster, most logs have been from 0930 fade-in to 1330 UTC. Send your details to *symban@radiosymban.com.au*

Brazilian Increases Air-time

Radio Difusora, Cáceres, on 5055 (5054.97) kHz, is reported as increasing their broadcast to 24 hours, from former 0900-1400 UTC. Portuguese details preferred and return mint postage to: Rua Tiradentes 979, Centro, 78200-000 Cáceres, MT Brazil.

Clandestine QSLing

Radio Bar-Kulan (Radio Meeting Place) has confirmed their broadcast on 9930 and 9960 kHz with a verification letter. Targeted to Somalia and brokered by South Africa's Sentech Ltd., Bar-Kulan has been active since March 1, 2010, at 0500-0600, 15750; 1600-1700, 9930. Details to: Sentech Ltd., P.O. Box 234, Meyerton 1960 South Africa. English/Somali website **www.bar-kulan.com/** or details to: *barkulanradio@gmail.com*

Christian Lehmann, Vice President of GTT, informs the DX community that Radio Mada Internationale is currently inactive and "hopes to return to shortwave sooner or later." He recently verified reports for 15660, 15670 kHz via E-QSLing. Any outstanding reports should be sent to *radiomada.int@gmail.com* or postal: GTT International, Maison de Associates, 15 Rue de Savoises, CH-1205 Geneva, Switzerland.

Serui Reactivates

Indonesian station RRI-Serui has reactivated on 4605 kHz, 0800-1500 UTC. Listen for their distinctive *Song of the Coconut Island* interval signal, Jarkarta news relay, and choral national anthem at each hour. Details and return mint postage to: JL. Pattimura, Serui 98213 Papua, Indonesia.

Still Chasing PNG

After a nine month absence, Radio East Sepik is back on 3335 kHz, heard at 1230 UTC. You may recall my June 2010 column, reporting that Papua New Guinea would soon end their shortwave and AM services, opting for FM. At editorial deadline, hobbyists continue to log and QSL the elusive PNGs. Reception reports with return mint postage may be addressed to: Radio East Sepik, P.O. Box 65, Wewak, Papua New Guinea.

BAHRAIN

Radio Bahrain, 9745 kHz. Full data verification, signed by Mr. Abdulla Ahmed Al Balooshi, Acting Director of Technical Affairs. Received in 44 days after postal follow up report from original email report. QSL address: P.O. Box 1075, Manama, Bahrain (Jim Evans, Germantown, TN). FM website, *The Beat of the Gulf*: **www.radiobahrain.fm/**

BELARUS

Radio Station Belarus, 6010 kHz. Full data verification letter and sticker for Belarussian service, signed by Naum Galperovich, Station Manager. Received in 56 days for an English report to *radiostation-belarus@tvr.by* Postal address: 4 Krasnaya Street, Minsk 220807 Belarus (Duane Hadley, Bristol, TN). ^ Streaming audio **www.radiobelarus.tvr.by**

MEDIUM WAVE

BENIN: Trans World Radio 1566 kHz AM. Full data QSL card signed by Mrs. L. Stavropoulos, DX Secretary. Received in 35 days. QSL address: TWR, P.O. Box 64, Manzini, Swaziland (Vashek Korinek, South Africa/playdx2003).

OMAN: BBC Relay Station at A'Seela, 1413 AM kHz. Full data letter from VT-Group Merlin Communications, signed by Afrah Al Orimi. Received in 21 days for airmail report and $5.00 US. Email address: *opsaseela@yahoo.com*. This just arrived …Thanks to Gayle Van Horn who also just sent me an email turning me on to the *World QSL Book* for addresses including utility stations (Albert Muick, Kabul, Afghanistan).

USA: WFED 1500 AM kHz *Federal News Radio,* Wheaton, MD. Verification letter signed by David Kolesar, Senior Broadcast Engineer, plus coverage map. Received in 55 days for an AM report. QSL address: Federal News Radio 1500 AM WFED, 3400 Idaho Avenue NW, Washington, DC 20016 USA (Vaskek Korinek/playdx2003). Streaming audio **www.federalnewsradio.com/.**

SLOVAKIA

Miraya FM via IRRC, Rimavska Sobota, 7385 kHz. Full data orange/yellow Miyaya FM logo card except transmitter site, noting incorrectly, "we are pleased to credit your reception of Star Radio from Liberia." Received in five months. QSL address: Fondation Hirondelle, Avenue du Temple 19C, CH-1012, Lausanne, Switzerland (Wendel Craighead, Prairie Village, KS).

UTILITY

Turkey: TAH, 8431 kHz Istanbul Radio. Full data verification letter signed by Mehmet Colak, Director of Turk Radio. Received in 56 days for a utility report and $1.00US. QSL address: Kiyi Gemi Kurtarma, Isletmeleri Gene Müdürlügü, Sefaköy, Istanbul 34630. Email: *telsiz@kiyiemnigov.tr* (Muick).

USA: NAJ, 4011.5 kHz, Great Lakes IL. Full data 61st *Annual DOD Armed Forces Day Mil-Amateur Crossband Commsw Test* card. Received in 52 days for a utility report, $1.00 US and SASE. Station address: Director Central Area MARS, David Ouellett, 6148 W. Cutler Road, Dewitt, MI 48820 (Bill Wilkins, Springfield, MO).

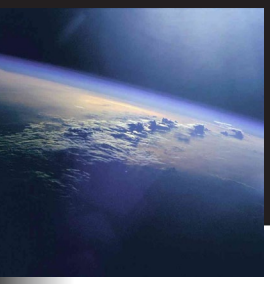
NNN0ASF, 13974 kHz, Bennington, KS. Full data card same as NAJ. Received in 56 days for utility report, $1.00US and SASE (both returned). Station address: MARS, P.O. Box 224, Bennington, KS 67422 (Wilkins).

WHV382 Sail Mail Coastal Station, Friday Harbor, WA, 7995 kHz, 150 watts PEP. Full data letter. Received in eight days. QSL address: 39270 Pasco Padre Pkwy # 850, Fremont, CA 94538 USA (Martin Foltz, CA).

Uzbekistan: Tashkent VOLMET 10090 kHz. No data *thank-you* photo QSL of Tashkent Intercontinental Hotel, signed by Renat Grenaderov, Communications Leading Engineer Inspector Received in 56 days for utility report and $2.00 US. QSL address: 13 Lokomotivnaya Street, Tashkent, Uzbekistan 100167. Email: *grenad@rambler.ru* (Muick).

USA

WJHR International, 15550 kHz. E-QSL with photo of transmitter from G.S. Mock. Received in one day for an email report to *wjhr@usa.com*. Postal address: 5920 Oak Manor Drive, Milton, FL 32570 USA (Korinek).



MTXtra
Shortwave Broadcast Guide

PORTUGUESE

The following language schedule is extracted from our new *MTXtra Shortwave Broadcast Guide* pdf which is a free download to all *MTXpress* subscribers. This new online *Shortwave Broadcast Guide* has more than 9,100 station entries that include all languages being broadcasts via shortwave radio worldwide, sorted by time and updated monthly.

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

1200	1230		Brazil, Radio Verdes Florestas	4865do	
1200	1245		USA, WYFR/Family Radio Worldwide	9625sa	
1200	1300		Angola, Radio Nacional de Angola	4950do	
1200	1300		Brazil, Jornal A Critica	5055do	
1200	1300		Brazil, Novas de Paz	6080do	9515do
			11725do		
1200	1300		Brazil, Radio Alvorada/Londrina	4865do	
1200	1300		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1200	1300		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1200	1300		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1200	1300		Brazil, Radio Brasil	4785do	
1200	1300		Brazil, Radio Brasil Central	4985do	11815do
1200	1300		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1200	1300		Brazil, Radio Capixaba	4935do	
1200	1300		Brazil, Radio Clube do Para	4885do	
1200	1300		Brazil, Radio Congonhas	4775do	
1200	1300		Brazil, Radio Cultura do Para	5045do	
1200	1300		Brazil, Radio Cultura Ondas Tropicais	4845do	
1200	1300		Brazil, Radio Cultura Sao Paulo	9615do	
			17815do		
1200	1300		Brazil, Radio Cultura/Araraquara	3365do	
1200	1300		Brazil, Radio Daqui	4915do	
1200	1300		Brazil, Radio Difusora Acerana	4885do	
1200	1300		Brazil, Radio Difusora Caceres	5055do	
1200	1300		Brazil, Radio Difusora de Macapa	4915do	
1200	1300		Brazil, Radio Difusora do Amazonas	4805do	
1200	1300		Brazil, Radio Difusora Roraima	4875do	
1200	1300		Brazil, Radio Difusora/Londrina	4815do	
1200	1300		Brazil, Radio Educadora	2380do	
1200	1300		Brazil, Radio Educadora 6 de Agosto	3255do	
1200	1300		Brazil, Radio Gaucha	6020do	11915do
1200	1300		Brazil, Radio Gazeta Universitaria	5955do	
			9685do	15325al	
1200	1300		Brazil, Radio Globo	6120do	9585do
1200	1300		Brazil, Radio Guaiba	6000do	11785do
1200	1300		Brazil, Radio Imaculada Conceicao	4755do	
1200	1300		Brazil, Radio Inconfidencia	6010do	15190do
1200	1300		Brazil, Radio Itatiaia	5970do	
1200	1300		Brazil, Radio Maria	4885do	
1200	1300		Brazil, Radio Marumby	9665do	11750do
1200	1300		Brazil, Radio Minicipal	3375do	
1200	1300		Brazil, Radio Missoes da Amazonia	4865do	
1200	1300		Brazil, Radio Mundial	3325do	
1200	1300		Brazil, Radio Nacional da Amazonia	6185do	
			11780do		
1200	1300		Brazil, Radio Nossa Voz	4975do	
1200	1300		Brazil, Radio Nove de Julho	9820do	
1200	1300		Brazil, Radio Novo Tempo	4895do	
1200	1300		Brazil, Radio Record	6150do	9505do
1200	1300		Brazil, Radio Rio Mar	6160do	9695do
1200	1300		Brazil, Radio Rural	4765do	
1200	1300		Brazil, Radio Senado	5990do	
1200	1300		Brazil, Radio Trans Mundial	5964do	9530al
			11735do		
1200	1300		Brazil, Radio Voz Missionaria	5940do	
1200	1300		Brazil, SRDA/Super Radio Deus e Amour	6060do	
			9565do	11765do	
1200	1300		Brazil, Super Rede Boa Vontade	4860do	
			9550do	11895do	
1200	1300		Brazil, Voz Missionaria	5940do	
1200	1300	mtwhf	Portugal, RDP Internacional	15560am	
1200	1300	Sat/Sun	Portugal, RDP Internacional	12020eu	15560am
			21655va		

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

1300	1330		Brazil, Radio Difusora do Amazonas	4805do	
1300	1400		Angola, Radio Nacional de Angola	4950do	
1300	1400		Brazil, Jornal A Critica	5055do	
1300	1400		Brazil, Novas de Paz	6080do	9515do
			11725do		
1300	1400		Brazil, Radio Alvorada/Londrina	4865do	
1300	1400		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1300	1400		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1300	1400		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1300	1400		Brazil, Radio Brasil	4785do	
1300	1400		Brazil, Radio Brasil Central	4985do	11815do
1300	1400		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1300	1400		Brazil, Radio Capixaba	4935do	
1300	1400		Brazil, Radio Clube do Para	4885do	
1300	1400		Brazil, Radio Congonhas	4775do	
1300	1400		Brazil, Radio Cultura do Para	5045do	
1300	1400		Brazil, Radio Cultura Ondas Tropicais	4845do	
1300	1400		Brazil, Radio Cultura Sao Paulo	9615do	
			17815do		
1300	1400		Brazil, Radio Cultura/Araraquara	3365do	
1300	1400		Brazil, Radio Daqui	4915do	
1300	1400		Brazil, Radio Difusora Acerana	4885do	
1300	1400		Brazil, Radio Difusora Caceres	5055do	
1300	1400		Brazil, Radio Difusora de Macapa	4915do	
1300	1400		Brazil, Radio Difusora Roraima	4875do	
1300	1400		Brazil, Radio Difusora/Londrina	4815do	
1300	1400		Brazil, Radio Educadora	2380do	
1300	1400		Brazil, Radio Educadora 6 de Agosto	3255do	
1300	1400		Brazil, Radio Gaucha	6020do	11915do
1300	1400		Brazil, Radio Gazeta Universitaria	5955do	
			9685do	15325al	
1300	1400		Brazil, Radio Globo	6120do	9585do
1300	1400		Brazil, Radio Guaiba	6000do	11785do
1300	1400		Brazil, Radio Imaculada Conceicao	4755do	
1300	1400		Brazil, Radio Inconfidencia	6010do	15190do
1300	1400		Brazil, Radio Itatiaia	5970do	
1300	1400		Brazil, Radio Maria	4885do	
1300	1400		Brazil, Radio Marumby	9665do	11750do
1300	1400		Brazil, Radio Missoes da Amazonia	4865do	
1300	1400		Brazil, Radio Mundial	3325do	
1300	1400		Brazil, Radio Nacional da Amazonia	6185do	
			11780do		
1300	1400		Brazil, Radio Nossa Voz	4975do	
1300	1400		Brazil, Radio Nove de Julho	9820do	
1300	1400		Brazil, Radio Novo Tempo	4895do	
1300	1400		Brazil, Radio Record	6150do	9505do
1300	1400		Brazil, Radio Rio Mar	6160do	9695do
1300	1400		Brazil, Radio Rural	4765do	
1300	1400	mtwhf	Brazil, Radio Senado	5990do	
1300	1400		Brazil, Radio Trans Mundial	5964do	9530al
			11735do		
1300	1400		Brazil, Radio Voz Missionaria	5940do	
1300	1400		Brazil, SRDA/Super Radio Deus e Amour	6060do	
			9565do	11765do	
1300	1400		Brazil, Super Rede Boa Vontade	4860do	
			9550do	11895do	
1300	1400		Brazil, Voz Missionaria	5940do	
1300	1400	Sat/Sun	Portugal, RDP Internacional	12020eu	15180af
			15560am	21655va	
1300	1400	mtwhf	Portugal, RDP Internacional	15560am	21810va
1300	1400		USA, WYFR/Family Radio Worldwide	17555sa	
1315	1330		Vatican City State, Vatican Radio	9645eu	
			11740eu		
1355	1400	Sun	Swaziland, TWR Swaziland	7315af	

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

1400	1425	Sun	Swaziland, TWR Swaziland	7315af	
1400	1500		Angola, Radio Nacional de Angola		4950do
1400	1500		Brazil, Jornal A Critica	5055do	
1400	1500		Brazil, Novas de Paz	6080do	9515do
			11725do		
1400	1500		Brazil, Radio Alvorada/Londrina		4865do
1400	1500		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1400	1500		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1400	1500		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1400	1500		Brazil, Radio Brasil	4785do	
1400	1500		Brazil, Radio Brasil Central	4985do	11815do
1400	1500		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1400	1500		Brazil, Radio Capixaba	4935do	
1400	1500		Brazil, Radio Clube do Para	4885do	
1400	1500		Brazil, Radio Congonhas	4775do	
1400	1500		Brazil, Radio Cultura do Para	5045do	
1400	1500		Brazil, Radio Cultura Ondas Tropicais		4845do
1400	1500		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
1400	1500		Brazil, Radio Daqui	4915do	
1400	1500		Brazil, Radio Difusora Acerana		4885do
1400	1500		Brazil, Radio Difusora Caceres		5055do
1400	1500		Brazil, Radio Difusora de Macapa		4915do
1400	1500		Brazil, Radio Difusora Roraima		4875do
1400	1500		Brazil, Radio Difusora/Londrina		4815do
1400	1500		Brazil, Radio Educadora	2380do	
1400	1500		Brazil, Radio Educadora 6 de Agosto		3255do
1400	1500		Brazil, Radio Gaucha	6020do	11915do
1400	1500		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
1400	1500		Brazil, Radio Globo	6120do	9585do
1400	1500		Brazil, Radio Guaiba	6000do	11785do
1400	1500		Brazil, Radio Imaculada Conceicao		4755do
1400	1500		Brazil, Radio Inconfidencia	6010do	15190do
1400	1500		Brazil, Radio Itatiaia	5970do	
1400	1500		Brazil, Radio Maria	4885do	
1400	1500		Brazil, Radio Marumby	9665do	11750do
1400	1500		Brazil, Radio Missoes da Amazonia		4865do
1400	1500		Brazil, Radio Mundial	3325do	
1400	1500		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
1400	1500		Brazil, Radio Nossa Voz	4975do	
1400	1500		Brazil, Radio Nove de Julho	9820do	
1400	1500		Brazil, Radio Novo Tempo	4895do	
1400	1500		Brazil, Radio Rio Mar	6160do	9695do
1400	1500		Brazil, Radio Rural	4765do	
1400	1500	mtwhf	Brazil, Radio Senado	5990do	
1400	1500		Brazil, Radio Trans Mundial	5964do	9530al
			11735do		
1400	1500		Brazil, Radio Voz Missionaria	5940do	
1400	1500		Brazil, SRDA/Super Radio Deus e Amour		6060do
			9565do	11765do	
1400	1500		Brazil, Super Rede Boa Vontade		4860do
			9550do	11895do	
1400	1500		Brazil, Voz Missionaria	5940do	
1400	1500	mtwhf	Portugal, RDP Internacional	15560am	21810va
1400	1500	Sat/Sun	Portugal, RDP Internacional	11905eu	15470af
			15560am	21655va	
1400	1500		South Africa, Channel Africa	9625af	
1400	1500		USA, WYFR/Family Radio Worldwide		15770sa
1425	1455		Swaziland, TWR Swaziland	7315af	

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

1500	1545	USA, WYFR/Family Radio Worldwide		18980sa
1500	1600	Angola, Radio Nacional de Angola		4950do
1500	1600	Brazil, Novas de Paz	6080do	9515do
		11725do		
1500	1600	Brazil, Radio Alvorada/Londrina		4865do
1500	1600	Brazil, Radio Aparecida	5035do	6135al
		9630al	11855al	
1500	1600	Brazil, Radio Bandeirantes	6090do	9645do
		11925do		
1500	1600	Brazil, Radio Boa Vontade	6160do	9550do
		11895do		
1500	1600	Brazil, Radio Brasil	4785do	
1500	1600	Brazil, Radio Brasil Central	4985do	11815do
1500	1600	Brazil, Radio Cancao Nova	4825do	6105do
		9675do		
1500	1600	Brazil, Radio Capixaba	4935do	
1500	1600	Brazil, Radio Clube do Para	4885do	
1500	1600	Brazil, Radio Congonhas	4775do	
1500	1600	Brazil, Radio Cultura do Para	5045do	
1500	1600	Brazil, Radio Cultura Ondas Tropicais		4845do
1500	1600	Brazil, Radio Cultura Sao Paulo		9615do
		17815do		
1500	1600	Brazil, Radio Cultura/Araraquara		3365do
1500	1600	Brazil, Radio Daqui	4915do	
1500	1600	Brazil, Radio Difusora Acerana		4885do
1500	1600	Brazil, Radio Difusora Caceres		5055do
1500	1600	Brazil, Radio Difusora de Macapa		4915do
1500	1600	Brazil, Radio Difusora do Amazonas		4805do
1500	1600	Brazil, Radio Difusora Roraima		4875do
1500	1600	Brazil, Radio Difusora/Londrina		4815do
1500	1600	Brazil, Radio Educadora	2380do	
1500	1600	Brazil, Radio Educadora 6 de Agosto		3255do
1500	1600	Brazil, Radio Gaucha	6020do	11915do
1500	1600	Brazil, Radio Gazeta Universitaria		5955do
		9685do	15325al	
1500	1600	Brazil, Radio Globo	6120do	9585do
1500	1600	Brazil, Radio Guaiba	6000do	11785do
1500	1600	Brazil, Radio Imaculada Conceicao		4755do
1500	1600	Brazil, Radio Inconfidencia	6010do	15190do
1500	1600	Brazil, Radio Itatiaia	5970do	
1500	1600	Brazil, Radio Maria	4885do	
1500	1600	Brazil, Radio Marumby	9665do	11750do
1500	1600	Brazil, Radio Missoes da Amazonia		4865do
1500	1600	Brazil, Radio Mundial	3325do	
1500	1600	Brazil, Radio Nacional da Amazonia		6185do
		11780do		
1500	1600	Brazil, Radio Nossa Voz	4975do	
1500	1600	Brazil, Radio Nove de Julho	9820do	
1500	1600	Brazil, Radio Novo Tempo	4895do	
1500	1600	Brazil, Radio Record	6150do	9505do
1500	1600	Brazil, Radio Rio Mar	6160do	9695do
1500	1600	Brazil, Radio Rural	4765do	
1500	1600	mtwhf	Brazil, Radio Senado	5990do	
1500	1600		Brazil, Radio Voz Missionaria	5940do	
1500	1600		Brazil, SRDA/Super Radio Deus e Amour		6060do
			9565do	11765do	
1500	1600		Brazil, Super Rede Boa Vontade		4860do
			9550do	11895do	
1500	1600		Brazil, Voz Missionaria	5940do	
1500	1600	mtwhf	Portugal, RDP Internacional	15560am	
1500	1600	Sat/Sun	Portugal, RDP Internacional	11905eu	15470af
			15560am	21655va	
1545	1600	Sun	Swaziland, TWR Swaziland	3200af	

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

1600	1615	Sun	Swaziland, TWR Swaziland	3200af	
1600	1700		Angola, Radio Nacional de Angola		4950do
1600	1700		Brazil, Novas de Paz	6080do	9515do
			11725do		
1600	1700		Brazil, Radio Alvorada/Londrina		4865do
1600	1700		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1600	1700		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1600	1700		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1600	1700		Brazil, Radio Brasil	4785do	
1600	1700		Brazil, Radio Brasil Central	4985do	11815do
1600	1700		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1600	1700		Brazil, Radio Capixaba	4935do	
1600	1700		Brazil, Radio Clube do Para	4885do	
1600	1700		Brazil, Radio Congonhas	4775do	
1600	1700		Brazil, Radio Cultura do Para	5045do	
1600	1700		Brazil, Radio Cultura Ondas Tropicais		4845do
1600	1700		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
1600	1700		Brazil, Radio Cultura/Araraquara		3365do
1600	1700		Brazil, Radio Daqui	4915do	
1600	1700		Brazil, Radio Difusora Acerana		4885do
1600	1700		Brazil, Radio Difusora Caceres		5055do
1600	1700		Brazil, Radio Difusora de Macapa		4915do
1600	1700		Brazil, Radio Difusora do Amazonas		4805do
1600	1700		Brazil, Radio Difusora Roraima		4875do
1600	1700		Brazil, Radio Difusora/Londrina		4815do
1600	1700		Brazil, Radio Educadora	2380do	
1600	1700		Brazil, Radio Educadora 6 de Agosto		3255do
1600	1700		Brazil, Radio Gaucha	6020do	11915do
1600	1700		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
1600	1700		Brazil, Radio Globo	6120do	9585do
1600	1700		Brazil, Radio Guaiba	6000do	11785do

1600	1700		Brazil, Radio Imaculada Conceicao		4755do
1600	1700		Brazil, Radio Inconfidencia	6010do	15190do
1600	1700		Brazil, Radio Itatiaia	5970do	
1600	1700		Brazil, Radio Maria	4885do	
1600	1700		Brazil, Radio Marumby	9665do	11750do
1600	1700		Brazil, Radio Missoes da Amazonia		4865do
1600	1700		Brazil, Radio Mundial	3325do	
1600	1700		Brazil, Radio Nacional da Amazonia 11780do		6185do
1600	1700		Brazil, Radio Nossa Voz	4975do	
1600	1700		Brazil, Radio Nove de Julho	9820do	
1600	1700		Brazil, Radio Novo Tempo	4895do	
1600	1700		Brazil, Radio Record	6150do	9505do
1600	1700		Brazil, Radio Rio Mar	6160do	9695do
1600	1700		Brazil, Radio Rural	4765do	
1600	1700	mtwhf	Brazil, Radio Senado	5990do	
1600	1700		Brazil, Radio Voz Missionaria	5940do	
1600	1700		Brazil, SRDA/Super Radio Deus e Amour 9565do 11765do		6060do
1600	1700		Brazil, Super Rede Boa Vontade 9550do 11895do		4860do
1600	1700		Brazil, Voz Missionaria	5940do	
1600	1700	mtwhf	Portugal, RDP Internacional 21655va	11905eu	15560am
1600	1700	Sat/Sun	Portugal, RDP Internacional 21655va	15170af	15560am
1630	1645	mh	Swaziland, TWR Swaziland	3200af	
1630	1645	twfa	Swaziland, TWR Swaziland	3200af	

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

1700	1800		Angola, Radio Nacional de Angola		4950do
1700	1800		Brazil, Novas de Paz 11725do	6080do	9515do
1700	1800		Brazil, Radio Alvorada/Londrina		4865do
1700	1800		Brazil, Radio Aparecida 9630al	5035do	6135al 11855al
1700	1800		Brazil, Radio Boa Vontade 11895do	6160do	9550do
1700	1800		Brazil, Radio Brasil	4785do	
1700	1800		Brazil, Radio Brasil Central	4985do	11815do
1700	1800		Brazil, Radio Cancao Nova 9675do	4825do	6105do
1700	1800		Brazil, Radio Capixaba	4935do	
1700	1800		Brazil, Radio Clube do Para	4885do	
1700	1800		Brazil, Radio Congonhas	4775do	
1700	1800		Brazil, Radio Cultura do Para	5045do	
1700	1800		Brazil, Radio Cultura Ondas Tropicais		4845do
1700	1800		Brazil, Radio Cultura Sao Paulo 17815do		9615do
1700	1800		Brazil, Radio Cultura/Araraquara		3365do
1700	1800		Brazil, Radio Daqui	4915do	
1700	1800		Brazil, Radio Difusora Acerana		4885do
1700	1800		Brazil, Radio Difusora Caceres		5055do
1700	1800		Brazil, Radio Difusora de Macapa		4915do
1700	1800		Brazil, Radio Difusora do Amazonas		4805do
1700	1800		Brazil, Radio Difusora Roraima		4875do
1700	1800		Brazil, Radio Difusora/Londrina		4815do
1700	1800		Brazil, Radio Educadora	2380do	
1700	1800		Brazil, Radio Educadora 6 de Agosto		3255do
1700	1800		Brazil, Radio Gaucha	6020do	11915do
1700	1800		Brazil, Radio Gazeta Universitaria 9685do 15325al		5955do
1700	1800		Brazil, Radio Globo	6120do	9585do
1700	1800		Brazil, Radio Guaiba	6000do	11785do
1700	1800		Brazil, Radio Imaculada Conceicao		4755do
1700	1800		Brazil, Radio Inconfidencia	6010do	15190do
1700	1800		Brazil, Radio Itatiaia	5970do	
1700	1800		Brazil, Radio Maria	4885do	
1700	1800		Brazil, Radio Marumby	9665do	11750do
1700	1800		Brazil, Radio Missoes da Amazonia		4865do
1700	1800		Brazil, Radio Mundial	3325do	
1700	1800		Brazil, Radio Nacional da Amazonia 11780do		6185do
1700	1800		Brazil, Radio Nossa Voz	4975do	
1700	1800		Brazil, Radio Nove de Julho	9820do	
1700	1800		Brazil, Radio Novo Tempo	4895do	
1700	1800		Brazil, Radio Record	6150do	9505do
1700	1800		Brazil, Radio Rio Mar	6160do	9695do
1700	1800		Brazil, Radio Rural	4765do	
1700	1800	mtwhf	Brazil, Radio Senado	5990do	
1700	1800		Brazil, Radio Voz Missionaria	5940do	
1700	1800		Brazil, SRDA/Super Radio Deus e Amour 9565do 11765do		6060do
1700	1800		Brazil, Super Rede Boa Vontade 9550do 11895do		4860do
1700	1800		Brazil, Voz Missionaria	5940do	
1700	1800		France, Radio France Internationale		15530af
1700	1800	mtwhf	Portugal, RDP Internacional 21655va	11905eu	15560am
1700	1800	Sat/Sun	Portugal, RDP Internacional 15560am 21655va	11905eu	15170af
1700	1800		USA, Voice of America 15740af	9800af	12080af
1700	1800		USA, WYFR/Family Radio Worldwide 21525af		17725sa

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

1800	1830	mtwhf	USA, Voice of America 15740af	9800af	12080af
1800	1830		Vatican City State, Vatican Radio 13765af 15570af		11625af
1800	1900		Angola, Radio Nacional de Angola		4950do
1800	1900		Brazil, Jornal A Critica	5055do	
1800	1900		Brazil, Novas de Paz 11725do	6080do	9515do
1800	1900		Brazil, Radio Alvorada/Londrina		4865do
1800	1900		Brazil, Radio Aparecida 9630al	5035do	6135al 11855al
1800	1900		Brazil, Radio Bandeirantes 11925do	6090do	9645do
1800	1900		Brazil, Radio Boa Vontade 11895do	6160do	9550do
1800	1900		Brazil, Radio Brasil	4785do	
1800	1900		Brazil, Radio Brasil Central	4985do	11815do
1800	1900		Brazil, Radio Cancao Nova 9675do	4825do	6105do
1800	1900		Brazil, Radio Capixaba	4935do	
1800	1900		Brazil, Radio Clube do Para	4885do	
1800	1900		Brazil, Radio Congonhas	4775do	
1800	1900		Brazil, Radio Cultura do Para	5045do	
1800	1900		Brazil, Radio Cultura Ondas Tropicais		4845do
1800	1900		Brazil, Radio Cultura Sao Paulo 17815do		9615do
1800	1900		Brazil, Radio Cultura/Araraquara		3365do
1800	1900		Brazil, Radio Daqui	4915do	
1800	1900		Brazil, Radio Difusora Acerana		4885do
1800	1900		Brazil, Radio Difusora Caceres		5055do
1800	1900		Brazil, Radio Difusora de Macapa		4915do
1800	1900		Brazil, Radio Difusora Roraima		4875do
1800	1900		Brazil, Radio Difusora/Londrina		4815do
1800	1900		Brazil, Radio Educadora	2380do	
1800	1900		Brazil, Radio Educadora 6 de Agosto		3255do
1800	1900		Brazil, Radio Gaucha	6020do	11915do
1800	1900		Brazil, Radio Gazeta Universitaria 9685do 15325al		5955do
1800	1900		Brazil, Radio Globo	6120do	9585do
1800	1900		Brazil, Radio Guaiba	6000do	11785do
1800	1900		Brazil, Radio Imaculada Conceicao		4755do
1800	1900		Brazil, Radio Inconfidencia	6010do	15190do
1800	1900		Brazil, Radio Itatiaia	5970do	
1800	1900		Brazil, Radio Maria	4885do	
1800	1900		Brazil, Radio Marumby	9665do	11750do
1800	1900		Brazil, Radio Missoes da Amazonia		4865do
1800	1900		Brazil, Radio Mundial	3325do	
1800	1900		Brazil, Radio Nacional da Amazonia 11780do		6185do
1800	1900		Brazil, Radio Nossa Voz	4975do	
1800	1900		Brazil, Radio Nove de Julho	9820do	
1800	1900		Brazil, Radio Novo Tempo	4895do	
1800	1900		Brazil, Radio Record	6150do	9505do
1800	1900		Brazil, Radio Rio Mar	6160do	9695do
1800	1900		Brazil, Radio Rural	4765do	
1800	1900	mtwhf	Brazil, Radio Senado	5990do	
1800	1900		Brazil, Radio Voz Missionaria	5940do	
1800	1900		Brazil, SRDA/Super Radio Deus e Amour 9565do 11765do		6060do
1800	1900		Brazil, Super Rede Boa Vontade 9550do 11895do		4860do
1800	1900		Brazil, Voz Missionaria	5940do	
1800	1900	DRM	Chile, CVC La Voz Crista	17640sa	
1800	1900	mtwhf	Portugal, RDP Internacional 21655va	11905eu	15560am
1800	1900	Sat/Sun	Portugal, RDP Internacional 15560am 21655va	11905eu	15170af
1800	1900	mtwhf	Spain, Radio Exterior de Espana		17595sa
1800	1900		USA, WYFR/Family Radio Worldwide		17725sa
1850	1900	Sat	Swaziland, TWR Swaziland	6130af	

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

1900	1905	Sat	Swaziland, TWR Swaziland	6130af	
1900	2000		Angola, Radio Nacional de Angola		4950do

1900	2000		Brazil, Jornal A Critica	5055do	
1900	2000		Brazil, Novas de Paz	6080do	9515do
			11725do		
1900	2000		Brazil, Radio Alvorada/Londrina		4865do
1900	2000		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
1900	2000		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
1900	2000		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
1900	2000		Brazil, Radio Brasil	4785do	
1900	2000		Brazil, Radio Brasil Central	4985do	11815do
1900	2000		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
1900	2000		Brazil, Radio Capixaba	4935do	
1900	2000		Brazil, Radio Clube do Para	4885do	
1900	2000		Brazil, Radio Congonhas	4775do	
1900	2000		Brazil, Radio Cultura do Para	5045do	
1900	2000		Brazil, Radio Cultura Ondas Tropicais		4845do
1900	2000		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
1900	2000		Brazil, Radio Cultura/Araraquara		3365do
1900	2000		Brazil, Radio Daqui	4915do	
1900	2000		Brazil, Radio Difusora Acerana		4885do
1900	2000		Brazil, Radio Difusora Caceres		5055do
1900	2000		Brazil, Radio Difusora de Macapa		4915do
1900	2000		Brazil, Radio Difusora Roraima		4875do
1900	2000		Brazil, Radio Difusora/Londrina		4815do
1900	2000		Brazil, Radio Educadora	2380do	
1900	2000		Brazil, Radio Educadora 6 de Agosto		3255do
1900	2000		Brazil, Radio Gaucha	6020do	11915do
1900	2000		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
1900	2000		Brazil, Radio Globo	6120do	9585do
1900	2000		Brazil, Radio Guaiba	6000do	11785do
1900	2000		Brazil, Radio Imaculada Conceicao		4755do
1900	2000		Brazil, Radio Inconfidencia	6010do	15190do
1900	2000		Brazil, Radio Itatiaia	5970do	
1900	2000		Brazil, Radio Maria	4885do	
1900	2000		Brazil, Radio Marumby	9665do	11750do
1900	2000		Brazil, Radio Missoes da Amazonia		4865do
1900	2000		Brazil, Radio Mundial	3325do	
1900	2000		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
1900	2000		Brazil, Radio Nossa Voz	4975do	
1900	2000		Brazil, Radio Nove de Julho	9820do	
1900	2000		Brazil, Radio Novo Tempo	4895do	
1900	2000		Brazil, Radio Record	6150do	9505do
1900	2000		Brazil, Radio Rio Mar	6160do	9695do
1900	2000		Brazil, Radio Rural	4765do	
1900	2000	mtwhf	Brazil, Radio Senado	5990do	
1900	2000		Brazil, Radio Voz Missionaria	5940do	
1900	2000		Brazil, SRDA/Super Radio Deus e Amour		6060do
			9565do	11765do	
1900	2000		Brazil, Super Rede Boa Vontade		4860do
			9550do	11895do	
1900	2000		Brazil, Voz Missionaria	5940do	
1900	2000	DRM	Chile, CVC La Voz Crista	17640sa	
1900	2000		China, China Radio International		5985af
			7335eu	7405af	9535af 9620af
			9765af		
1900	2000	mtwhf	Portugal, RDP Internacional	9820eu	11945va
			15560am	21655va	
1900	2000	Sat/Sun	Portugal, RDP Internacional	9820eu	11945af
			15170af	15560am	21655va
1900	2000		USA, WYFR/Family Radio Worldwide		3955af
			6100af	17725sa	
1905	1920	mt	Swaziland, TWR Swaziland	6130af	
1920	1950		Swaziland, TWR Swaziland	6130af	
1930	1959		Germany, Deutsche Welle	6150af	11795af
			17865af		

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

2000	2030		Cuba, Radio Havana Cuba	15370eu	
2000	2100		Angola, Radio Nacional de Angola		4950do
2000	2100		Brazil, Jornal A Critica	5055do	
2000	2100		Brazil, Novas de Paz	6080do	9515do
			11725do		
2000	2100		Brazil, Radio Alvorada/Londrina		4865do
2000	2100		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
2000	2100		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
2000	2100		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
2000	2100		Brazil, Radio Brasil	4785do	
2000	2100		Brazil, Radio Brasil Central	4985do	11815do
2000	2100		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
2000	2100		Brazil, Radio Capixaba	4935do	
2000	2100		Brazil, Radio Clube do Para	4885do	
2000	2100		Brazil, Radio Congonhas	4775do	
2000	2100		Brazil, Radio Cultura do Para	5045do	
2000	2100		Brazil, Radio Cultura Ondas Tropicais		4845do
2000	2100		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
2000	2100		Brazil, Radio Cultura/Araraquara		3365do
2000	2100		Brazil, Radio Daqui	4915do	11830do
2000	2100		Brazil, Radio Difusora Acerana		4885do
2000	2100		Brazil, Radio Difusora Caceres		5055do
2000	2100		Brazil, Radio Difusora de Macapa		4915do
2000	2100		Brazil, Radio Difusora do Amazonas		4805do
2000	2100		Brazil, Radio Difusora Roraima		4875do
2000	2100		Brazil, Radio Difusora/Londrina		4815do
2000	2100		Brazil, Radio Educadora	2380do	
2000	2100		Brazil, Radio Educadora 6 de Agosto		3255do
2000	2100		Brazil, Radio Gaucha	6020do	11915do
2000	2100		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
2000	2100		Brazil, Radio Globo	6120do	9585do
2000	2100		Brazil, Radio Guaiba	6000do	11785do
2000	2100		Brazil, Radio Imaculada Conceicao		4755do
2000	2100		Brazil, Radio Inconfidencia	6010do	15190do
2000	2100		Brazil, Radio Itatiaia	5970do	
2000	2100		Brazil, Radio Maria	4885do	
2000	2100		Brazil, Radio Marumby	9665do	11750do
2000	2100		Brazil, Radio Missoes da Amazonia		4865do
2000	2100		Brazil, Radio Mundial	3325do	
2000	2100		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
2000	2100		Brazil, Radio Nossa Voz	4975do	
2000	2100		Brazil, Radio Nove de Julho	9820do	
2000	2100		Brazil, Radio Novo Tempo	4895do	
2000	2100		Brazil, Radio Record	6150do	9505do
2000	2100		Brazil, Radio Rio Mar	6160do	9695do
2000	2100		Brazil, Radio Rural	4765do	
2000	2100	mtwhf	Brazil, Radio Senado	5990do	
2000	2100		Brazil, Radio Voz Missionaria	5940do	
2000	2100		Brazil, SRDA/Super Radio Deus e Amour		6060do
			9565do	11765do	
2000	2100		Brazil, Super Rede Boa Vontade		4860do
			9550do	11895do	
2000	2100		Brazil, Voz Missionaria	5940do	
2000	2100		Portugal, RDP Internacional	9820eu	11945va
			13755am	15295va	
2005	2020	Sun	Swaziland, TWR Swaziland	6130af	
2030	2100	mtwhf	UK, BBC World Service	6065af	6135af
			11855af	13745af	15165as

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

2100	2145		USA, WYFR/Family Radio Worldwide		15695eu
2100	2200		Angola, Radio Nacional de Angola		4950do
2100	2200		Brazil, Jornal A Critica	5055do	
2100	2200		Brazil, Novas de Paz	6080do	9515do
			11725do		
2100	2200		Brazil, Radio Alvorada/Londrina		4865do
2100	2200		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
2100	2200		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
2100	2200		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
2100	2200		Brazil, Radio Brasil	4785do	
2100	2200		Brazil, Radio Brasil Central	4985do	11815do
2100	2200		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
2100	2200		Brazil, Radio Capixaba	4935do	
2100	2200		Brazil, Radio Clube do Para	4885do	
2100	2200		Brazil, Radio Congonhas	4775do	
2100	2200		Brazil, Radio Cultura do Para	5045do	
2100	2200		Brazil, Radio Cultura Ondas Tropicais		4845do

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Monitoring the U.S. Navy SESEFs

Sometimes it is hard to let the past go, because, quite frankly, it was so much fun at the time! One of my fondest memories from the early days of my monitoring career was spending hours listening to US Navy warships and shore stations on a wide variety of HF radio frequencies.

We used to be able to monitor all sorts of communications from a wide variety of naval warfare disciplines, such as antisubmarine warfare, ships on test and weapon ranges, and (my personal favorite) the old 2-MHz marine harbor control frequencies. On those frequencies you could hear Navy ships calling using their real names instead of a computer-generated trigraph callsign as they requested permission to enter or leave port.

Ask any old timer if they remember the old HF HICOM or NORATS 8-MHz phone nets, and you may catch a glint in his eye. Old call signs such as Barbaric (Guantanamo Bay), Hershey (Key West), Jitterbug (Canal Zone), and Overwork were some of the common users we heard from that era.

Unfortunately for the HF monitor, military satellite technology is now the primary vehicle for U.S. Navy communications. So that golden era of monitoring that I enjoyed so much has vacated the HF radio spectrum.

But, not all of the Navy communications have jumped ship to the satellite bandwagon. If you are patient enough, some interesting Navy communications still take place on HF frequencies. For instance, you can monitor unencrypted analog voice communications that are associated with several U.S. Navy Shipboard Electronic Systems Evaluation Facilities (SESEF) worldwide on a variety of radio frequencies, including several in the HF spectrum.

The SESEFs are land-based test facilities, established to facilitate testing of the electromagnetic transmitting and receiving equipment for U.S. Navy, U.S. Coast Guard and Military Sealift Command vessels. Their coastal locations are near major fleet concentrations, in both transit and operational areas, and that allows the individual SESEFs to meet scheduled and unscheduled testing requirements for fleet units.

The SESEF facilities were originally established in the 1950s to provide naval shipyards with the means to assess the material readiness of shipboard systems following overhaul and maintenance efforts. In the late 1970s, the SESEF mission was expanded to include fleet operational readiness support. With a focus on keeping pace with the evolving technology of shipboard electronic equipment, a formal upgrade program was established in 1987. That upgrade improved SESEF testing capabilities and allowed these shore based stations to increase the diversity of systems tested while reducing test time.

Some of the major shipboard electronic systems currently tested by the SESEFs include: Communications Systems (HF and above); Identification Friend or Foe (IFF); Tactical Digital Information Link (TADIL) C (Link-4A); Tactical Digital Information Link A (Link-11); Tactical Digital Information Link (TADIL) J (Link-16); Radar Beacon Acquisition (RBA) equipment; Tactical Air Navigation (TACAN); Shipboard Antenna Radiation Patterns (ARP); AN/ULM-4 ECM and AN/ULM-4 ESM equipment; Radio Direction Finding (RDF) equipment; Universal Radar Moving Target Transponder (URMTT); AN/SRQ-4 Light Airborne Multi-Purpose System (LAMPS) MK III; and the Radar Cross-Section Measurement System (RCS).

❖ Where in the World are the SESEFs?

There are six SESEF facilities scattered around the world. These installations are located at Norfolk, Virginia; Mayport, Florida; San Diego, California; Ediz Hook, Washington; Barbers Point, Hawaii; and Yokosuka, Japan. The Navy also has an SESEF mobile van that is moved and used anywhere within the continental United States where it is needed. I will profile each of the SESEF sites below.

Norfolk SESEF (Mid Atlantic)

This is the most common SESEF installation heard by radio monitors here in the United States. The Norfolk SESEF facility is located in Building 102 at Fort Story, Virginia Beach, Virginia. The facility overlooks the Atlantic Ocean, Chesapeake Bay and the approaches to the Virginia Capes operating area.

In addition to at-sea testing, directional antennas provide line-of-sight (LOS) support for pier side testing from all naval and shipyard facilities in the Tidewater area. The Naval Undersea Warfare Center (NUWC) Division, Newport, Rhode Island, operates this facility. The Norfolk SESEF site is operational five days a week from 0700-1600 local time, excluding weekends and holidays.

Norfolk SESEF guard frequencies
Call Sign: "SESEF Norfolk"
HF: 7535.0 kHz (Window - USB) Clear/Secure
UHF: 274.800 MHz (AM) Clear/Secure

AN/ULM-4 Range Information (For Active Ships)
Call Sign: "Lamb Stew One"
Test Frequency: 361.2 00 MHz (AM) - Secure

RCS Range Information
Call Sign: "Bandit Control"
Test Frequency: 379.700 MHz (AM) Clear (Initial contact)

Additional HF frequencies to monitor include: 4040.0 4515.0 9260.0 12315.0 kHz (USB mode)

Mayport SESEF (Southeast US)

The Mayport SESEF is located in Building 1860 on Naval Station Mayport, Florida. The facility has LOS capability for pier-side testing as well as easy access to ships in the Jacksonville operating area. This facility is operated by NUWC Division Newport, Rhode Island, and is managed by the Norfolk SESEF facility. The Mayport SESEF site is operational five days a week from 0700-1600 local time, excluding weekends and holidays.

Mayport SESEF guard frequencies
Call Sign: "Mayport SESEF"
HF: 5745.0 kHz (Window - USB) Clear/Secure
UHF: 274.800 MHz (AM) Clear/Secure

AN/ULM-4 Range Information
Call Sign: "Lamb Stew One"
Test Frequency: 361.2 00 MHz (AM) - Secure

San Diego SESEF (SoCal)

The San Diego SESEF is located at the Space and Naval Warfare Systems Command (SPAWAR) Seaside Complex, Building 610, on the ocean side of Point Loma, overlooking the Pacific Ocean, and at Building 589 on the crest of Point Loma. This location provides easy access to ships as they transit the entrance of San Diego's harbor. NUWC Detachment,

San Diego, California operates this facility. The San Diego SESEF site is operational five days a week from 0700-1530 local time, excluding weekends and holidays.

San Diego SESEF guard frequencies
Call Sign: "Reliable Partner"
Ship Call Sign: Use Current AKAI-6 Call Signs
HF: 5742.0 kHz (Window - USB) Clear/Secure
UHF: 264.200 MHz (AM) Clear/Secure

AN/ULM-4 Range Information
Call Sign: "Reliable Partner"
Test Frequency: 236.200 MHz (AM) Secure

RCS Range Information
Call Sign: "Reliable Partner"
Test Frequency: 236.200 MHz (AM) Secure

Additional HF frequency to monitor: 2792.0.0 kHz (USB mode)

Ediz Hook SESEF (PACNORWEST)

The Ediz Hook SESEF is located on the U.S. Coast Guard Air Station, Ediz Hook, near Port Angeles, Washington. The Puget Sound coastal waters are adjacent to the facilities. This site supports the Puget Sound Naval Shipyard, Bangor Naval Submarine Base, Naval Air Station Whidbey Island and Everett Naval Station. Naval Undersea Warfare Center (NUWC) Division Keyport, Washington, operates this facility. LOS service can be provided to ships en route to or from activities listed above. The Ediz Hook SESEF facility is operational five days a week from 0800-1600 local time, excluding weekends and holidays.

Ediz Hook SESEF guard frequencies
Call Sign: "Magic Carpet Sierra"
HF: 3236.0 kHz (Window - USB) Clear/Secure
UHF: 308.500 MHz (AM) Clear/Secure
UHF Repeater: 347.900 MHz (AM) Clear/Secure
(Covers most of Puget Sound)
VHF: 156.250 MHz Marine Channel 5A (Seattle VTS) and 156.800 MHz Marine Channel 16

AN/ULM-4 Range Information
Call Sign: "Magic Carpet Sierra"
Test Frequency: 308.5 MHz (AM) Secure

Hawaii SESEF (MIDPAC)

The Hawaii SESEF is located at the Barber's Point Light Station, Kapolei, HI. It is within LOS of Pearl Harbor, Sand Island, and the Fleet Operational Readiness Accuracy Check Site (FORACS) III Underwater Tracking Range. Surface ships and submarines can readily be serviced at dockside and underway. This facility serves the U.S. Naval Forces in the MIDPAC area. SESEF testing is conducted in port, during transit to and from Pearl Harbor, Schofield and Wheeler Army Bases, and on designated test ranges (SESEF/FORACS III). NUWC Division Detachment Pacific operates this facility. The Hawaii SESEF site is operational Monday through Friday from 0700-1530 local time, excluding weekends and holidays.

Hawaii SESEF guard frequencies
Call Sign: "Patrol Leader Bravo"
HF: 16087.0 kHz (Window - USB) Clear/Secure
UHF: 277.000 MHz (AM) Clear/Secure

AN/ULM-4 Range Information
Call Sign: "Patrol Leader Bravo"
Test Frequency: 277.000 MHz (AM) Secure

Yokosuka SESEF (WESTPAC)

The Yokosuka SESEF communication facility is located in Building A37 at the Naval Ship Repair Facility and Japan Regional Maintenance Center (NSRF/JRMC) Yokosuka, Japan, and the TACAN, AN/ULM-4, ARP, OUTBOARD, RBA and IFF test facility is located approximately 10 miles from NSRF/JRMC on the eastern shore of Sagami-Wan at Nagai, Japan. NSRF/JRMC Yokosuka, JA, operates both facilities. The Yokosuka SESEF site is operational from 0730-1600 local time, excluding weekends and holidays. After hours testing can be arranged with 24-hour advance notice.

Yokosuka SESEF guard frequencies
Call Sign: "Park Entrance"
HF: 5304.0 kHz (Window - USB) Clear/Secure
VHF: 156.500 MHz Marine Channel 10 and 156.800 MHz Marine Channel 16
UHF: 295.000 MHz (AM) Primary Clear/Secure
233.700 MHz (AM) Secondary Clear/Secure

AN/ULM-4 Range Information
Call Sign: "Park Entrance"
Test Frequency: 295.000 MHz (AM) Secure

SESEF Mobile Van

The Mobile SESEF Van, when not deployed, is located at the Mayport SESEF facility in Building 1860 on Naval Station Mayport, Florida. The mobile van can be deployed anywhere along the Atlantic or Gulf coasts of the continental U.S. The van is maintained by Mayport SESEF and when deployed, is staffed by personnel from both the Norfolk and Mayport SESEF facilities. The Naval Undersea Warfare Center (NUWC) Division, Newport, Rhode Island operates this facility.

SESEF Mobile Van guard frequencies
Call Sign: "Mobile SESEF"
HF: 7535.0 kHz (Window - USB) Clear/Secure
UHF: 274.800 MHz (AM) Clear/Secure

In short, if you are looking for some HF Navy activity, check out the frequencies in Table One for some warship communications from the United States Navy. Until next time, 73 and good hunting.

TABLE ONE: SESEF FREQUENCIES

(Frequencies below are in kHz)

2792.0	SESEF San Diego (ANDVT/USB)
3236.0	SESEF Ediz Hook (ANDVT/USB)
4040.0	SESEF Norfolk (ANDVT/USB)
4515.0	SESEF Norfolk (ANDVT/USB)
5304.0	SESEF Yokosuka (ANDVT/USB)
5742.0	SESEF San Diego (ANDVT/USB)
5745.0	SESEF Mayport/SESEF Norfolk (ANDVT/USB)
7535.0	SESEF Norfolk (ANDVT/USB)
9260.0	SESEF Norfolk (ANDVT/USB)
12315.0	SESEF Norfolk (ANDVT/USB)
16087.0	SESEF Hawaii (ANDVT/USB)

(Frequencies below are in MHz)

156.250	SESEF Ediz Hook (Narrowband FM)
156.500	SESEF Yokosuka (Narrowband FM)
156.800	SESEF Ediz Hook/SESEF Yokosuka (Narrowband FM)
233.700	SESEF Yokosuka (AM mode/Encryption)
236.200	SESEF San Diego (AM mode/Encryption)
264.200	SESEF San Diego (AM mode/Encryption)
274.800	SESEF Norfolk/SESEF Mayport/Mobile SESEF (AM mode/Encryption)
277.000	SESEF Hawaii (AM mode/Encryption)
295.000	SESEF Yokosuka (AM mode/Encryption)
308.500	SESEF Ediz Hook (AM mode/Encryption)
347.900	SESEF Ediz Hook (AM mode/Encryption)
361.200	SESEF Norfolk/SESEF Mayport (AM mode/Encryption)
379.700	SESEF Norfolk (AM mode/Encryption)

FED FILES

GOVERNMENT COMMUNICATIONS

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2010 Federal Wrap-Up

It's hard to believe it's already November and the end of 2010 is already in sight. Since we've got a lot to squeeze in to finish up the *Fed Files* columns for the year, let's jump right in!

❖ On the Move with the DEA

The Drug Enforcement Administration (DEA) has been a favorite but sometimes elusive target of federal monitors for many years. I recall the DEA being one of the first federal agencies that I listened to regularly, starting around 1977 when the Bearcat 210 programmable scanners were new. At that time, not many radios would tune the 406 to 420 MHz end of the UHF band. DEA communications were very open and uncensored in those days, probably because they didn't think anyone could hear them!

The DEA channels do not carry nearly as much routine communications as they did years ago. Cell phones have greatly reduced the need for routine traffic on their frequencies. These days, agents in the field often don't even call in to the base for running license plates or checking criminal histories – these can all be done via laptops or cell phone. So, what do they use their radios for? Mostly surveillance and felony arrest operations.

Back in November of 2005 I did a close-up of the DEA and the frequencies that they use. However, recent indications are that change is in the air for the DEA. For instance, the agency appears to be moving more towards APCO P-25 digital radios, which had previously been limited to a few areas of the country. In addition to the move to digital radios, a general re-farming of the 406 MHz to 420 MHz federal UHF band will require some frequency changes.

In the original layout of the federal UHF band, there were no standard paired frequencies for radio systems using repeaters. But, the current National Telecommunications Information Agency (NTIA) plan calls for frequencies in this band to be allocated in pairs for repeater input and outputs, as well as simplex channels. Frequencies from 406-410.9875 MHz are to be paired with frequencies 9 MHz higher as an allocated pair. So, that means a frequency of 410.9875 MHz would be paired with 419.9875 MHz. Frequencies from 411.0 MHz to 415.0 MHz would be used for non-paired operations, either point-to-point or simplex use. More information on these changes can be found on the NTIA web site, **http://www.ntia.doc.gov/**.

A great number of federal radio systems in the 406-420 MHz band have not yet been rechanneled to meet these new specifications, but plans are in place for things to change in the near future as money becomes available for new equipment.

One agency with quite a few of the non-standard UHF allocations is the DEA. Some areas of the country have noted the DEA using their usual UHF channels in analog, some have switched to P-25 digital, and others seem to have abandoned their channels altogether.

In the Pacific Northwest, the DEA has been a subscriber agency to the Justice Department's Integrated Wireless Network or IWN. Reports were that the DEA was not satisfied with coverage of the IWN, but I've recently been told that the DEA agents in the Portland area no longer have UHF radios in their vehicles, but only have IWN radios for their use.

Although that would appear to indicate that the DEA will be sharing common channels with the other agencies of the Justice Department (FBI, BATF, US Marshals), other sources are contradictory. A recent budget request for the Justice Department mentions that the DEA, after trying to utilize the VHF IWN system, still prefers the UHF channels it has always used for "tactical" considerations and wishes to continue using those channels.

Listener reports in some areas show traditional DEA frequencies recently being used as repeater inputs, paired with output frequencies in the 409 MHz band previously not assigned to the DEA. Here is what has been confirmed so far:

409.6750 MHz - Repeater output, input 418.6750 MHz, P-25 NAC 156
409.9000 MHz - Repeater output, input 418.9000 MHz, P-25 NAC 156
413.9750 MHz - Simplex, P-25 NAC 156

Although these are the only new frequencies on which I have confirmed activity, it's easy to see how the new 9 MHz repeater offsets could be applied to all of the 415 MHz to 420 MHz DEA channels, with the higher frequencies being used as inputs to repeaters 9 MHz lower. For example, 418.6250 MHz would now be the input to a repeater on 409.6250 MHz.

Here is a list of known DEA allocations in the federal UHF band. Now that you know that many of the repeater inputs and outputs are in the process of changing, be on the lookout for new DEA activity on frequencies 9 MHz below the channels listed, and let me know what you hear in your area.

DEA UHF ALLOCATIONS

Freq MHz	*Known info*
408.2750	
408.3000	
408.3750	
409.6750	New repeater, input 418.6750
409.9000	New repeater, input 418.9000
411.1250	old input to 419.2500
411.1750	
412.0000	HIDTA Ch 6
412.1250	HIDTA Ch.10
412.4500	
412.4750	
412.5250	old input to 414.5500
413.6250	
413.6750	
413.7000	
413.7500	
413.9750	simplex, old input to 417.7500 & 419.2250
414.0000	simplex
414.0250	HIDTA Ch.3 simplex
414.0500	HIDTA Ch.4 simplex
414.0750	
414.1250	
414.1500	HIDTA Ch.5 simplex
414.1750	
414.2000	
414.2250	
414.2750	
414.3250	
414.3500	HIDTA Ch.7
414.4000	
414.4250	old input to 419.2750
414.4500	HIDTA Ch.8
414.4750	HIDTA Ch.9
414.5000	HIDTA Ch 2
414.5250	old input to 419.3000
414.5500	HIDTA Ch 1
414.5750	
414.6000	old input to 419.2000
415.5000	
415.6000	old input to 418.8250
416.0500	old input to 418.6250
416.1000	

HARDWARE FOR FEDERAL MONITORING

If you are interested in upgrading or expanding your radio resources for federal monitoring, check out the "Radio Buyers Guide" in this issue of *Monitoring Times*. There are several new models of scanners recently introduced that have features desired by most federal listeners (with the exception of encryption decoding!). A scanner or receiver that is capable of APCO P-25 digital reception is essential for federal monitoring these days. Scanners that support computer control or logging are always an asset to federal listeners, and the ability to search multiple frequency ranges adds to the ability to capture possible federal operations.

416.1500	
416.2000	old input to 418.9500
416.2750	
416.3250	old input to 418.9000
416.3750	old input to 418.7750
417.0250	old input to 418.9750
417.0500	
417.0750	
417.1000	
417.1250	old input to 412.0000
417.1500	simplex
417.1750	old input to 412.1250
417.2000	simplex
417.2750	simplex
417.3250	simplex
417.4000	old input to 419.0000
417.4500	simplex
417.5000	simplex
417.5500	simplex
417.7500	
418.0000	
418.0500	simplex (federal itinerant)
418.0750	Interagency Common
418.1250	
418.1750	simplex
418.2000	simplex
418.2250	simplex
418.3250	
418.5000	simplex
418.5750	simplex (federal itinerant)
418.6250	DEA Ch.1
418.6500	simplex
418.6750	DEA Ch.4 simplex, new input to 409.6750 repeater
418.7000	simplex
418.7500	DEA Ch.3 simplex
418.7750	simplex
418.8000	simplex
418.8250	DEA Ch.5
418.8500	
418.8750	simplex
418.9000	DEA Ch.2, new input to 409.9000 repeater
418.9250	
418.9500	DEA Ch.6
418.9750	DEA Ch.8
419.0000	
419.2000	
419.2250	simplex
419.2500	
419.2750	
419.3000	
419.3250	old input to 414.3500
419.3750	old input to 414.4500
419.4000	old input to 414.4750
419.4250	old input to 414.5000
419.4500	
419.5000	
419.5250	DEA Ch.10

As you look over this list, you will notice that there are channels set aside for HIDTA operations. *HIDTA* stands for High Intensity Drug Trafficking Area – a program that concentrates resources on major drug trafficking areas in the United States. HIDTA operations normally involve federal support of local law enforcement operations involving drug crimes. You can find out more about the HIDTA program at the DEA web site, **www.usdoj.gov/dea/programs/hidta.htm**.

Lest you think the DEA has abandoned their UHF radios, remember that the DEA often works with local or regional law enforcement task forces around the country. They sometimes share communications resources, so it's not unusual to hear DEA units showing up on local or state police frequencies or radio systems. Many major metropolitan areas with 800 MHz trunking systems have talk-groups assigned to federal task force operations, including the DEA and HIDTA.

❖ USFS Fire Channels

I recently received some interesting information from a federal monitoring fan – frequencies from an aircraft radio from the US Forest Service, Redmond, Oregon Smokejumper Base. For more information on the Redmond Smokejumpers, you can check out these web sites:

www.fs.fed.us/fire/people/smokejumpers/RAC/history.html
www.ncsbsmokejumpers.com/

Here are the frequencies that are carried in the smokejumper's aircraft radio for use in fire fighting operations:

US Forest Service Aircraft Frequencies
CSQ = Carrier Squelch (no PL tone)
PL = CTCSS tone squelch

01	168.6500	CSQ	NATIONAL FLIGHT FOLLOWING
02	169.8750	103.5 PL	DEF 1 DIR - Awbrey Butte
03	170.4750	103.5 PL	DEF 2 DIR - Awbrey Butte
04	169.8750	123.0 PL	DEF 1 - Green Ridge
05	170.4750	146.2 PL	DEF 2 - Green Ridge
06	169.8750	167.9 PL	DEF 1 - Black Butte
07	170.4750	136.5 PL	DEF 2 - Black Butte
08	169.8750	136.5 PL	DEF 1 - Lookout Mountain
09	170.4750	167.9 PL	DEF 2 - Lookout Mountain
10	169.8750	156.7 PL	DEF 1 - East Butte
11	170.4750	123.0 PL	DEF 2 - East Butte
12	169.8750	131.8 PL	DEF 1 - Hoodoo
13	168.5500	CSQ	Smokejumper Air to Ground
14	169.8750	146.2 PL	DEF 1 - Odell Butte
15	170.4750	131.8 PL	DEF 2 - Odell Butte
16	169.9750	131.8 PL	Ochoco 2 Direct-West Prairie Division
17	169.1250	131.8 PL	Ochoco 3 Direct-East Prairie Division
18	169.9750	136.5 PL	Ochoco Prineville-Grizzly
19	169.1250	136.5 PL	Ochoco Paulina-Round Mountain
20	169.1750	131.8 PL	Ochoco Snow Mt-Dry Mountain
21	170.4750	156.7 PL	DEF Mt Bachelor
22	OPEN		
23	170.3500	156.7 PL	Malheur Direct
24	OPEN		

❖ CBP Border Patrol in Arizona

On a recent trip to the Tucson, Arizona area I came across some new P-25 repeaters and noted them in a *Fed Files* blog posting:
http://mt-fedfiles.blogspot.com/2010/05/arizona-border-activity.html

Since that blog post, I have received some additional information on these new active frequencies. It now appears that the CBP Border Patrol has added some additional repeaters to their known P-25 repeaters in Arizona. These new repeaters are set up in a "vote scan" system that allows the mobile subscriber radio to find the nearest repeater automatically. The system involves using a common input channel to multiple repeaters, and the mobile radio scans looking for a repeater with the best signal available. This may also explain why these frequencies are often heard with brief transmissions and no voice.

Here are some of the new frequencies that have been identified as part of the Border Patrol vote scan channels. Channel names have been provided where available:

Freq MHz	*Chan*	*Name*
168.8250	N302	RED MOUNTAIN
168.8250	N330	WIDE AREA
168.8250	N710	WIDE AREA
169.9375	N653	GILIO 1
170.3500	N130	WIDE AREA INTEROP
170.3500	N230	WIDE AREA INTEROP (Nogalas, AZ)
170.3500	N340	WIDE AREA INTEROP
170.4375	N301	AJO
170.4375	N130	AJO
170.4375	N230	Far East Arizona
173.1875	N230	INTEROP MT. LEMMON

In addition to these southeastern Arizona channels, I received some information about the following new channels used in the Yuma, Arizona area:

163.6250	N141	INDIO
168.8250	N330	WIDE AREA
168.8250	N403	WIDE AREA
168.8250	N710	WIDE AREA
169.9375	N330	RAVEN
169.9375	N430	SOUTH
170.3500	N330	WIDE AREA
170.4375	N301	AJO
170.4375	N430	DATALAND
170.4375	N530	BLACK MOUNTAIN
170.4375	N670	FLAGSTAFF
173.1875	N30D	PARKER

Besides all the P-25 digital repeaters, there are still some analog or mixed-mode Border Patrol repeaters in southern Arizona. I had assumed that all the Border Patrol channels were migrated to P-25 digital, but I heard some analog traffic on my last trip. Here are some of the remaining analog channels in use, most likely used for interoperability with agencies not having digital radios:

163.6250	131.8 PL	TELEGRAPH MOUNTAIN repeater
163.6250	151.4 PL	RODEO repeater

❖ TSA Tracking Things

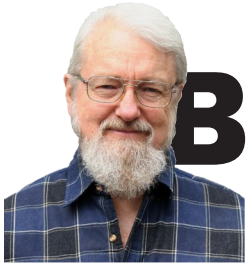
A handy resource to find interesting information on what federal agencies are buying is the Federal Business Opportunities web site at **www.fbo.gov/**. You can find federal agencies soliciting bids for equipment of all types, and even search bid requests via key words, like "radio" or "frequency".

I recently became aware of a solicitation by the Transportation Security Administration (TSA) for electronic tracking equipment. You can read the whole thing here:
www.fbo.gov/index?s=opportunity&mode=form&id=4d410725c0ddccc4aa5f97bfbb01331c&tab=core&_cview=0

If you dig through all the specifications in this document, you will find that they are looking for a tracking beacon and receiver that operate in the 380-420 MHz band. They also specify that the device should use Frequency Shift Keying or some proprietary from of digital modulation for operational security and low probability of interception.

One might wonder what the TSA would be using these devices for. Some have suggested that they may be interested in tracking baggage and others have noted that the TSA is not only interested in your suitcase, but international shipping and freight as well. Interesting stuff for a boring government bid!

That wraps it up for the 2010 *Fed Files*. I will be back in January with more federal monitoring information, including some up-close information for some national forests and other federal agencies. See you then!



BOATS, PLANES, AND TRAINS

PLANES

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Aeronautical Shortwave

Aeronautical communications and aero weather broadcasts heard on shortwave comprise quite a different world from what can be heard on a scanner.

Scanners receive the 118 to 137 MHz VHF civil aircraft band, but these frequencies rarely travel further than line-of-sight, and thus they are not usable for transoceanic air-to-ground communications.

Shortwave, due to ionospheric skip, can cover thousands of miles and is well suited for communicating with transoceanic aircraft and for long distance aero weather broadcasts. The aeronautical shortwave bands are scattered in segments roughly between 3 and 22 MHz.

Let's take a look at what aeronautical things can be heard on shortwave from many distant places!

❖ Ionospheric Propagation

Shortwave is subject to propagation variations. In simple terms, the sun's radiation causes the upper atmosphere, the ionosphere, to become charged in varying degrees. At night, on the dark side of the earth, the charge that built up during the day tends to dissipate. This is what causes the day-to-night variation.

When the ionosphere is more actively charged, it will better "reflect" the mid and higher HF radio frequencies. At night, the lower HF frequencies become more useful for communications. In other words, the time of day matters for given frequency bands and for target reception areas.

Another important variation is the extent of sunspots on the sun's surface. They produce ionizing radiation that affects shortwave and, in this case, the more the better. This varies somewhat in the short term but also during the eleven-year sunspot cycle. Solar Cycle 24, the current cycle, is pretty much of a dud compared to many previous cycles over the last several decades.

One website that offers good information about the ionosphere and propagation is *A Simple HF Radio Propagation Primer*, found at **www.ae4rv.com/tn/propflash.htm** It's certainly worth a look.

Another aid for shortwave listeners is a gray line map: A world gray line map can be useful in visualizing the line that separates day from night over the globe. For the lower to mid frequency aero bands, the map may make it clearer that, for example, early-morning distance reception favors the west and after-sunset listening favors the east. **http://dx.qsl.net/propagation/greyline.html**

❖ Receivers

Aeronautical shortwave communications use the single sideband mode (SSB) and more specifically, upper sideband (USB). The receiver must do at least a reasonable job at receiving SSB. The Icom R-75 receiver (**www.grove-ent.com/ICR75.html**) is a very good receiver, a great value for the money, and nothing more expensive is needed. A number of less expensive receivers will also do an acceptable job.

A plain, nothing-fancy, outside wire antenna of 60 feet or so erected as high as reasonably possible should work fine. Or, if restricted, a small outside active (amplified) antenna is pretty much of a necessity to get acceptable reception. If your receiver is a portable, it must have a connector for an external antenna and be able to tolerate the extra signal strengths that such antennas will bring to the receiver.

❖ The HF Aero Bands

By international agreement, aeronautical communications and weather broadcasts are in defined ranges called bands. The bands above 10 MHz tend work better during the day and the bands below 10 MHz usually work better at night. The 5 through 13 MHz bands seem to carry the bulk of the traffic.

2850-3025	10005-10100
3400-3500	11275-11400
4650-4700	13260-13360
5450-5680	17900-17970
6525-6685	21924-22000
8815-8965	

Shortwave aeronautical bands in KHz. Transmissions are USB.

One approach to listening is to pick a band and slowly tune back and forth through it before about 7am local, at mid-day, and after sunset to see what you may hear. Another approach is to pick a published frequency and sit on it for awhile. On the HF air traffic control frequencies, it is common to hear other frequencies mentioned, and they are always worth a try.

❖ MWARA: Areas, Freqs, Communications

The world is divided into "Major World Air Route Areas" (MWARAs). Each area has its set of transoceanic HF frequencies and its own name, such as "NAT-A" for North Atlantic Network A.

For Pacific and Atlantic frequencies, see **www.arinc.com/products/voice_data_comm/air_ground_radio_svc/jepp_charts.html** and download *ARINC-3 HF Atlantic/Caribbean* and *ARINC-4 HF Pacific Coverage*.

To explore additional MWARA frequency lists, go to Google **www.google.com** and enter "MWARA frequencies."

In addition to MWARAs, in other parts of the world, there are "Regional and Domestic Air Route Areas" (RDARAs). They are smaller and more localized than the MWARAs. Some of these can make challenging DX targets.

You will hear transoceanic flights announce their arrival at reporting points (waypoints) for safety and air traffic control tracking along established routes. If you find this interesting, you can order paper charts, should you wish to follow flights or to simply locate one along a track after hearing the reporting point name.

The transoceanic Route Charts are designed for controllers to monitor flight progress, but are great for listeners. The charts show the flight tracks with the 5-letter reporting points along them. You will hear the reporting points and other information called out on the radio.

Example: *American Two Five Three at FOOTS one six five one, Flight Level Three Three Zero, estimating ETECO one seven four nine, next DIALO, fuel four eight decimal nine, minus three six, two two five diagonal five six, and we are Juliet Mike Papa Romeo for SELCAL on eight eight.*

- *American 253* is the airline and flight number.
- *FOOTS* is current position, *ETECO*, and *DIALO* are upcoming reporting points for that flight and may be found on a North Pacific Route Chart. Knowing just this much and using a chart, one can see that the flight is leaving the Los Angles area progressing toward Hawaii. This is confirmed by entering the airline and flight number into **FlightAware.com** which for this flight showed KLAX to PHOG.
- *1651* and *1749* are times in UTC.
- *Minus 36* is the outside air temperature in degrees Celsius.
- *225 / 56* is the wind direction in degrees Magnetic that the wind is coming *from* and at 56

knots – as if the plane had stopped to take the reading.

- *Flight Level Three Three Zero* (FL330) is a standardized altitude of 33,000 feet using a fixed altimeter setting of 29.92.
- *Next DIALO* is calling out the next reporting point after ETECO.
- *Fuel 48.9* is 48,900 pounds of fuel on board.
- *Juliet Mike Papa Romeo* are the letters JM-PR said phonetically for the SELCAL code (mentioned below).
- *On eight eight* is short for the ARINC frequency of 8843 kHz. The ARINC operators can have several frequencies going, so this helps them.

❖ Chart Info

Paper charts can be helpful to transoceanic aircraft listeners. For a Pacific paper chart, consider the Northeast version: PORCNEAZ - PACIFIC RTE CHT NE FLAT (rolled). It covers from the North American west coast out beyond the Hawaiian Islands. Keep in mind that the size is 59½ x 41½ inches, but goes great on a wall if space permits.

For the North Atlantic, NARCZ is full size and flat (rolled), and NARC is reduced size and folded.

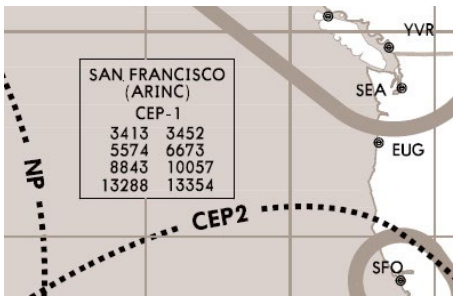
For a glimpse of part of a chart, go to **http://naco.faa.gov/index.asp?xml=naco/catalog/charts/supplementary/np_route** If you want to order, click on "Order Online."

Downloadable PDF oceanic charts may be found at **http://avn.faa.gov/index.asp?xml=aeronav/applications/IFR/chartlist_enroute_Carib_Pac**. Click on the "IFR Caribbean, Atlantic & Pacific" link. On that page, the areas covered by the various maps are shown and apply to the downloads listed further down. Scroll to "High Altitude Pacific (Hawaii)" and download "EPHI1," about 10 MB. For the Atlantic, download "NARC," about 8.5 MB.

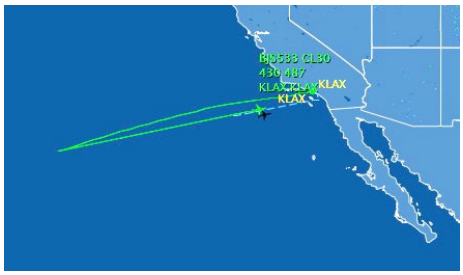
Remember that FlightAware **http://flightaware.com/** can complement the use of a paper chart, a downloaded chart, or offer useful information by itself.

❖ ARINC

Aeronautical Radio, Inc. (ARINC) handles HF aeronautical radio traffic for a large part of the world. In their words, "ARINC's Air/Ground International Radio Service provides high-frequency (HF) single side band aeronautical operational control (AOC) voice communications for aircraft flying over the Atlantic,



This is a small part of the* ARINC-4 HF Pacific Coverage *chart showing the Central East Pacific 1 (CEP-1) frequencies. The full chart shows ARINC and LDOC frequencies for several Pacific areas. Courtesy Jeppesen.



FlightAware image of a plane headed from Los Angeles International to Hawaii. It encountered a mechanical problem and had to return. Not all flights you monitor will be routine. The problem was first reported on the regular ARINC frequency of 8843 kHz. Courtesy of FlightAware (flightaware.com)

Caribbean, and Pacific oceans; Canadian and Arctic regions; and the Gulf of Mexico and Central and South America." ARINC operators relay information and requests back and forth between Air Traffic Controllers and the aircraft.

On the MWARA frequencies, you will hear operators call out "Primary" and "Secondary" frequencies. Sometimes you will hear the term "Backup." If the aircraft cannot make contact on the Primary frequency, then attempts will be made on the Secondary or Backup.

Aircraft over the Atlantic that communicate with the U.S. for ATC purposes, do it via the ARINC Communications Center located at New York (Long Island MacArthur Airport) and with the radio I.D. of "New York." This is the case even when aircraft are not departing from or arriving at New York. Aircraft over the Eastern Pacific, bordering the U.S.-Canadian West Coast and up through southern Alaska, communicate with the ARINC Communications Center located near Livermore, CA with the radio I.D. of "San Francisco" even when an aircraft may be flying to or from Los Angeles or Seattle, as examples.

❖ LDOC

Besides MWARA communications for air traffic control, there is LDOC (Long Distance Operational Control). LDOC is analogous to "company frequencies" found in the VHF aircraft sub-bands of 128.825-132.0 and 136.5-136.975 MHz.

LDOC communications are frequently conducted via phone patches between flight crews and their company ground personnel. Some may relate to aircraft maintenance or malfunctions that will need attention upon landing – all the way to In-Flight Emergencies (IFEs) requiring real-time troubleshooting and attempts at implementing in-flight repairs or work-arounds.

Some are concerned with getting medical assistance for an in-flight illness or injury requiring medical specialists on the ground to pass on care instructions and/or to arrange for medics upon landing.

Sometimes medical problems, mechanical problems, and in-flight emergencies can be dramatic to monitor. For LDOC frequencies, see the *ARINC-3* and *ARINC-4* charts mentioned above.

❖ SELCAL

On MWARA frequencies, you will also routinely hear SELCAL (SELective CALling) tones. The ground stations use the tones to open the squelch of the receiver of a specific airliner that they wish to contact, so the flight crew does not have to listen to all the other communications and static on frequency.

Each "tone" you hear is a combination of two simultaneous tones. Overall, four tones are used. The pilot tells the operator what four tones he or she requires. This is done by speaking four letters in the phonetic alphabet such as LIMA QUEBEC HOTEL JULIET for LQ-HJ – the combined "L" and "Q" tones followed by the combined "H" and "J" tones. Tone info: **www.selcal.co.uk/What%20are%20Selcals.htm**

Each SELCAL code is registered via ARINC. You can use these codes to identify the specific aircraft, the airline, and the registration. To look up individual SELCAL codes, go to **www.selcalweb.co.uk/**

There are also SELCAL decoders that can be used with shortwave receivers. Here is an example: **www.airnavsystems.com/Selcal/**

❖ VOLMET/Aviation Weather

Aircraft can receive VOLMET (*VOL ME-Téorologique*) regional and international aero weather broadcasts. You can receive them, too, and some can provide challenging DX targets.

Each VOLMET frequency has a set roster of participating stations for a specific geographic area. Each one of the stations transmits on a published schedule in a time slot starting at a certain number of minutes after the hour and ending before the next station in the sequence begins. The same station grouping may transmit on two or more frequencies in other bands to try to offer choices for best reception for time of day and location.

Broadcast schedules will include notations like "H + 45." This means that at 45 minutes after every hour the named station will start its broadcast. The next station would likely begin at "H + 50."

For starters for the Pacific, try 2863, 6679, 8828, and 13282 kHz. For the Atlantic, try 3485, 6604, 10051, and 13270 kHz. You can also try CanForce (Canadian Armed Force) VOLMET via "Trenton Military" on 6754 and 15034 kHz.

For a great VOLMET list, sorted by frequency, see: **www.dxinfocentre.com/volmet.htm** and for the same list sorted by area and with the forecast cities shown, see **www.dxinfocentre.com/volmet-wx.htm**

To decode the three-letter country codes at the above site, see **www.worldatlas.com/aatlas/ctycodes.htm**

It seems that most VOLMET broadcasts use computerized voice robots and some are implemented better than others. Some have male voices and some female.

Like other things going digital – Digital VOLMET (D-VOLMET) usage may gain over time. Transmissions moving to digital can disappoint listeners who like things the "old way," but they do offer opportunities for those exploring the newer modes. See you next time!

Loyd Van Horn, W4LVH
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First Annual GlobalNet "Best of" Awards

Greetings, fellow Internet Radio aficionados. As we head into the holiday shopping season with our annual Radio Buyers' Guide edition of *MT*, I thought it might be good to peek into some of the top gadgets, equipment and services essential to the Internet Radio hobby.

This is by no means a comprehensive list; rather, a great starting point for those looking for equipment to get started in the Internet Radio hobby. I have included items for each of the three most likely means by which a person will access streaming content: cell phones, WiFi radios, or a mobile WiFi device.

So, without further ado, I present to you our first annual "Best Of" Awards!

"BEST OF" MOBILE WIFI

Virgin Mobile's MiFi 2200 Intelligent Mobile Hotspot

Price: $149.99 plus monthly fee

Who says you can't take it with you? While the mobile internet craze has put the power of the Web (and streaming audio and video) into a portable format, there are still those pesky long-term contracts and extra fees to deal with. Even with mobile-broadband being as popular as it is, many users are still limited to a "mobile" interface (smaller and not as feature-intensive as traditional Internet).

Ahhh, but the promise of Virgin Mobile's MiFi can be a remedy to commitment-phobes, while creating a portable WiFi hotspot that can power the Internet for laptops and other portable devices.

MiFi is nothing new, really. Cellular providers such as Verizon and Sprint have carried their own version of the Novatel 2200 MiFi device, which converts a 3G signal to a WiFi signal that can be encrypted using WEP/WPA/WPA2. The signal has a range of about 30 feet and can serve up to five WiFi devices at once. The downside is that each of the current providers requires a user to sign a contract and limits the amount of monthly data usage.

What makes Virgin Mobile's option intriguing (and worthy of a "Best of" award) is that you do not have to sign a contract to use the MiFi service, and they include an unlimited option (which is becoming a rarity these days). It works much in the same way that pre-paid cell phones work: users pay $10 (100mb) - $40 (unlimited) and receive a month of MiFi service. At the end of the month, if you find you won't need to use the MiFi service, you don't have to. Then, when you are ready to turn it back on (for a vacation, for instance), you can log onto the Virgin Mobile website (even through the MiFi device!) to pay for an additional month of service.

The freedom to use the MiFi service without signing up for a required contract makes the Virgin Mobile MiFi service a very attractive option for use away from home. People like storm chasers, business travelers, and those wishing to listen to streaming radio in their vehicles without using their cell phone data plan allotment will find it especially useful.

With data transfer speeds that are comparable to DSL (3.1 mbps download, 1.8 mbps upload) I can even see people using the MiFi service in their homes to power their home computing needs.

"BEST OF" CELL PHONE

iPhone 3GS

Price: Varies based on model and contract, in addition to monthly data fees

OK, I am going to admit a few things up front: Yes, I am an iPhone 3GS user. Yes, I know there are other options out there. Here are my problems with the other options.

First, let us start with the most obvious question you are probably asking yourself: "Why not the new iPhone 4.0?" As much as I want to think the new iPhone will be a huge improvement for the streaming enthusiast, I can't buy into that just yet.

For one, the main benefit of the new phone was the new iOS 4.0 operating system, which opened the door to multi-tasking on the iPhone, enabling streaming apps to run in the background of other activities. You don't have to have the new phone to get that, you can use the 3GS.

Another thing that the iPhone 4 has going against it is the problem of poor reception. Yes, I know that Apple made a few software changes to fix the antenna issues, including the "bumper" program we saw through the summer months. However, I am still under the impression that the 3GS is a far more stable and reliable platform, especially for those wishing to do streaming of Internet radio and other services from their phones.

In addition to Apple's new iPhone, the other predominant smartphone maker on the market, HTC, has released a slew of new phones running the Android operating system that are becoming increasingly popular. Some are even capable of creating a WiFi hotspot directly from the phone. The main issue I have seen with these phones is battery life. Reviews and reports abound about phones like the HTC Evo suffering from insufferably short battery life.

So, until Apple actually addresses the antenna issues (still widespread enough to be a problem) and HTC solves battery life issues, those looking for a portable Internet radio option through a cell phone are best served by the iPhone 3GS.

Alternatively, you could just get a brand new iTouch, combine it with a MiFi option, and for roughly the same cost as some data plans, you can have a mobile-broadband option without the phone.

"BEST OF" WIFI RADIO

Logitech Squeezebox Radio - $199.99
C. Crane WiFi Radio - $124.95

So, you have your cell phone or MiFi device giving you Internet radio in your car or in your pocket, but what about at home?

I have chosen both of these units, not for being the absolute best units on the market, but for providing the best options for the price. These are best geared to either the experienced Internet enthusiast who already has a main radio and is looking for a bedside or in-office device, or to someone just starting with WiFi radio devices and wanting to start with only a limited investment.

This year I had the pleasure of reviewing the Logitech Squeezebox Radio: I found it to be a very easy-to-use and powerful WiFi radio device.

The interface is particularly easy to use. A few other WiFi radios I have used rival the

Logitech in aesthetic beauty and sound, but their interface is far more complicated and less intuitive. The Logitech uses a RadioTime interface, as opposed to the popular Reciva interface. The RadioTime interface makes it easy to find streams from various locations around the world and to set up favorite streams that are easily recalled.

In addition, the Logitech has a powerful search function to find desired streams or programs, and entering search parameters is easy and intuitive.

In addition to the Logitech, I have to give a close second to the C.Crane WiFi radio. I have had the C.Crane on my testing bench for a few months now, putting it through the rigors of intensive WiFi radio use, and so far, I have found few things to complain about.

Is it the most beautiful WiFi radio on the market? No, but are you buying a centerpiece for your home or something to tune in Internet Radio streams?

If you want something that makes an artistic statement, there are plenty of WiFi radios on the market for you, including the Logitech Squeezebox. But, if you just want a reliable WiFi radio that will bring the radio stations of the world to your home, you can't go wrong with the C. Crane WiFi radio.

For one, it has a small footprint. It is a perfect complement to a bedside nightstand or for inconspicuous placement in an office. Secondly, as it uses the Reciva interface, it is easy to navigate. It has sufficient audio quality (especially for office setting or bedside) and the included remote control (an unfortunate omission by many WiFi radio companies) means you can operate the device from across the room.

As with any major purchase like this, I encourage you to do your research and find the best fit for you based on your desired features, interface, how the unit will be used, etc. But if you are looking for a cost-effective and reliable WiFi radio, you really cannot go wrong with either of these choices.

Again, this list is not intended to be exhaustive, but if you are shopping for someone who is looking for an Internet radio streaming option, these are excellent places to start.

❖ RadioTime: A Growing Source

Speaking of RadioTime, it looks like a larger number of Internet radio devices are turning to RadioTime as their stream source. I already mentioned Logitech's Squeezebox as one example of a RadioTime interface in a WiFi radio, but there are several others.

The very popular TunedIn mobile app is a great example. TunedIn claims to be the most popular mobile-radio app. Not only does it provide listeners with RadioTime's ever growing database of streams, but it also includes the ability to pause live audio, show album artwork of songs playing over a stream, and other helpful features. Add this to other apps which use RadioTime, such as WunderRadio, Android's RadioTime app, iOS's TimeTuner (alarm clock that uses Internet Radio stations), and you can see that RadioTime's share of the mobile streaming market is on the rise. RadioTime is also making inroads into the Internet radio streaming market in automobiles.

For the majority of Internet radio's young history, Reciva has held the lion's share of the industry as the premier source for Internet radio streams. Now, with RadioTime's aggressive push into mobile and WiFi radios such as Logitech's Squeezebox, we may soon be seeing RadioTime overtake Reciva in that role. Could we be heading for another XM/Sirius type scenario in the not too distant future?

radiotime®
what's on radio

❖ Internet Radio on iTunes?

Apple's iTunes software program has long included a list of Internet radio stations for users to stream over their computers. Traditionally, these were mostly Internet-only radio stations, with very few terrestrial broadcasters.

Imagine my surprise when I downloaded the latest iTunes release recently and found a large number of terrestrial broadcasters included in iTunes. Stations such as WBBM in Chicago, KNX in Los Angeles, WSB in Atlanta and even my local Greenville, SC station WSPA are now available on iTunes. So, does that mean we all are soon going to be turning to iTunes to listen to our favorite radio station?

Not just yet, I suspect. I don't see iTunes, in the current format used by the program, making any waves in the Internet radio sector. For one thing, you cannot search streams in the same format you can search your music library or the App Store. Nor are there as many stations available (especially internationally) as you can get on services like Reciva, RadioTime and others.

However, with the growing popularity of Internet radio, this would be an area that Apple would be wise to explore for further development. Perhaps they can even develop their own Internet radio app for their iOS devices to compete with WunderRadio and others.

Until next month, 73s!

GLOBALNET LINKS

C.Crane WiFi Radio - **www.ccrane.com/radios/wifi-radios/cc-wifi-radio.aspx**
Virgin Mobile MiFi 2200 - **www.virginmobileusa.com/mobile-broadband/mifi-2200.html**
Inside RadioTime - **http://inside.radiotime.com/**
HTC Evo - **www.htc.com/us/products/evo-sprint**
iPhone 4 and 3GS - **http://store.apple.com/us/browse/home/shop_iphone/family/iphone**
Logitech Squeezebox Radio - **www.logitech.com/en-us/speakers-audio/wireless-music-systems/devices/5847**

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.com

Loop Success, Web Tips, Mailbag

If you've been following along for the past few months, you know that I've been building a broadband (40-500 kHz) shielded loop, based on a construction article found online at **http://tinyurl.com/ygt39z7**.

You also know that I had trouble getting my preamplifier to work properly, and had to put the project aside for a while to attend to other needs. Steve McDonald (VE7SL), originator of the loop project, graciously offered me some troubleshooting tips to help get things working. Well, I am happy to report that the problem has now been fixed, and my loop is working like a champ!

I listed Steve's tips in last month's column. One of the things he suggested was to check the wiring of the J310 FET transistor. (By the way, Steve advises that an MPF-102 transistor may be used here, as well.) Sure enough, on close inspection, I noticed that I had connected the leads improperly to the FET. A telltale sign was that I was not getting any voltage drop across R1, the resistor in the Drain circuit of the transistor. This indicated that the transistor was not drawing any current at all (there should be about 1V).

I found some other errors on the board as well, and decided to essentially rebuild it. The old adage of "haste makes waste" certainly comes to mind and played a part in my errors with the board.

This Loop Performs!

Upon rewiring the preamp, I applied 12 V dc via the coupler, and *voila!*, signals came booming in. In fact, by just holding the loop in my shack, I was able to completely null out my local "pest" AVN/344, and was also able to hear IZS/426 in Georgia. I also found that I could null a source of power line noise, allowing me to hear several new signals as I tuned up and down the band. A brief test outside on a temporary mast yielded even better results.

I'm excited to see what this antenna will do mounted up high and in the clear, where it should really shine for DXing this winter! All I have left to do is seal all openings with silicone sealer, and mount it on my roof. I'll use an inexpensive TV-type rotator to turn it from inside my shack.

If you haven't already built this loop, I *highly* recommend it. The loop, in conjunction with a good omni-directional active antenna, should make a first-rate DX combination. If you've built the loop (or started it), I'd like to hear from you. Just drop me a line at the e-mail address in the masthead. Based on the responses, I'll decide whether or not to present other construction projects in future issues.

So, the loop project is complete, at least for now. At the beginning, I mentioned wanting to try a "sense" antenna in conjunction with the loop to achieve a uni-directional response pattern. I still plan to do that, but considering the trouble I had in getting the basic loop to work, I'm going to hold off for now, and just get to know the antenna over the winter months.

My completed loop after ground testing, ready for rooftop mounting.

On the Web

From time to time, I've mentioned the excellent Beaconworld website hosted by Alan Gale, G4TMV. But, on a recent visit there, I was surprised to discover that it had been replaced by a site with a focus on beacon station photos, and that the original site was discontinued in May of 2010. The new site is also interesting, but there was such a wealth of information and downloads on the old site, that I was dismayed to find it vanished from the web.

On a lark, I decided to try one of my favorite tools for locating archived versions of long-gone websites. That tool is the Wayback Machine found at **www.waybackmachine.org**. Go there, and enter **www.beaconworld.org.uk**. As of the date of this writing, the Beaconworld site was still accessible there, including many (but not all) of the downloadable resources. Download what you can, *while* you can! One of my favorite items on the old site was the *Beacon Hunter's Handbook*, and I was able to find a zipped copy of the most recent edition (2007) via the Wayback Machine.

Looking for some longwave projects to keep you busy over the winter months? The **SWL Homebuilder** website has a page devoted to NDB Information and Circuits. You can find it at **www.qrp.pops.net/ndb_more.asp**. This site has some excellent information on building low-pass filters to eliminate AM broadcast interference on longwave. I've had a number of readers ask about these filters over the years, and these ones appear to be easy to build. Each has a response chart showing just where the cutoff frequencies are, and how steep the curve is.

A few years ago, I did a talk at the Kulpsville, PA SWL Festival on buying and restoring old receivers. Later I gave a similar presentation to the Rochester Amateur Radio Association. This latest version can be accessed online, in a slide show format. If you like old and classic receivers, this program might interest you. Check it out at **http://tinyurl.com/32d8rqf**.

Featured Beacon

Our featured beacon this month is INE-521 from Missoula, Montana, thanks to a suggestion by Robert Holmuth, KB7AQD (AZ). Who can hear this station, how well, and what do you use for receiving gear? Let's see who can hear it from the farthest distance away.

To verify proper reception, please state the number of *complete* IDs from the station in

a 1-minute period. (This serves as a beacon's "fingerprint," as the number of IDs is unique to each station.) I look forward to hearing from our readers! Send along loggings of any other LF stations you hear, too; we are simply highlighting INE with this challenge.

Robert also submitted some of his historical loggings (see Table 1) to give us our own "Wayback Machine." It provides a glimpse into what the LF band looked like back in 1986. He writes: "Kevin, I found my old copy of Sheldon Remington's *West Coast NDB Checklist*. Sheldon was kind enough to include my NDB loggings, as I was the only Arizona contributor back in 1986. The *Checklist* was handwritten and photocopied, not typed nor word-processed. After November 1986, the noise floor rose impossibly high at my parent's house, so I didn't get a chance to log any new beacons from that location.

"Below 300 kHz, I had broad areas of spectrum buried under the musical-sounding chords attributed to power line carrier (PLC) telemetry. Still, I could log many NDBs running less than 50 watts all over the USA, and even some Colombian DX!"

Thanks for the logs, Robert, and it's interesting to note the wide variety of stations you heard, ranging from North Carolina to Iowa to Canada to South America. It also caught my eye to see "Winslow, AZ" at the top of the list. This city was made famous in my favorite *Eagles* tune. (And yes, I'm sure that beacon would be such a fine sight to see!)

HISTORIC LOGGINGS (1986) FROM AZ

FREQ	ID	Location
206	SOW	Winslow, AZ
206	GLS	Galveston, TX
214	CHX	Choix, Sinaloa, Mexico
216	CLB	Carolina Beach, NC
220	RBJ	Robles Junction, AZ
222	FDR	Oklahoma
224	SDL	Scottsdale Airpark, AZ
227	SJY	San Jacinto, CA
230	ILT	New Mexico
230	RDK	Iowa
233	LG	Southern California
233	YJ	British Columbia, Canada
236	YZA	British Columbia, Canada
242	EL	El Paso, TX
245	TLR	Tulare, CA
247	CYH	Unid. AZ
251	YCD	British Columbia, Canada
251	AM	Amarillo, TX
254	SPK	Sparks, NV
255	GAZ	Globe, AZ
259	PBY	Kayenta, AZ
260	SNE	TX
263	ER	TX
264	SZT	ID
266	LLN	TX
266	RYU	TX
269	AAP	TX
272	LD	Laredo, TX
274	CQI	Council, ID (Neg. keying?)
275	PLS	MT
275	GEY	WY
275	GUY	Guymon, OK
275	PEZ	TX
278	XSD	NV (Groom Lake?)
281	RSZ	Mesa, AZ (Now FFZ)
284	DPG	Dugway Pvg. Ground, UT
284	MXR	NM
285	MZ	Sinaloa, Mexico
286	PI	Piedras Blancas Light, CA (11 watts)
287	AOQ	NE
287	SMR	Santa Maria, Colombia
288	SL	Light Station, Southern CA

Equipment used for Table 1 loggings
Receiver: Radio Shack DX-400 (Uniden CR2021)
Antenna: Homemade box frame loop, triangular, and about 2 feet high. It tuned from about 200 to 530 kHz.

❖ VLF Radio CD

Many readers have asked if there is a way to purchase my narrated CD tour of the longwave band *VLF Radio!* online. I have recently set up a listing on eBay for this purpose. All you need to do is go to **www.ebay.com** and enter "VLF Radio" into the search box to find the full information.

The original *VLF Radio!* recording was produced in the spring of 1997 with the aid of an old Radio Shack dubbing tape recorder, an inexpensive mic, and lots of patience! Later, with the help of Jacques d'Avignon, VE3VIA (ON), the tape was digitally re-mastered on CD, and that is now the primary format. (I still offer it on cassette for those who need it, but I ship very few of those today.)

See you next month!

SKY SURFING

RADIO FROM THE OUTER REACHES

Keith Baker, KB1SF / VA3KSF
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How to Use Linear Amateur Satellite Transponders

In previous columns, I've been discussing ways to find, track, listen for, and then communicate through our expanding fleet of amateur radio satellites. In this installment, I'll introduce you to another (non-FM) type of satellite transponder called a "linear" transponder that is carried aboard many of our current amateur satellites. I'll also bring you up to date on the status of some new satellites.

You'll remember from previous columns that a *transponder* is the circuit in a satellite that receives an uplink signal and then retransmits what it hears via its downlink transmitter, much like your local FM repeater does. However, unlike your local FM repeater (and most of our FM satellites which have a specific input and output frequency), most so-called "linear" satellite transponders (sometimes also called "analog" transponders; the terms are used interchangeably) receive and then retransmit *a whole band* of frequencies commonly called a *passband*.

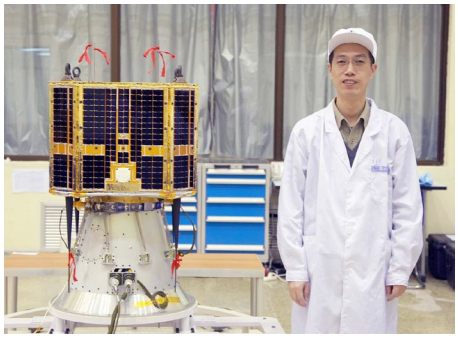
What's more, linear amateur satellite transponders come in one of two flavors. These transponders are usually classed as *inverting* or *non-inverting*. If the satellite has a non-inverting transponder, when an operator's uplink signal frequency is on the high end of the uplink passband, their downlink signal will also be in the high end of the downlink passband.

Conversely, in an inverting transponder, when an operator's uplink frequency is on the high end of the uplink passband, it will become "inverted" (hence the name) and come out on the lower end of the downlink passband. Put another way, inverting transponders make mirror images of the signals they pass.

This also holds true for the sideband sense as well. In a non-inverting transponder, the signals an operator sends up to the satellite (USB or LSB) will come out the same way on the downlink. However, in an inverting transponder, a USB uplink will be "inverted" and come out as LSB on the downlink. Conversely, a LSB uplink will be "inverted" and come out as USB on the downlink. The latter approach (USB signals on the downlink) is also what's most preferred by operators using our linear satellite transponders today. Fortunately, CW will be CW regardless of the transponder's variety!

Note that most linear-transponder-equipped satellites currently in orbit (including FO-29, VO-52 and HO-68) use inverting transponders. The one exception is our old AO-7 satellite that was launched back in 1974 and which is still "sort of" operational. It uses a non-inverting, linear transponder.

As with the FM birds, common operating



Called XW-1 before launch, Hope OSCAR-68's project leader, Alan Kung, BA1DU, proudly stands beside his team's collective handiwork during the satellite's final ground tests. (Courtesy: CAMSAT)

practice on amateur satellites with linear transponders is to first listen for your own signal on the downlink. You'll remember from my previous columns that working through a satellite transponder is a *full duplex* operation, much like talking on a telephone. This means that others can usually hear you as well as you are hearing yourself.

Finding your own signal in the downlink passband of a satellite with a linear transponder the first few times can be tricky. However, I've found that placing your transmit frequency somewhere in the middle of transponder's passband and then sending a few "dits" of CW while tuning your receiver to find your own downlink signal works best. Once you've located your own signal, you're ready to try making a contact.

Unlike the FM birds, calling CQ on these satellites *is* acceptable and you'll usually find the convention of CW operations in the low end of the passband with phone operation in the upper part of the passband (an arrangement common to High Frequency [HF] amateur radio operation) generally also holds true for satellite work as well.

As I have also noted in previous columns, since a satellite is a moving target, its downlink signals will exhibit a pronounced *Doppler shift*, just like the changing pitch of a train whistle as it approaches and then passes. Prior to computer frequency control, the "one true rule" of thumb for linear satellite operation during a satellite QSO is that if the uplink band is *higher* in frequency than the downlink, you should slowly shift your *transmit* frequency on the uplink as the Doppler effect changes the frequency of your downlink signal. Conversely, you should shift your *receive* frequency if the uplink band is *lower* in frequency than the downlink.

Or, to put it another way, the highest frequency band in use (uplink or downlink) is what you should shift as Doppler affects your signals. This approach will usually help prevent an inadvertent shift of your conversation into someone else's on the transponder. However, in the heat of the moment, with everyone frantically searching through the passband for their own downlink signals, these conventions are often ignored.

❖ Keep the Power Down!

Because it is generated from the Sun, satellite power is a finite and therefore scarce resource. That's why it is *very* important to use only enough power on your uplink transmissions to produce a readable signal on the downlink. You need to get used to the idea that satellite work is weak signal work. It's *not* like operating on HF (or terrestrial VHF or UHF), where the use of more power is usually "better."

Besides being potentially harmful to a satellite's battery life by using more uplink power than is necessary, overpowering your uplink signal beyond the point of creating a discernable signal through the satellite's transponder on the downlink will *not* appreciably improve the overall strength of your downlink signal.

To the contrary, such activity will do little more than "pump" the satellite's automatic gain control as it tries to compensate for the onslaught you are creating with your overpowered uplink signal. Such activity will only gobble up yet *more* of the satellite's precious available power, not to mention limiting the overall downlink power available for others using the transponder.

Unfortunately, all it takes is one overpowered uplink signal in the passband to drastically cut the strength of everyone else's downlink signal. As you might expect, such activity will *not* make you a popular camper on the satellites, for *crocodiles* – those who operate with "all mouth and no ears" – are about as welcome on the birds as *lids* are elsewhere in Amateur Radio.

❖ FM is Not Welcome!

Because satellite power is such a scarce commodity, most linear satellite transponders are built to use the most efficient operating modes possible. Normally, this equates to Single Sideband (SSB) voice and/or Morse (CW).

Therefore, it should also come as no surprise that another big *"no-no"* is running FM through linear satellite voice transponders. FM signals occupy a much larger bandwidth and take a significantly greater portion of a transponder's precious output power to handle than do CW and

SSB signals. And, while some people have met with moderate success operating through linear satellite transponders by "simulating CW" (using the push-to-talk circuit on a 2 Meter FM radio, for example) this approach often produces a wide (and *very* "chirpy") CW downlink signal.

Either way, your FM signals will gobble up lots of downlink power and stick out like a sore thumb. Just imagine how obnoxious you'd sound running SSB signals through your local FM repeater, and I think you'll agree that *all* use of FM should be avoided when operating through a linear satellite transponder.

❖ OSCAR Who?

Since 1961, some 60 plus "OSCARS" (short for Orbital or Orbiting Satellite Carrying Amateur Radio) have been built and launched by a number of amateur radio-related organizations worldwide. Just like their Hollywood counterpart of the same name, there are some very strict rules as to how our amateur satellites get to be so honored.

First, they have to be capable of transmitting and/or receiving in the amateur radio bands. They also have to successfully achieve orbit and be activated in space. And, lastly, the builders of the satellite have to formally request that an OSCAR number be assigned to their orbiting handiwork.

Today, by mutual agreement between AMSAT and the original Project OSCAR team that built and launched the very first OSCAR satellites, those formal requests all go to AMSAT founding member and Past President, Bill Tynan, W3XO, who passes judgment on the amateur quality of the payload before he officially assigns an OSCAR number.

Most amateur satellites have other names prior to launch. For example, AMSAT-NA has chosen to use sequential alphabetic characters for their satellites. AMSAT's current, most popular FM bird, AO-51, was dubbed "Echo" prior to its successful launch and activation on orbit. The next satellite in that series, "Fox" is now in the very early planning stages. The fleet of Japanese amateur satellites uses "JAS" (Japan Amateur Satellite), followed by a sequential number for their amateur satellites. Their currently active amateur satellite, FO-29, was called "JAS-2" prior to its successful launch in 1996.

Usually, the "O" part of the on-orbit designator stands for "OSCAR," while the number following it is sequentially assigned by Bill, depending on precisely when the satellite's transponder is activated on orbit.

However, the first letter of the OSCAR designator can stand for many things. That letter is usually suggested by the satellite's builders or sponsors and often gives a hint about its heritage. For example, the "F" in FO-29 stands for "Fuji" (for "Fuji OSCAR"), while the "A" in AO-51 stands for "AMSAT" (as in "AMSAT-OSCAR 51"). However, the "A" in AO-27 stands for "AMRAD," the suburban, Washington, DC amateur radio group that built the amateur radio satellite payload.

The "S" in SO-50 stands for "SaudiSat," as a university team in Saudi Arabia sponsored the building and launch of that satellite. However, the "S" in SO-67 stands for "SumbandilaSat."

Hans Van den Groenendaal, ZS6AKV, (right) officially turns over the amateur radio payload to be carried aboard SumbandilaSat to Mr. Mosibudi Mangena (left) South Africa's Minister of Science and Technology. The amateur radio payload was later named SO-67 when it achieved orbit. (Courtesy: AMSAT-SA)

Sumbandila is a South African Venda word that means "lead the way."

Now, if this "alphabet soup" all sounds a bit confusing, that's probably because it is! Just remember that the letter "O" in a satellite's official, on-orbit name followed by a dash and then one or two numbers usually indicates that the satellite is one of our fleet of amateur radio (OSCAR) satellites.

❖ Satellite Status Update

Hope OSCAR 68

In late December 2009, China's AMSAT organization (CAMSAT) launched China's first-ever amateur radio satellite. Called XW-1 before launch and later named Hope OSCAR 68 (HO-86) once it successfully achieved orbit, the satellite sports a CW beacon, a VHF/UHF (Mode V/U) FM voice repeater, a Mode V/U (inverting) linear transponder for SSB/CW, and a Mode V/U Packet Radio Bulletin Board.

At press time, the satellite was still undergoing checkout in orbit, and its transponders were being turned on and off over various parts of the world according to an established schedule. When it has been briefly activated, I've heard it sending strong signals on its downlink. More information about HO-68, including its uplink and downlink frequencies, can be found at: **www.amsat.org/amsat-new/satellites/satInfo.php?satID=116&retURL=/satellites/status.php.** The current operating schedule can be found on the CAMSAT Web site at**: www.camsat.cn.**

SumbandilaSat OSCAR 67 (SO-67)

Our AMSAT friends in South Africa have (briefly) activated the amateur radio transponder aboard their recently launched SumbandilaSat (SO-67) satellite. However, as of this writing, that transponder was again being cycled while the ground station was commissioning some of the other on-board payloads. Near-term plans were to continue briefly activating the amateur radio transponder over South Africa to see if it remained stable. If so, the ground team then planned to activate the amateur transponder over other parts of the world on a semi-regular schedule.

More information on SO-67 is at: **www.amsatsa.org.za/SZASAT.htm.** You can also check the AMSAT Web site for frequency information and updates on SO-67's current status at: **www.amsat.org/amsat-new/satellites/satInfo.php?satID=71&retURL=/satellites/status.php.**

ARISSat-1

Some readers may recall that a satellite called SuitSat-1 (where an amateur radio transponder was tossed overboard from the International Space Station [ISS] inside a surplus Russian space suit) was less than a rousing success. Unfortunately, SuitSat-1's downlink transponder was extremely hard to receive on the ground. So, the same experimenter team began a follow-on effort called SuitSat-2 to (hopefully) be more successful.

Unfortunately, due to space limitations, one of the two surplus Russian space suits then in storage aboard the ISS (including the space suit that was being reserved for SuitSat-2) was sent back down on a *Progress* cargo vessel in 2009. So, rather than construct a follow-on payload for a surplus space suit, a new, entirely self-contained satellite (called ARISSat-1) was conceived to fly in its place. And, if all goes as planned, this new bird will offer users a far more robust amateur satellite than what could have ever been flown inside a Russian space suit!

For example, ARISSat-1's linear, inverting U/V transponder will use an innovative Software Defined Radio (SDX) system with a 50 kHz bandwidth centered on 435.750 MHz for the uplink and 145.930 MHz for the downlink. In addition, the spacecraft will sport a single BPSK and two CW bacons as well as a number of onboard cameras that will send SSTV pictures of the Earth (along with broadcast greetings in several languages) via its FM downlink transmitter at.145.950 MHz.

Construction of the flight model ARISSat-1 began in early February 2010 and has been proceeding apace ever since. As of early September, Gould Smith, WA4SXM, AMSAT's ARISSsat-1 Project Manager, reported that four ARISSat satellites had been assembled and that two of the four (one for actual launch and one for ISS crew training on the ground) were undergoing extensive operational tests. In addition, flight software was being finalized and the ARISSat team was planning to have the two flight units ready for vibration testing sometime in early September 2010.

Shipment to Russia was set for late September, where a Russian experimental payload was to be integrated into the actual flight satellite prior to its shipment to the Baikonur Cosmodrome in Kazakhstan for launch up to the ISS aboard an unmanned Russian *Progress* cargo vessel.

Gould also reported that ARISSat-1 has now been firmly manifested on *Progress* 41P, which, if it launches on schedule, will carry the satellite up to the ISS sometime in early 2011. On a date yet to be determined, one of the astronauts or cosmonauts will turn the satellite "on," step outside the ISS, and toss it overboard into space.

The orbital life of ARISSat-1 before it re-enters the Earth's atmosphere is expected to be about a year or so. More information about the ongoing progress of ARISSat-1 can be found on the SuitSat-2/ARISSat-1 Web page at**: www.arissat1.org**.

ANTENNA TOPICS

BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Dan Farber, AC0LW
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Stepping Up in the World: Ladder Line

Regular readers of my column are no doubt beginning to suspect that I'm a little obsessed with ladder line. I use it whenever I can, because, as I've said many times, a tuner and ladder line can match some really crazy antenna configurations to your radio.

Contrast this with conventional coaxial cable, which must be connected to a resonant or nearly resonant antenna or else SWR losses will quickly climb to alarming proportions. Often, due to stealth or other "downsizing" requirements, a resonant antenna just isn't possible. Ladder line and a tuner quickly become the only effective choice for many of these shortened antennas.

Well, another ladder line brainstorm finally worked its way to the surface, after simmering in the hollows of my skull for many years. Why not make the dipole itself out of ladder line?

Two excellent possibilities jumped right out at me; one, a *folded dipole,* fed with ladder line; and two, a pair of *"resonant" dipoles* made from a single length of ladder line and fed with coaxial cable. So I proceeded to build and test these two ideas.

The Folded Dipole

You might recall that I briefly discussed the folded dipole before, noting that it's actually a full-wavelength loop that's been "folded" into a long, narrow rectangle, a half-wave long and a few inches wide. (See "The Humble Dipole," April 2010).

In practice, this means a two-wire dipole – one wire fed at its center, the other unbroken – and the two wires tied together at their ends. So, the only tricky part is assembling two wires parallel to each other for the entire length of a given dipole. The manufacturers of ladder line have already made this assembly for us! All we need do is cut a piece of ladder line the desired length, cut one side at the center to attach a ladder line feedline, and tie the ends together.

And, of course, as I've said many times, the ladder line feed makes the length of the dipole largely unimportant, as long as we try to make it at least a quarter-wavelength long at the lowest desired frequency. In practice this means a dipole at least 33 feet long should give us coverage of everything above 7 MHz.

With all this in mind, I cut a piece of ladder line 35 feet long, since I had two convenient supports available about 40 feet apart. I stripped the insulation from both wires on both ends, twisted the pairs together, soldered them, and sealed the solder joints in ordinary silicone sealant.

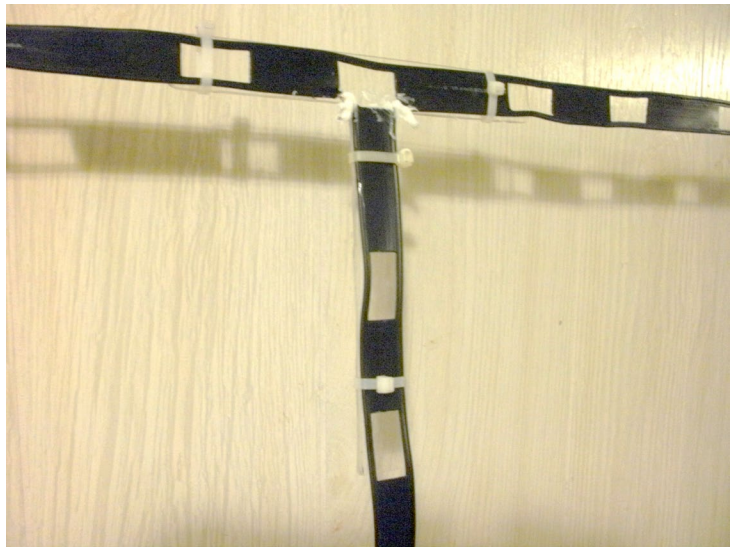
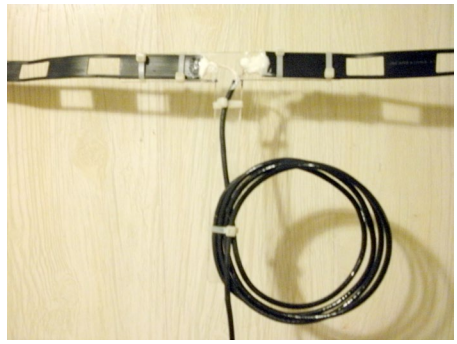


Photo1: The center of the two-band dipole, wire-tied to the plexiglass "T", with solder joints sealed and choke balun in the coaxial cable. (Photo by author)

Then I cut a "T" of plexiglass to serve as a strain relief for the center. At the center of the dipole, 17 feet 6 inches from either end, I cut one of the wires, stripped the ends thus created, soldered them to the ladder line feeder and sealed them, and wire-tied the whole shebang securely to the plexiglass "T" (see photo 1).



The center of the folded dipole, wire-tied to the plexiglass "T", with solder joints sealed with silicone sealant. (Photo by author)

The "T" furnishes strain relief, but no center insulator is required. In like fashion, no end insulators are required – just tie nylon rope to the last "window" in the ladder line at each end. Fire up your trusty E-Z Hang (see "How's It Hangin'?" May 2010) and hang the two ends from convenient supports, and you're ready to try out the ladder line folded dipole.

On-the-air testing revealed several pleasant surprises. For one, even though the folded dipole I made was only 35 feet long and about 25 feet off the ground, it loaded up on 80 meters. I didn't work any DX on this band, but I was able to reach out into the 100 mile radius around my house. This would enable a person to partake of net activity, for example, using this very small antenna.

Another bonus was the folded dipole's broad frequency response. I found that the folded dipole when tuned up near the center of any given band would hold a fairly low SWR all across the band. Having to use the tuner less is certainly an advantage.

Also, the old trick of feeding the antenna as a "tee vertical" (tying the ladder line feed wires together at the tuner's WIRE output) worked very well with the folded dipole. Even on 160 and 80 meters, this "poor man's vertical" did a fine job.

Resonant Dipole

Meanwhile, I had constructed the second ladder line dipole and wanted to test it. This time, since I would use coaxial cable as the feedline, the dipole length was critical. I cut a piece of ladder line 33 feet 4 inches long; this is ideal dipole length for 14.040 MHz, in the CW end of the 20 meter band. Then I cut one of the wires 3 feet 8 and a quarter inches from each end, and opened a gap two inches long, leaving a 25 foot 10 and a half inch dipole, perfect for 18.086 MHz in the 17 meter band. (See Figure 1.)

Now it was a simple matter to cut this length of ladder line exactly in half, strip the four wire ends thus exposed, solder the pair on one side to the center conductor of a length of coaxial cable, and the pair on the other side to the shield of the coax. The solder joints, and the opening in the coax jacket, were then encased

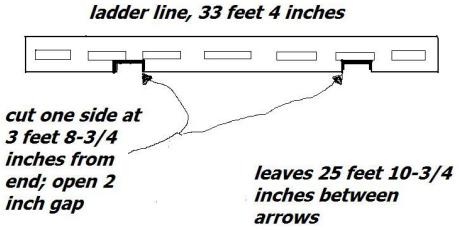


FIGURE 1

in silicone sealant. Wire-tying the assembly to another plexiglass "T", and making a choke balun of four turns of the coax six inches in diameter and wire-tied, completed the center of this two-band dipole. (See photo 2.) Again, no end insulators are needed; just tie nylon rope to the last "window" at each end of the dipole.

With some regret, I lowered the folded dipole to the ground, and pulled up the two-band dipole in its place. Time for another test drive!

First I tried the dipole with the tuner set to BYPASS, so I could see what sort of SWR existed on the line. Results were pretty much as I expected. SWR was less than 1.2 at 14.040 on 20 meters, the same at 18.086 on 17 meters. Reverting to the tuner's TUNED function, I got acceptable (1.5 or less) results on all of both bands. (The coax doesn't "see" the dipole not in use, since its impedance at the wrong frequency is miles from 50 ohms.)

Since my dipole was sitting on a roughly east-west azimuth, I wasn't able to work the East or West coast very well, but the dipole did a good job to the South and North, working many Latin American, Asian, and Canadian stations.

One thing I will say for this coax-fed dipole, though it pains my ladder line-loving heart to say it – on receive the setup was quieter, sometimes much quieter, than what I've been accustomed to using ladder line feed. This is part of the trade-off, friends: Ladder line is much less affected by SWR and length issues; coax is quieter, but largely restricted to resonant-length antennas.

At the risk of being overly obvious, I should point out that you can make this two-band dipole for any two bands you like. An 80/40 meter dipole might be just the ticket for some hams with only a couple of trees available, for instance. Or perhaps someone has a trap vertical for the non-WARC bands and would like a dipole for 30 and 17 to fill in the holes. Or the SWL might like a dipole cut for two favorite bands, say 6 MHz and 11.8 MHz. Just use the good old "Feet=468/MHz" formula to determine your dipole lengths, and you'll be in business.

Also, don't overlook that either of these antennas can be built as an indoor version, if stealth is necessary at your location.

Well, dear readers, that's it from me for 2010. Everyone have a wonderful holiday season, and I'll be back here in the January 2011 issue, with more "below 30 MHz" antenna adventures. Happy operating!

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

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Another New Project: The Majestic Zephyr

Just twice in the history of this column have we begun restoration work on a radio and, for various reasons, given it up as being not worth the trouble. The first time was a few years ago in the middle of work on a National NC-46, which was an entry-level ham/SWL receiver of the early postwar era. The reason was two fold: (1) it turned out that the antenna coils were burned out on all four bands – perhaps the result of a lightning strike, and (2) the radio had an unusually large number of difficult-to-replace bypass capacitors.

❖ We Discontinue the Philco Project

The second rejection just happened. I've decided to discontinue work on the Philco 38-62, a household broadcast receiver we began work on in September and just resumed in this issue. In September, we did a general profile of the receiver and took a first look inside. It turned out that the top and front apron of the chassis were *exceedingly* rusty, and the large accumulation of odds and ends of vegetation and opened seeds explained why. This set had obviously been home to a family of mice. Probably for quite a long time!

I originally I felt that a good wire brushing, application of some rust remover, and coating with some quality aluminum paint would take care of the problem. Beginning again this month, I found that a small wire brush with brass bristles ($1.00 at a local hardware store) did a better job than any of the heavier brushes in my toolbox. But the more I brushed, the more disillusioned I became.

The tubes and tube shields had already been released from the grip of decades-old corrosion. I had just removed the fragile plastic tuning dial assembly from the radio to avoid breaking it. Now it looked like I would have to remove the i.f. transformers and electrolytic capacitors to clean them and the surrounding chassis. I also got a good look at the chassis front apron, which was at least as deeply rusted, in places, as the chassis top. So was a section of the loudspeaker frame.

At this point, I decided to take a closer look at the underside of the chassis – which I knew to be very clean and, apparently, untouched. I figured that the sight would give me more motivation to continue with what was beginning to look like a very lengthy and messy project. What I discovered turned out to be a deal breaker as far as I was concerned. It was the presence of three of those special Philco Bakelite capacitor assemblies.

By the way, it's worth pointing out that discontinuing a project in midstream, which might seem to suggest bad planning on the part of your columnist, is an inevitable, if occasional, consequence of the column philosophy. I never complete a project in advance and report on it later. Rather, I allow my readers to look over my shoulder as I proceed – sharing the setbacks as well as the accomplishments.

Even though this is now a rejected project, we've gone over some useful material (in the September issue) on pre-startup testing of long-disused sets, releasing rusty tubes and tube shields without damaging them, and the construction of dynamic speakers.

In this issue, I discovered a good tool for preliminary rust removal, and I encountered those annoying Philco Bakelite capacitors (or condensers as they called them then). Now let's take a little time to discuss the Philco Bakelites.

❖ About Those Bakelite Caps

While we won't be working with them in this radio, the information will be useful to those who are not familiar with Bakelite caps and who may very well run into them in other restoration projects.

These components are not capacitors themselves, but rather housings that, with some exceptions, contain a single capacitor, two capacitors, or a capacitor and a resistor. The parts are sealed inside with a waxy compound poured in as a last step in manufacture. The connections to these parts are brought out to a group of double-lug terminals that provide attachment points for other components in the radio.

This dual function of component part and terminal strip must have really simplified the construction of Philco radios and helped make them very cost competitive with other brands.

Two of the three "Bakelite caps" in the Philco 38-62.

However it had to be a serviceman's nightmare.

To isolate an ordinary discrete component for diagnosis purposes, one could either unsolder one of its leads or temporarily clip it. However with the Bakelites, the service technician might have to disconnect a jungle of connections to isolate a capacitor or resistor for diagnosis. Should it be found defective, still other groups of connections would have to be removed to extricate the entire Bakelite unit for replacement.

Back in the day, the technician could at least order replacement Bakelites at nominal cost. The parts list in the service manual for the Model 38-62 prices its three Bakelite cap units at $0.25, $0.35 and $0.40. But today's radio restorers don't have that option.

After disconnecting and removing the unit, the sealing compound needs to be melted out – usually with a heat gun. Now the original components can be disconnected, pulled out, and replaced with modern ones. Luckily, these are so compact compared with vintage components that they can be easily slipped into the Bakelite housing.

Some restorers like to reseal the rebuilt housing with wax or epoxy. But modern capacitors are already very well sealed and this step is not necessary. Nor is it important for cosmetic purposes. The opened end is installed against the chassis and is not visible. Once rebuilt, the tangle of wiring now must be replaced on the terminal lugs and, hopefully, the restorer has kept good enough records or photographs to avoid the very real possibility of mixing up the leads.

I think that if our Philco had been rust free, or if it had been as rusty as found but without the Bakelite caps, or if it had both problems but was a more interesting radio, I would probably have continued with the restoration. I once restored a Philco 70 table model, one of the great classic cathedrals, and didn't think twice about rebuilding all of its Bakelite caps.

Bakelite Cap Ratings and Connections

Now here's some more Bakelite cap information that might help you, should you run into a radio using those components. Figure 1 shows the "Universal" lug arrangement as used for the capacitors in our radio. Figure 2 shows an older arrangement that was

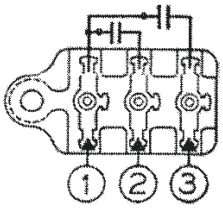


Fig. 1. "Universal" Bakelite cap style as found in the 38-62.

discontinued when the "Universal" style was adopted. These drawings are from Philco Service Bulletin 289, which can be found at Philco expert Ron Ramirez's web site **http://philcoradio.com**.

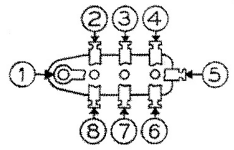


Fig. 2. Older style units, as pictured, might contain a resistor as well as one or more capacitors.

The units in the "Universal" group will contain either one or two capacitors connected as shown. If there is only one, it will be connected between terminals 1 and 3. Part number listings in the bulletin, keyed to the diagram, show the value and number of capacitors in each unit as well as their voltage ratings. Supplementary letters following the numbers indicate such things as whether terminal 1 is grounded to the mounting lug, whether the unit is a single or dual capacitor, and whether the sealing wax used is a high melting point variety.

Note that the older units have an extra terminal lug. These units might contain a single capacitor, two capacitors, a capacitor and a resistor, or even two capacitors and a resistor. Once again, part number listings in the Service Bulletin provide information about the component ratings and the terminal lugs to which they are connected.

❖ Wartime Reminiscences

In my original column on the Philco 38-62 (September) I queried our readers to see what they thought about including household receiver projects in the column. Prior to the Philco I had, for a few years, neglected consumer sets in favor of military models. The response was unanimously in favor of introducing an occasional project involving a household set. In their response, a few readers also used the occasion to let me know, in detail, how much they enjoyed the column. I thank those readers for their thoughtful and supportive comments!

One respondent (name and location unknown), who is obviously in favor of including broadcast sets in the column, sent me both a long letter and a couple of very full postcards, unsigned but full of radio reminiscences and suggestions. For instance, in 1938 his great-grandmother purchased both the tabletop and floor versions (37-611T and 27-611F), of the same Philco radio, on sale, from a dealer who wanted to close out his last 1937 models.

She had no a.c. on her farm, but ran these sets on d.c. from her Delco lighting system, which used a generator that charged a bank of storage batteries delivering 120 volts. The tabletop stayed at her bedside and the floor model was the centerpiece of her living room. During the war, she was able to hear shortwave broadcasts from both the Axis and the Allies, and even, at night, police calls from all over the country. She powered the radios that way until 1954, when she sold the farm and moved to town.

Our anonymous respondent's stepfather, who also had lived in a rural area – but one with good wind (the NC outer banks), grew up in a family that used a Jacobs wind generator on a 40-foot tower to charge its 120 volts worth of batteries. As a teen in 1941, he bought himself an Echophone EC-1, a predecessor of the Hallicrafters S-38.

This was essentially a household "All American Five" receiver in a metal communications receiver type cabinet. But in addition to the broadcast band, it included shortwave bands to 30 MHz, a bandspread control, a BFO and headphone jacks. It was really quite a lot of radio for $19.50 and, being a.c.-d.c., he could operate it from the Jacobs system.

For a small extra charge, the dealer who sold the set added an extra coil that could be switched in to lower the broadcast band coverage to include the 350-525 kHz marine band. This enabled stepdad to DX surface ships, German U-Boats and German diplomatic channels. Though most of the latter communications was encrypted, personal telegrams were often sent in the clear – allowing him to ID the sources.

❖ Introducing "The Zephyr"

The Philco radio project having bombed out, I went scurrying up to the attic to locate a suitable replacement project radio. And, mindful of the results of the recent voting, I picked out another household set. The one I found, being a 1946 model, is about a generation newer than the 1930s Philco.

The back of the radio identifies the set as a product of Majestic, with the subtitle "Mighty Monarch of the Air." The ID sticker on the bottom tells us that it's a Model 5A410 and that it's an a.c.-d.c. radio with the standard "All American Five" tube layout: 12SA7 (first detector), 12SK7 (i.f. amplifier), 12SQy (detector/first audio amplifier), 50L6 (power amplifier) and 35Z5 (rectifier).

The cabinet is walnut finish Bakelite with just one small inconspicuous crack on one side, towards the rear. Its surface is rather dull right now. It will be interesting to see if one of the plastic polishes that are on the market will bring back the glow and help repair two spots on top where the finish may be damaged. The back, with attached loop antenna, is complete and unbroken – unusual in a small a.c.-d.c. set.

The design is definitely "moderne" – some on the internet call it "machine age." Even the knobs (bullet shaped) are of stylized design. A somewhat unusual feature is that the speaker faces out the left side of the cabinet rather than the front. Judging from the number of internet postings that feature it, this seems to be quite a popular collector radio.

The Majestic "Zephyr" as removed from the attic – dust and all. Looks like the finish may be damaged at a couple of spots on top.

Many sites note that the set is nicknamed "The Zephyr." Perhaps this is because of a fancied resemblance to the very moderne Pioneer Zephyr train (1934 vintage) on permanent display at the Chicago Museum of Science and Technology. I guess I can sort of see that, though the comparison seems a little forced! And by the way, in my research I discovered that the 5A410 chassis is also used in a "Coke Cooler" novelty radio that some of you may have collected.

The two pages devoted to this set in *Riders Volume 15* provide all of the basic servicing information required – including schematic, voltage readings, and alignment instructions. Ordinarily, I would have to take apart the *Rider's* binder to remove the pages so I could scan them to make working copies. But I was able to download very nice, sharp copies from the **www.nostalgiaair.org** site, saving me a lot of trouble!

I haven't removed the set from its cabinet yet because I don't like having too many radios in pieces at once on my bench. However, judging from the general condition of this set, I don't expect that too many tragic flaws will be revealed upon opening up the cabinet. Before I break down the Majestic, I want to put the Philco completely back together and set it aside as a possible parts radio.

WiNRADiO Excalibur G31DDC SDR Receiver

by Bob Grove, W8JHD

I grew up in the analog age. By age nine I was already playing with old tube-type radios, and by 13 I had my ham license. I cut my teeth on WWII surplus transmitters and receivers – anything with knobs to turn and meters to move.

By the time I reached adulthood, Asian-made radios began to trickle into the U.S. and pushbuttons replaced tuning knobs, prompting a whimsical question: "Don't the Japanese have thumbs?"

And then the final blow to my analog world – computers! My sons Bob and Bill grew up with these, wondering how I ever got along without them. I resisted getting a computer, even when I started Grove Enterprises in 1978.

But I finally capitulated and bought one for the office. It actually streamlined our operation. What a concept! Then I bought some more. "Hey, these things actually work!" I exclaimed.

When radios started getting "smarter," I was skeptical about digital control, but it's here. And with the emergence of the new WiNRADiO G31, I capitulate once again; the future of radio monitoring has arrived.

❖ Degrees of Digital: A Quick Tutorial

With the advent of the personal computer, digital technology has permeated the electronic communications industry. Receivers are now classed as either analog (the traditional architecture) or software defined.

Considerable debate has raged over just what must be digitized in a radio to make the claim that it is a software defined receiver (SDR). Early examples had simply the detector stage digitized; later on it included the intermediate frequencies (IF).

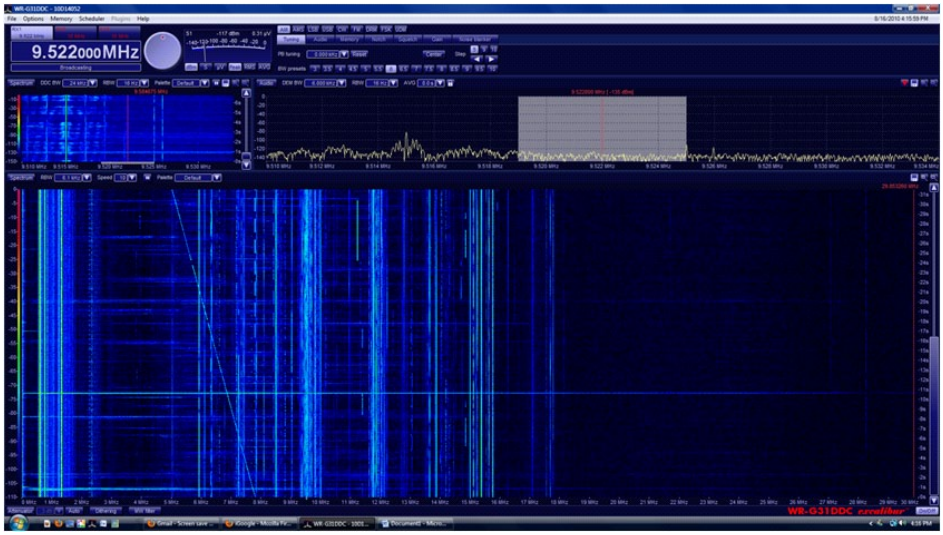
But WiNRADiO's new G31DDC Excalibur leaves little doubt it is a fully implemented SDR, since the only analog circuitry is in the RF preamplifier and audio output stages. All the rest of its signal processing is handled in a high level of fast Fourier transform (FFT) analog to digital (ADC) converters and field programmable gate arrays (FPGA).

With analog technology, the contents of a radio signal – frequency, amplitude, period, and modulation – are replicated as an electrical signal. In digital technology, there is no such mirror-like replication: The signal is sampled, parsed into myriad bits, and its contents become a single-amplitude, single-rate data stream.

But there's more to it than that. Once you purchase a conventional analog radio, what you see is what you get. With a software-defined receiver, improvements, refinements, additional features, and even functions can be changed or added via a simple software download.

❖ It's All in the Box

The entire receiver is encased in a sturdy, compact, die cast package the size of a paper-



The G31 waterfall spectrum for 0-30 MHZ left to right: Vertical lines are signals slowly scrolling upward to show changes over time. The diagonal trace is a frequency sweeper.

WINRADIO G31 EXCALIBUR SPECIFICATIONS

Design: Direct-sampling, digitally down-converting (DDC), software defined receiver (SDR)
Frequency Range: 9 kHz to 49.995 MHz
Tuning Resolution: 1 Hz
Modes: AM, AMS (AM Synchronous), LSB, USB, CW, FMN (FM narrow), FSK, UDM (User-Defined Mode), DRM (optional)
Image Rejection: 90 dB (typical)
Third Order Intermodulation (IP3): +31 dBm or better
Attenuator: 0 to 21 dB, adjustable in 3 dB steps
Spurious Free Dynamic Range (SFDR): 107 dB minimum
Noise Figure: 14 dB
Minimum Detectable Signal (MDS): -130 dBm at 10 MHz, 500 Hz BW
Phase Noise: -145 dBc/Hz at 10 kHz
Received Signal Strength Indicator (RSSI) Accuracy: 2 dB (typical).
Received Signal Strength Indicator (RSSI) Sensitivity: -140 dBm (0.02 uV)
Processing and Recording Digital Down Converting (DDC) Bandwidth: 20 kHz to 2 MHz in 21 selectable steps
Demodulation Bandwidth (Selectivity): 10 Hz to 62.5 kHz variable in 1 Hz steps
Spectrum Analyzers:
- Full spectrum/waterfall: 30 or 50 MHz span, 1.5 kHz resolution bandwidth
- DDC spectrum/waterfall: up to 2 MHz span, 1 Hz resolution bandwidth
- Channel spectrum: up to 62.5 kHz wide, 1 Hz resolution bandwidth
- Demodulated audio: 16 kHz wide, 1 Hz resolution bandwidth

Analog to Digital Conversion: 16 bit, 100 Mega Samples Per Second (MSPS)
Sensitivity (at 10 MHz):
- AM: -101 dBm (2.00 μV) at 10 dB S+N/N, 30% modulation
- SSB: -116 dBm (0.35 μV) at 10 dB S+N/N, 2.1 kHz bandwidth
- CW: -123 dBm (0.16 μV) at 10 dB S+N/N, 500 Hz bandwidth
- FM: -112 dBm (0.56 μV) at 12 dB SINAD, 3 kHz deviation, 12 kHz bandwidth

Audio Filter 300-3000 Hz, de-emphasis -6dB/octave
Tuning Accuracy: 0.5 ppm at 25 °C
Tuning Stability (0°-50° C.): 2.5 parts per million (ppm)
Medium Wave Stop-Band Filter:
- Cut-off frequency: 1.8 MHz at -3 dB
- Attenuation: 60 dB or greater at 0.5 MHz

Antenna Input Impedance: 50 ohm (SMA connector)
Output: 24-bit digitized I&Q signal, USB 2.0 high-speed interface
Power Required: 11-13 VDC at 500 mA (typical), 45 mA in power save mode
Operating Temperature: 0 to 50 °C
Dimensions: 3-3/4"W x 1-5/8"H x 6-1/2"D
Weight: 16 oz.

back novel, accessorized with a USB computer interface with matching cable; an SMA antenna connector (an SMA/BNC adapter is included); a DC jack (a 120VAC/12VDC adapter is also included); a push-button power switch; and an LED pilot light that doubles as a status indicator.

This new G31 Excalibur from WiNRADiO is a giant digital leap from a previous century of analog design. Covering a continuous 9 kHz (and lower) to 50 MHz spectrum, the screen for this receiver is an awesome display of numbers, graphs, and tables (admittedly, somewhat bewildering to the newcomer).

A highly accurate signal strength meter is included; it can be push-button selected to show S units, microvolts (uV) and dBm, and may be additionally contoured to show these units as peak values, RMS, or smoothed out for average.

❖ THREE Receivers!

Three tabs in the upper left screen invite selection of RX1, RX2 or RX3, which emulate the separate VCO/VFO settings in a conventional receiver. This feature allows you to set up three entirely different receivers with different functions which may be instantly selected anywhere in the 50 MHz receiver bandwidth.

In addition, you may hear the blended audio output of all three receivers at once, provided they are within a 2 MHz spread. For example, you may be waiting for an LSB ham transmission on 7212 kHz, an AM international broadcaster log-on at 7420 kHz, and an arriving airline USB station on 8918 kHz. There's no scanning delay: it's an instant capture of any of them, or even all three simultaneously!

For the game-playing computer guru, information-packed screens are familiar, but to the long-time, analog dial twister, it's a jaw dropper! It can become familiar, but it will take a while. Reading the accompanying instruction manual is mandatory.

All receiver functions are PC hosted. System requirements are quite conventional for modern computers: Windows XP, Vista, or 7, with a 2 GHz dual core CPU and 1 GB RAM. The display should be SVGA and only 20 MB hard drive space is required. A free USB port allows the connection, and audio is provided by your sound card.

User preference can be saved to disk, and spectrum display traces can be saved as BMP files as well.

The G31 will actually work with slower computers, but there will be some sacrifice in the sharpest selectivity and DDC bandwidth.

❖ Frequency Accuracy

With a built-in, temperature-compensated, crystal oscillator (TCXO) offering a stability of 2.5 parts per million, it's hardly necessary to calibrate your G31. But if you're a purist like I am, you can select a frequency of known precision like WWV, invoke the automatic calibration function, and touch the ENTER key to bring the oscillator even closer.

❖ Spectrum Displays

Dominating the screen are three spectrum displays – dynamic charts of the radio spectrum, constantly gyrating from the presence, frequencies, and relative amplitudes of signals. Unlike many competitive displays, the user can simultaneously listen to the signal as well as see it on the spectrum display, and can also drag the cursor across the screen at any speed like the tuning dial of a conventional receiver.

G31DDC screen showing full spectrum display (lower), 2 MHz span DDC display (upper left), and single-signal modulation waveform (upper right)

The bottom display – appropriately the largest display – shows all the signals present in the span of spectrum chosen by the operator, either 30 MHz for the familiar high frequency (HF or shortwave) portion of the spectrum, or the entire 50 MHz swath of the receiver's tuning range.

Being able to see the activity in the entire spectrum at once affords a number of advantages, including watching for activity and band openings so that one may immediately pounce on a signal anywhere in the spectrum with a click of the mouse.

The upper-left-hand display (DDC BW) allows the user to choose the chunk of digitally-down-converted spectrum to which he wants to pay particular attention, as narrow as 20 kHz or up to 2 MHz in bandwidth. The upper-right-hand display (DEM BW) allows the user to analyze the contents of any demodulated signal(s) up to 60 kHz bandwidth.

Want to see more signal detail on specific spikes or traces? Simply press and step the zoom icon for larger and larger magnification.

The display is in real time, with the received signal showing perhaps a 50-100 millisecond processing delay. The delay is so short it's hard to detect, unless you happen to have an analog receiver nearby receiving the same signal so that you can hear the echoic effect between the two. You can also *see* the slight delay as you watch excursions of the signal spike while monitoring the audio content of the signal.

Want to mark signal spikes you've already monitored? Simply press your right-hand mouse key. You can save any spectrum display by simply pressing the SAVE key.

❖ The Waterfall

Switch to this feature from the conventional spectrum display to reveal a colorful, mesmerizing, continuously-updated, scrolling panorama of all the signals in the 30 MHz HF spectrum or even full 50 MHz spectrum. Be sure to select the DEFAULT color palette – it's the prettiest!

The speed is adjustable to show up to ten continuous minutes of graphic data in full motion, and it can be recorded to disk for later playback and analysis. The scroll shows amplitude, modulation, on/off keying interval, frequencies and their shifts, interference, and other characteristics of the radio spectrum.

The waterfall adds a new dimension to monitoring as it reveals all band conditions and signals within its bandwidth over time. Strong signals register in orange to red, average signals in yellow and green, weak signals in blue. Watch band openings as weak signals begin to emerge on the dark palette background.

You'll see sweepers (ionosondes) as they register with diagonal lines, amplitude-modulated (AM) broadcasters with their delicately-fluctuated patterns, frequency shift keying (FSK) as side-shuttling lines, Morse code (CW) with its pulsed traces, and more.

And, just as with the spectrum display, you can zoom in on the waterfall as well.

Viewing the entire spectrum with the waterfall perspective is a transfixing, if not transcendental, experience. It reminds me of how I used to stare at the night sky with wonder, and how I admired photos of distant celestial objects – and then I got my own telescope and viewed infinity with awe! But don't watch it too long: take it from me, it's addictive!

❖ Tuning In

Selecting a signal frequency is easy and there's more than one way to do it. For precise frequency selection, simply type in the numbers, entering "k" or "m" for kilohertz or megahertz respectively. If the previous selection was already in the unit you want, just type in the numbers and hit ENTER.

The frequency display window reads out to 1 Hz, and the G31 is capable of this sort of tuning accuracy. A small window below the frequency display tells you the service authorization for that frequency (broadcasting, amateur radio,

G31 waterfall displays showing full spectrum users (lower) and modulation patterns on a smaller, magnified portion of the spectrum (upper).

maritime mobile, etc.).

There is also a graphic tuning dial; by resting the cursor there you can slew the dial up and down in frequency by pressing the left or right mouse button. Similarly, you can slew with your keyboard's up/down arrow keys, and fine tune by tapping or gliding the left/right on-screen tuning arrows or bar on the demodulator display.

Tuning steps are factory set at 1 kHz for general slewing, but can be set at 100 Hz with your ALT key, 10 Hz with your SHIFT key, or as fine as 1 Hz with your CTRL key. Especially useful for medium wave (MW) and shortwave (SW) broadcast tuning, you can select 5, 9 (European domestic), or 10 kHz steps by pressing on-screen buttons.

Detection modes are numerous: AM, synchronous AM, USB, LSB, CW, FM, FSK, UDM (user defined mode), and even DRM (Digital Radio Mondiale; French for digital radio worldwide, the international shortwave digital broadcast standard).

Because of the license cost to implement DRM, that mode is available only as an extra-cost option. The DRM works very well; it's the first time I've ever heard shortwave stations crisply, without fade, distortion, noise, static, or background hiss! DRM is not without fault, however; unstable band conditions can lead to frequent echo effects or even dropouts.

It may take up to ten seconds or so for the decoder to synch up with the received station. Even so, few stations are using DRM, so don't expect to be deluged with stations operating in that digital mode. It's popular in Europe, but North American listeners will be lucky to find one or two at the present time. [*For more on DRM see MT April, 2010 "Chasing DRM: the Elusive Dream of Digital Audio via Shortwave"- Ed.*]

While conventional factory-set parameters are invoked with each mode's selection, they can be independently altered to suit the requirements. The user defined mode (UDM) allows the operator to save special custom settings for a mode of his choice.

❖ Single-Signal Reception

Choosing the bandwidth necessary for pulling a signal out of the mire is an art, but it's easier when you can do it as you listen to it and can even see an impinging, adjacent-channel source of interference.

Selectivity options are simple, yet elegant. A gray shadow is placed over the frequency cursor; it follows a drag of the mouse key as you to stretch or compress the bandwidth, or even move the selectivity curve away from the center for the digital equivalent of IF shift (since direct digital conversion has no intermediate frequency). Alternatively, simply tap a preset bandwidth between 3 and 10 kHz from a screen chart.

A passband tuning feature is also provided which shifts both the center frequency and the filter bandwidth away from the offending interference signal. Since the filtering technology is digital, you can think of it as an endless series of filters which you can engage without any signal loss.

While it might seem the more filters the better, that takes husky processing which can slow down your computer. To choose an appropriate amount of filtering, the G31 panel has a load meter, and as long as you keep the load on the CPU below about 30%, filter to your heart's delight!

The RF notch filter is an amazing tool to squash adjacent-channel interference like a bug! Using a drop-down box, the user selects the frequency of the interfering signal and its bandwidth, hits "ENABLE," and it's gone! The spectrum display shows the graphic notch on the shadow so it can be trimmed to perfection. Try to do that with an analog radio!

❖ Powerful Recording

For decades, intelligence agencies like NSA have used high-tech receiving installations for "pre-detection recording"; that is, they could record and save for later playback and analysis all the signals in a particular part of the spectrum in actual time.

The G31 can do this, too, in any 2 MHz swatch of spectrum. Suppose you go away and want to hear the contents of a signal that you believe will come on the air between 6 and 8 MHz. Simply store that spectrum live on your hard drive for the time period in question, and when you return you can bring up the spectrum display screen and review what happened in those two megahertz while you were gone.

You can take your time while sampling one signal at a time, watching it on screen and demodulating its contents to hear. Massage the signal for best reception, and if the transmission stops, you can start it all over again.

Of course, as you become acquainted with the variety of functions, you're bound to screw it up. How do you ever get those settings back to where they were when you began? Easy – under OPTIONS, select RESTORE FACTORY DEFAULTS and you're there. And, I'll have to admit, the factory has made some pretty good decisions for their presets!

When you do actually arrange a pattern of functional selections you like that are different from the factory presets, you can save them in a memory file to call up again, even if you factory-reset the entire receiver.

❖ Audio Functions

Depending on your sound system, the audio characteristics of the received signal may be adjusted for low and high frequency cutoff, and de-emphasis (treble slope). A volume slider and up/down volume arrow keys are provided as well.

Of course, you don't have to switch to the audio screen every time you want to change the volume; just press or tap the left/right arrow keys on your keyboard.

A versatile squelch feature is a great help for listener fatigue, and the G31 does it with style. You can adjust the squelch level by signal strength, noise level, and voice presence. The three factors may be selected individually or in combination.

A flexible audio mixer allows up to three received signals to be monitored simultaneously in various combinations, including separate left and right ears for headphones or stereo speakers.

A mute key toggles the audio on and off, or you can simply switch the receiver off – it only takes one second to come back on.

❖ Using an Accessory Frequency Converter

If a VHF or UHF converter is used with the G31, a display offset feature allows the conversion frequency to be shown rather than the original receiver frequency. The frequency will track the receiver's tuning through the converter's operating bandwidth.

❖ Dealing with Interference

With a brawny third-order intermodulation factor of at least +31 dB, strong signal overload is unlikely, but should you have a local AM broadcaster with a whopping signal, you can activate the 1.8 MHz high-pass filter and watch the broadcast band virtually disappear.

For other high-power inundations anywhere in the 50 MHz worth of spectrum space, there is a variable-step attenuator you can select to suit the conditions.

❖ The Bottom Line

I'm sure my exuberance over this remarkable receiver is obvious. In my professional lifetime in communications electronics, I've never seen anything with such shortwave receiving and processing power at such a low price. In the time it took me to write this review, I have changed from a digital skeptic to a true believer. This is one amazing radio!

The new WiNRADiO G31DDC Excalibur is available from Grove Enterprises for $849.95.

AR5001D Wide Coverage Professional Grade Communications Receiver

The Legend Lives On!

The AR5001D delivers amazing performance in terms of accuracy, sensitivity and speed.

Available in both professional and consumer versions, the AR5001D features wide frequency coverage from 40 KHz to 3.15 GHz, with no interruptions. Developed to meet the monitoring needs of security professionals and government agencies, the AR5001D can be controlled through a PC running Windows XP or higher. Up to three channels can be monitored simultaneously. Fast Fourier Transform algorithms provide a very fast and high level of signal processing, allowing the receiver to scan through large frequency segments quickly and accurately. AR5001D standard features include storage of up to 2000 frequencies, 45 MHz IF digital signal processing, direct digital sampling, a high performance analog RF front-end, a DDS local oscillator and advanced signal detection capabilities which can detect hidden transmitters. With its popular analog signal meter and large easy-to-read digital spectrum display, the AR5001D is destined to become the choice of federal, state and local law enforcement agencies, the military, emergency managers, diplomatic service, news-gathering operations, and home monitoring enthusiasts.*

Discover the next generation in AOR's legendary line of professional grade desktop communications receivers.

- Multimode receives AM, wide and narrow FM, upper and lower sideband and CW
- Up to 2000 alphanumeric memories (50 channels X 40 banks) can be stored
- Analog S-meter
- Fast Fourier Transform algorithms
- Operated by a Windows XP or higher computer through a USB interface using a provided software package that controls all of the receiver's functions
- An SD memory card port can be used to store recorded audio
- Analog composite video output connector
- CTCSS and DCS squelch operation
- Two selectable Type N antenna input ports
- Adjustable analog 45 MHz IF output with 15 MHz bandwidth
- Triple-conversion receiver exhibits excellent sensitivity
- Powered by 12 volts DC (AC Adapter included), it can be operated as a base or mobile unit
- Professional (government) version is equipped with a standard voice-inversion monitoring feature

Add to the capabilities of the AR5001D with options:

- Optional APCO-25 decoder
- Optional LAN interface unit enables control via the internet
- Optional I/Q output port allows capture of up to 1 MHz onto a computer hard drive or external storage device
- Optional AR-I/Q Windows software facilitates the easy storage and playback of transmissions captured within the selected spectrum in conventional modes, or, signals can be subjected to further analysis
- Optional GPS board can be used for an accurate time base and for time stamping digital I/Q data

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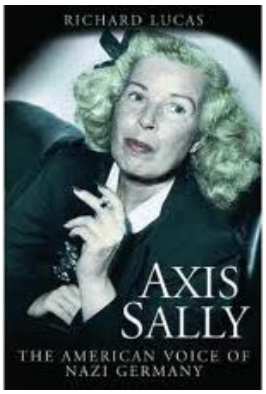
What's NEW

Tell them you saw it in Monitoring Times

Larry Van Horn, New Products Editor

Axis Sally – The American Voice of Nazi Germany

One of the most notorious Americans of the twentieth century was a failed Broadway actress turned radio announcer named Mildred Gillars (1900-1988), better known to American GIs as "Axis Sally." Despite the richness of her life story, there has never been a full-length biography of the ambitious, star-struck Ohio girl who evolved into a reviled disseminator of Nazi propaganda.



At the outbreak of war in September 1939, Mildred had been living in Germany for five years. Hoping to marry, she chose to remain in the Nazi-run state even as the last American departed for home. In 1940, she was hired by the German overseas radio, where she evolved from a simple disc jockey and announcer to a master propagandist. Under the tutelage of her married lover, Max Otto Koischwicz, Gillars became the personification of Nazi propaganda to the American GI.

Spicing her broadcast with music, Mildred used her soothing voice to taunt Allied troops about the supposed infidelities of their wives and girlfriends back home, as well as the horrible deaths they were likely to meet on the battlefield. Supported by German military intelligence, she was able to convey personal greetings to individual US units, creating an eerie foreboding among troops who realized the Germans knew who and where they were.

After broadcasting for Berlin up to the very end of the war, Gillars unsuccessfully tried to pose as a refugee and was captured by US authorities. Her 1949 trial for treason captured the attention and raw emotion of a nation fresh from the horrors of the Second World War. Gillar's twelve-year imprisonment and life on parole, including a stay in a convent, is a remarkable story of a woman who attempts to rebuild her life in the country she betrayed.

Written by Richard Lucas, a freelance writer and lifelong shortwave radio enthusiast, *Axis Sally: The American Voice of Nazi Germany* is the first thoroughly documented look at this mythologized figure of World War II.

This is a hard cover book with 288 pages. To order or for more information contact CASEMATE, 908 Darby Road, Havertown, PA 19083 (**www.casematepublishing.com**).

Desk Top "Noise Away"

The Desk Top "Noise Away" from bhi Ltd. is a stylish matt black, robust base station speaker for use in radio communications, especially amateur radio, two-way radio and HF radio. It is suitable for all bands and is easy to set up and control via the microprocessor-controlled pushbuttons on the front of the speaker grill. It comes with a mounting bracket that can be left on or removed depending on personal choice.

The unit is supplied with a 1.2 meter audio cable with a molded 3.5mm jack plug and banana plugs, plus a fused DC power lead (12-18 volts at 300 mA).

The feature set for this new quality DSP speaker includes:

- 4-inch bass driver and a 1-inch tweeter unit
- 2.5 Watt amplified DSP noise cancelling unit
- Wide audio input level 50 - 500 mW
- Four or seven filter levels (selectable) with visual and audio indications of filter level
- Noise reduction 9 - 24 dB and tone reduction 4 - 65 dB

The "Noise Away" sells for $230.00 and is available from W4RT Electronics (**www.w4rt.com**) and GAP Antenna Products (**www.gapantenna.com**).

MFJ-1775 Rotatable Dipole

If you live in a town house, apartment or condo, and want to operate on the HF ham bands, your options have been limited in the antennas you can use. Now MFJ has a possible answer to your antenna woes – the MFJ-1775 Rotatable 6-Band Dipole Antenna.

You can hardly see this mini 14 foot rotatable dipole from across the street. Its tiny 7-foot turning radius fits on the smallest roof. The MFJ-1775 is inconspicuous and low profile – not much bigger than a TV antenna – and can easily be turned by a lightweight TV rotator. Its directivity reduces interference (QRM)/noise and lets you focus your signal in the direction that you want. You can operate the 1775 on any of six amateur radio bands – 40, 20, 15, 10, 6 and 2 meters, and run full 1500 Watts SSB/CW on all HF bands.

This antenna features automatic band switching, and, with 6- and 2-meters thrown in, you have ham radio's most versatile rotatable dipole.

Each HF band uses a separate, efficient, end-loading coil wound on fiberglass forms with Teflon™ wire, and capacitance hats at each end (no lossy traps).Six and 2-meters are full-length halfwave dipoles. Adjusting the SWR on one band has little effect on other bands.

This antenna is built-to-last with an incredibly strong solid rod fiberglass center insulator and 6063 T-6 aircraft strength aluminum tubing radiator. It's easy to assemble and can be put together in one afternoon.

The MFJ-1775 sells for $249.95 plus shipping and is available direct from MFJ (**www.mfjenterprises.com**) and most major amateur radio dealers.

2010-2014 Technician Class Study Guide

released by Gordon West, WB6NOA

If you want to pass your Technician amateur radio license exam the first time out, then you need study with the best – the new 2010 Gordon West Technician Manual.

Known as Gordo to his friends and fellow hams on the air, he is one of the best-known hams in the radio hobby today. This is primarily a result of his classic body of work over the years, including his comprehensive amateur radio license exam study books, which continue to be a major source for newcomers in the hobby.

Gordon is a contributing editor to both *CQ* and *CQ VHF* magazines and is a frequent speaker at amateur radio conventions and club meetings. He has also written extensively on topics relating to maritime VHF radio and ham radio for RV use, as well as on electronics topics for commercial electronic magazines.

His newest study guide covers the Technician class question pool that became effective on July 1, 2010 and runs through June 30, 2014 for examination; it contains a complete study guide with answer explanations.

This new edition has been re-organized

into logical study topic order with highlighted key words, and it includes Gordo's new helpful "Ham Hints" by "Elmer" with hundreds of related resource website links.

This new edition also includes a bonus CD – *Getting on the Air*! Gordo introduces you to using your Technician privileges, UHF/VHF operations and equipment, and how to make DX contacts with Technician privileges.

This new manual sells for $20.95 plus shipping and is available, along with all of Gordo's study materials on the W5YI Group website at **www.w5yi.org** or from Gordon West Radio School website at **www.gordonwestradioschool.com/**

New Simplex Repeater

The ADS-SR1 from Argent Data Systems is a multi-function voice recorder device that connects to virtually any handheld, base, or mobile radio. It features exceptional voice recording quality and higher capacity than any other comparable device on the market.

A simplex repeater records incoming transmissions and retransmits them on the same frequency. This has the effect of doubling the time required to transmit a message, but, while a traditional repeater typically costs thousands of dollars and might be semi-portable at best, a simplex repeater can be set up with a single handheld radio and operated from batteries. This makes it perfect for disaster response, home or campground use, and any place where radio range needs to be extended but the cost and complexity of a traditional repeater can't be justified.

Additionally, the unique 'say again' repeat-on-demand feature of the ADS-SR1 allows it to be operated in silent mode, repeating transmissions only when requested. This can be used to repeat a missed transmission or to check for missed calls, even hours or days after the last transmission was heard by the repeater.

The ADS-SR1's voice mail function operates like a telephone answering machine, allowing users to record messages for later retrieval. Up to 20 incoming messages can be recorded, and a separate voice mail access code lets multiple users retrieve messages without having to share the repeater's regular security code.

Up to 10 voice announcements can be stored in the ADS-SR1's non-volatile memory. Each message can be set to transmit at a specified interval, and a time offset setting allows beacons to be staggered or rotated. Intervals can be from a few seconds up to twelve hours.

One message can also be configured to play in response to an incoming transmission. This can be used for repeater identification, or to provide instructions on using the repeater or voice mail. A separate inhibit timer stops the message from playing again for a specified time interval.

The ADS-SR1 has the following feature set:

- 218 seconds total recording time
- 19.2 kHz sample rate for excellent voice clarity and SSTV compatibility
- 10 voice announcements with independent timers

- Programmable maximum message length setting
- 20-year data retention with no power
- An optional Morse code or voice identification
- DTMF remote control for all functions
- Operates from two AA batteries or external 4-28 V DC supply
- Has a 'Say again' function that repeats last received transmission on command
- Selectable courtesy tones
- Audio output adjustable in hardware and by remote command

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com*.

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

LETTERS

editor@monitoringtimes.com

Rachel Baughn
rachelbaughn@monitoringtimes.com

Ham Call-In Show

In our September *Letters*, Ryan KC2LKS asked if anyone could remember the name of a call-in ham radio show that aired on shortwave.

Larry Wheeler W9QR suggests "the 'Ham Radio and More' show hosted by Len Winkler, KB7LPW. It was carried by as many as 70 radio stations and was of the 'call in' and guest interview style of programming. Your readers can learn about the program at **www.hamradioandmore.com.** As with all efforts not controlled by the folks in Newington, it received very little outside support.

"Thanks for your good work and for a great magazine."

Larry Wheeler, W9QR, Spencerville, IN

On the other hand, Leonard Halvorsen WA2AMW says, "Bill Pasternak used to do a program called 'Amateur Radio Newsline' on the Westlink Radio Network. I think it used to be broadcast on a SWB station."

Both were great shows, and Bob Grove was interviewed on both programs. According to *Ham Radio and More*'s site, his interview with Len Winkler on shortwave listening aired April 10, 1994.

Better than Kindle

"I read your *Letters* page (Sept. 2010) with great interest. You asked us to let you know if we wish *MT Express* to be available on Kindle.

"I would like to say yes, but like Kindle, most readers are B&W, so I shied away from them, since book reading is not the only reason I would be interested in such a device (also, Kindle uses a proprietary format for ebooks from Amazon). So, I got another device called Novel from Pandigital. It's like an iPad, but smaller and easier to carry around.

"As is, I am able read my *MT Express* issues on it, since it is able to handle PDF documents. However, PDF format is not made for ereaders. I am wondering if *MT Express* would be made available in 'epub' format (Adobe-DRM or non-DRM) in addition to current PDF. Other readers like Nook from Barns and Noble are also capable of handling this format. I hope you consider it."

Ismail Ozguc, KT6LN

Parabolic Experiment

Jean Lavaud wrote Mike Frye regarding his two-part satellite antenna construction project in the March and June issues of *Antenna Topics:*

"Mike, Just to let you know, I took your article from *MT* and built one, but installed it on a 5-ft. parabolic dish. The results are amazing from what I used to get. I am pointing the antenna at 107 W equator and getting transmissions on many UHF downlink channels. Most are shackled, but many are in the clear. I am still experimenting. Had to cut the height to 17 inches to meet the parabola for the dish. I've been using an URC-101 and an Icom R-7000 without pre-amp. One problem so far: Very narrow beam width. You have to be right on to lock in signals."

Jean Lavaud

Hi Jean,

"Very good to hear your success with the parabolic dish and I can imagine it would be very directional. I have used a URC-101 in the past and currently use a URC-110; it's fun to receive the signals with an actual military satellite radio.

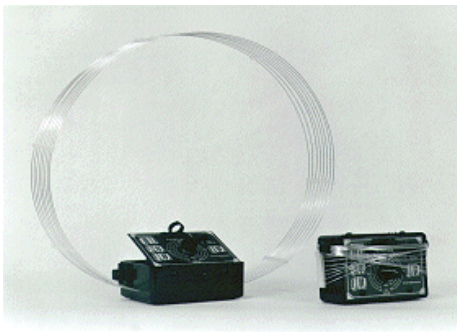
"Thanks for reading the magazine and we'll try to come up with more interesting antenna projects for you in future issues."

Mike Frye

Kiwa Loops

"Thank you for your article about available loop antennas [*MT September, 2010*]. I had the pleasure of talking to Craig [Siegenthaler] at Kiwa [Electronics]. Craig put me on the waiting list for a new Pocket Loop. So, Kiwa still makes pocket loops [for] $200."

Rick Sitz, Bradenton, FL.



"Thanks for your comments, Rick. Kiwa Electronics has for years manufactured high-end radio accessories including loop antennas designed for the medium wave and shortwave bands (a review of the more expensive Kiwa MW Air-Core antenna was reviewed in the December 1995 issue of *MT* and reprinted on the Kiwa web site). They had also been long-time *MT* advertisers. But, while researching the article I had not come across the product you mentioned.

"I contacted Kiwa concerning the Pocket Loop, but the news is not promising. In part, Craig Siegenthaler replied: "We still offer the Pocket Loop and we have the components to build a couple dozen more. Once these units sell, we plan to discontinue this product." The Pocket Loop is still listed on their web site (**www.kiwa.us/index.html**) for $195 plus $8 shipping and handling to North America.

"Kiwa offers other accessories and services of interest to AM and shortwave DXers including a shortwave pre-amp ($129 plus $10 S&H); broadcast band rejection filters; low pass filters and a number of performance upgrades for various popular shortwave receivers. For more information you may contact Kiwa Electronics at *kiwa@wolfenet.com*."

Ken Reitz, KS4ZR

MT Rocks!

"I have been a *Monitoring Times* subscriber since the 1980s, when the magazine was a newspaper-type publication. I still subscribe and am an avid SWLer, along with being an Amateur Extra Class, KN0F. I occasionally give shortwave lectures at local radio clubs and schools, and recommend your publications every chance I get, as I feel they are very up-to-date and accurate. I have ordered other products from Grove in past years and found the service to be excellent. Bob Grove even personally aided me with a product issue I had a long time back. Please keep up the good work!"

Steve Kremer, KN0F

"I might have missed the boat at the dock in the past, or perhaps things just changed for the better over time, but I am currently having a 'cover to cover' great time reading *MT*.

"It is a fantastic publication, and I have noticed that I scan the shelves at my local Borders store for a new *MT* fix every month lately.

"I lament the passing of other great pubs like *73*, and I treasure *QST*, but *MT* presents a wide variety of in-depth communications related information that is simply unavailable elsewhere. I love it!

"Thank you for assembling such a great powerhouse of full spectrum RF talent, and delivering them to my mind each month in an absolutely delicious format!

"*MT* rocks, plain and simple... Expect my subscription soon, and carry on for ages to come. I began as a SWL, dabbled in monitoring, CB, and other RF adventures before pressing forward for my Extra class ticket (12/7/91), and I have been an avid junkbox builder for nearly 50 years. *MT* is the first publication I am aware of that realized that all RF disciplines are simply different rooms within the same house, and all rooms deserve high quality, timely coverage between the same monthly cover pages. Bravo!!!"

Jim Krupnik KQ4MK

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

Happy monitoring!

Rachel Baughn, Editor

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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

BELOW 500KHZ
http://below500khz.blogspot.com/ - by Kevin Carey

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

SCANNING REPORT
http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

UTILITY WORLD
http://mt-utility.blogspot.com/- by Hugh Stegman
www.ominous-valve.com/uteworld.html

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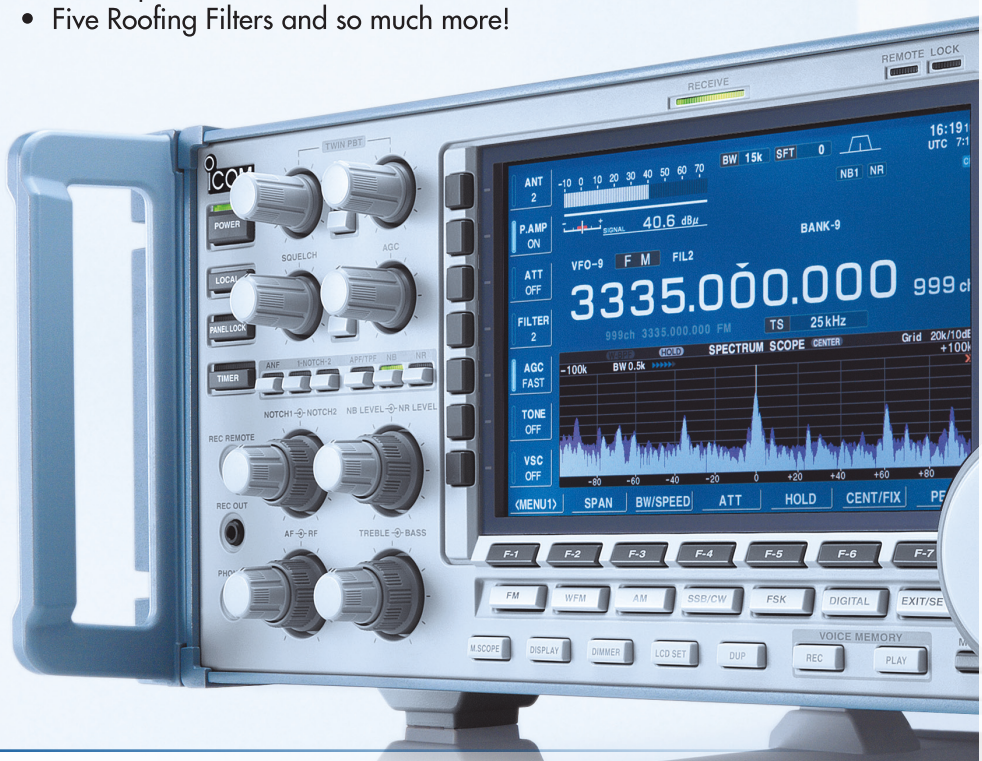

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