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WX4NHC HURRICANE WATCH

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In this issue:

- How to Apply for a Low Power FM License
- Radio Zanzibar returns to Shortwave
- Using Pro-Grade Radios as Scanners
- MT Reviews: Bonito 1102s SDR Receiver

AR2300 "Black Box" Professional Grade Communications Receiver

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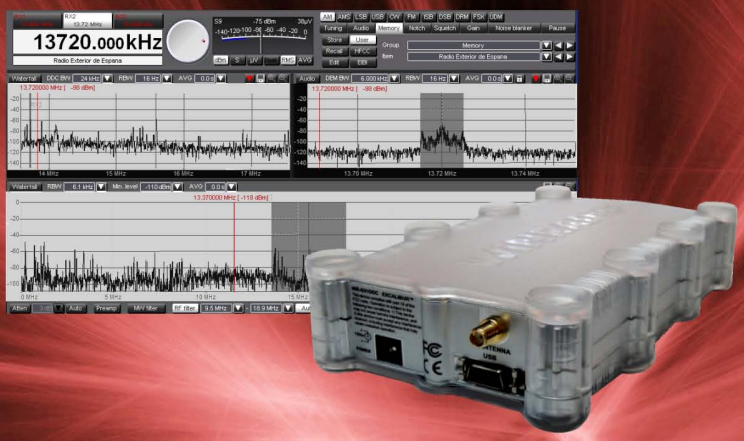


WinRadio Excalibur Pro

WRTH AWARDS 2012
WinRadio Excalibur Pro
BEST SDR

towards settled measurement protocols but it is abundantly clear that the Excalibur Pro is better than anything we have hitherto encountered. To be able to connect a full-size 6/7MHz dipole to a receiver on an autumn evening and be able to observe the sideband sets of individual broadcasters down to virtually the receiver's noise floor is – to put it mildly – an unusual position for a reviewer to find himself in! Certainly the Excalibur Pro was not remotely troubled at any time by anything our various antennas could throw at it.

CONCLUSION

The Excalibur Pro is the best SDR we have used – in some ways it is the best receiver we have used regardless of the underlying architecture –

www.wrth.com

Overall rating ★★★★★

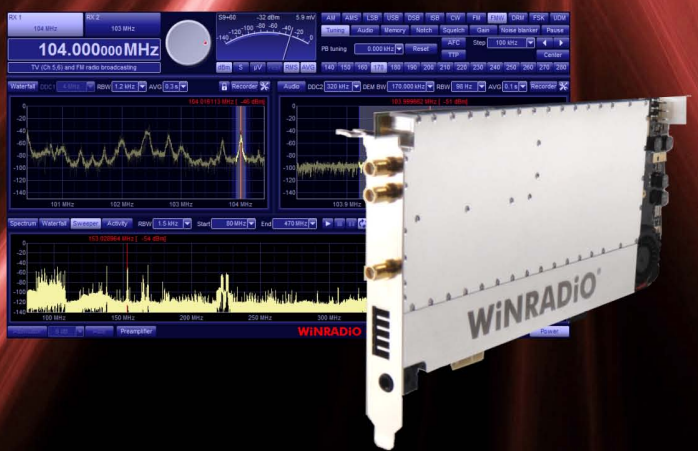
review

Mike Richards takes a look at the WiNRADiO G39DDC Excelsior, a receiver that some might consider the best software defined radio currently available.

If there's one thing that is likely to be at the top of a radio enthusiast's wish list, it's a system that can find signals quickly. The WiNRADiO G39DDC Excelsior certainly has the ability to do this and it must be something close to a dream receiver.

summary

w, the WiNRADiO G39DDC Excelsior is a stunning receiver and a dream for ew, I have only really covered the most interesting aspects of its performan



FIRST LOOK

MT Takes a Look at the Latest Tech

By Bob Grove, W8JHD

This is the most amazing receiver I've ever encountered. It employs the latest proven SDR architecture, operates well beyond the spectral range that most of us would ever think of trying to hear, and demodulates all conventional modes.

I ordinarily find something to complain about in my reviews, but trying to find something I don't like about the G39DDCe has left me at a loss, and that's a gain for this winner.

We have lots of good gear. Take a look:

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Monitoring Times

Vol. 31 No. 8 August 2012

WX4NHC: The National Hurricane Center's Vital Radio Link 8

By Ken Reitz KS4ZR

"When all else fails…." That's the famous ARRL slogan that refers to the robust ability of amateur radio to provide communications when commercial power, commercial broadcasting and Internet connections go down. And, nothing exemplifies that concept more than the amateur radio station at the National Hurricane Center (NHC) in Miami, Florida with the call sign WX4NHC.

Julio Ripoll WD4R was there 32 years ago when then NHC Director Dr. Neil Frank sought the ability to contact weather stations in the Caribbean for storm data when commercial power would eventually go out. As an architecture student and president of the amateur radio club at the University of Miami, Ripoll lugged the club's FT101 transceiver and wire antenna from his dorm room across the street to NHC headquarters. In this month's cover story Ripoll recalls the many times everyone listened to 14.325 MHz as the drama of the latest storm unfolded.

On Our Cover

The roof of the National Hurricane Center in Miami, Florida bristles with antennas for everything from satellite reception to 80 meter amateur radio. When a storm threatens landfall in Miami, the building becomes a large, sealed, self-powered bunker. (Courtesy: National Hurricane Center)

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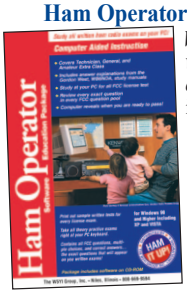

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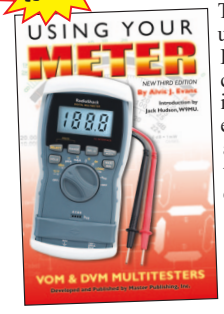

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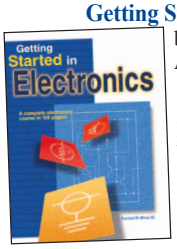

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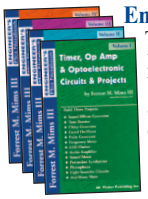

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MT

COMMUNICATIONS

by Ken Reitz

SHORTWAVE/AMATEUR RADIO

RCI Shambles/Vatican Radio Cuts

Numerous news outlets reported the nearly total dismantling of Radio Canada International, with what's left as just another Internet radio station. The Ottawa Citizen noted that "The $10 million cut — from $12.3 million to $2.3 million — will shut out access to Radio Canada broadcasts for swaths of the world's population — including China, where RCI's Internet site is blocked, and to millions of people in India and South America — all major Canadian trading partners." It noted too that, "In other developing nations, access to the Internet is either limited or non-existent, with vast portions of the population relying solely on radio for national and international news and information….Thirty of RCI's 45 permanent employees were laid off along with dozens of contract workers and other regular freelancers."

Meanwhile, Thomas Witherspoon's blog swling.com/blog reported an announcement from an Italian news service that "Vatican Radio will end its short and mediumwave broadcasts on 1 July, strengthening its web service. Spokesman of the Holy See and Director of Vatican Radio, Jesuit Father Federico Lombardi, announced: 'From 1 July Vatican Radio will end all its medium wave broadcasts and its shortwave ones to most of Europe and the Americas, which are regions of the world where the rebroadcasting of programmes by the local Catholic radio and internet access are more developed.'"

BBG FM Outlets Cut During Elections

For years the Broadcasting Board of Governors (BBG), the parent organization for Voice of America, Radio Free Europe and Radio Free Asia, has promoted a program of brokered in-country broadcasting via local FM radio stations instead of shortwave broadcasts in those languages beamed directly to the target countries. Shortwave radio supporters have long seen this policy as deeply flawed.

One of the flaws of such a policy is that locally broadcast programs are subject to being banned or removed from the air by local or national governments that may feel threatened by VOA, RFE or RFA programming content. The first week of June saw just such an example in Cambodia when the Cambodian Ministry of Information forced five VOA/RFA affiliated FM stations to stop airing election programming from RFA and the VOA.

According to a press release from BBG, Khmer-language RFA and VOA programs on Saturday, June 2 and Sunday, June 3, the day of the national elections, were taken off the air without notice. The BBG statement noted that two Khmer Radio programs on June 3 were broadcast as normal on an AM frequency, via shortwave and online.

AM/FM/TV BROADCASTING

New WTC Broadcast Tower Readied

The loss of the World Trade Center (WTC) in the terror attacks of September 11, 2001 also meant the loss of antenna space for New York City TV and FM stations. Many went immediately to the Empire State Building, which had been the site of most broadcast antennas prior to construction of the original World Trade Center.

Now that construction has begun on a new WTC, developers are trying to entice broadcasters to return. A planned 408 foot tower on top of the center would make it the tallest antenna structure in the western hemisphere (and third tallest in the world) at 1,776 feet, according to a report in Radio World Online. The Empire State Building, at over 1,400 feet tall is home to some 19 New York City FM stations and nearly every TV station in the city, according to the report. But, moving is no easy task, as the article notes; it's estimated that it could cost as much as $1 million to move just one FM station.

ATT&T Presses FCC on New Spectrum

The Telecommunications Industry Association (TIA), a lobbying group for the wireless broadband industry, brought out the heavy artillery in early June during a TIA show in the form of AT&T CEO Randall Stephenson. Stephenson urged the FCC to speed up the broadcast incentive auctions that will ask Over-the-Air TV stations to double-up on channel space so mobile TV interests can get in and start making some serious money. Who watches OTA TV anyway?

According to a report on CNET News, Stephenson warned that the industry is much closer than many think to running out of available spectrum. The online news service quoted Stephenson as saying, "By 2013 demand will outstrip supply…This isn't a problem that is six or eight years away from now. It's happening now."

According to the report, Stephenson also asked local regulators to aid the speed up of the approval process for the rapid build-out of new cell towers. Stephenson apparently didn't mention that one of the reasons demand is expected to outstrip supply is that new mobile devices using AT&T 4G services are "data-guzzlers," outstripping current device usage by many fold. The new data-guzzlers are a huge windfall for AT&T which stands to make billions on increases in individual data usage plans.

ATSC to offer Non-Real Time TV

The Advanced Television Systems Committee (ATSC) is the television industry group that in 2009 brought us the Digital TV (DTV) revolution that allowed Over-the-Air TV (OTA) stations to broadcast stunning HDTV pictures to homes equipped with HDTV sets. The problem now is that, according to industry sources, only 11 percent of the U.S. population actually watch OTA-TV. The rest watch their local TV stations over cable-TV or via the two satellite-TV services DirecTV or Dish Network. Most actually see a standard definition picture, not the full HDTV picture that's broadcast. Still, that doesn't bother ATSC who are busy planning their next revolution.

At the end of May ATSC announced the approval of what it calls the Non-Real Time (NRT) Content Delivery standard, "a backwards-compatible enhancement to DTV broadcasting that provides a framework for the delivery of a broad range of exciting new services," according to an ATSC press release. Basically, NRT will let broadcasters deliver file-based content, including programs, clips and emergency information to fixed and mobile TV receivers for later playback (or not), as the consumer may desire.

ATSC envisages that NRT will let viewers watch news and weather at will, Video-On-Demand content ranging from clips to full length movies and allow music distribution to such sets (mostly portable and hand-held devices). A plan for pay-based content via this system is implied in the announcement but remains a detail to be figured out later, presumably after our appetite for "exciting new services" has been whetted.

SATELLITES

Spy-Sat Crumbs fall to NASA

Last month in this column, the disparity between the satellites of the various U.S. spy agencies and the public interest agencies NOAA and NASA was noted. This month an article in the Washington Post, among others, reported that the ultra-secretive National Reconnaissance Office (NRO) has given NASA a gift of two surplus satellites with onboard telescopes as big and as powerful as the Hubble Space Telescope. Apparently, the NRO, awash in unpublished taxpayer-funded budget surpluses, had kept these birds in storage while even better satellites took their place in the launch schedule.

With the James Webb Space Telescope years away from launch (and gobbling every available NASA dime) and the Hubble Space Telescope growing older each day, you might think these satellites would make a convenient bridge between the two space telescopes. But, according to the article, the satellites aren't exactly finished. While they both feature telescopes nearly eight feet in diameter (just what was the NRO planning to look at here on the ground?), they're really just shells without the instruments, "scientific program, support staff, data analysis and office space" that usually accompany such devices. What will NASA do with the birds? Keep them in storage until they can come up with a scientific program, support staff, data analysis, office space, and, oh yeah, funding to be able to use them.

TECHNOLOGY

Cell Tower Deaths Probed

A documentary titled "Cell Tower Deaths: An investigation into the hidden cost of the smartphone revolution," produced by PBS TV's Frontline and investigative reporting organization ProPublica, aired on public television stations at the end of May. The program detailed the deaths of contractors who climb the towers, sometimes for as little as $10/hour, in a race to provide faster cell network service.

The program, which had been delayed from its original broadcast date in February, found that such jobs are contracted, subcontracted and further subcontracted to companies other than the cell phone service provider, and that, partly as a result, workers are sometimes poorly equipped and trained. It found that OSHA rules were written for a time when out-sourcing contracts for dangerous jobs were not the norm and that the agency, set up to protect such workers, seemingly can't enforce more stringent safety rules.

With some 10,000 broadcast and cell tower climbers working in the U.S., the PBS program found that, "Since 2003, tower climbing has ranked among the most dangerous jobs in America, compiling an average annual death rate more than 10 times that of construction work. Almost 100 climbers have been killed on the job, 50 of them on cell sites." Cell phone towers grew from 30,000 sites in 1996 to 238,000 sites in 2011, according to the program.

You may watch the entire 32 minute-long PBS Frontline report here: www.pbs.org/wgbh/pages/frontline/cell-tower-deaths/

Windular: Cell Tower Power

How do you power a remote cell tower or an amateur repeater site with no access to the grid? One company, appropriately named Windular, has a kit that attaches a 5 kW turbine driven generator to any free-standing, guyed, or monopole tower. The company advises grid-tied tower site owner/operators that they can make back the purchase price by charging other tower tenants retail electric prices or selling excess power back to the grid at wholesale prices. There are no details on how the kits are to be attached to the poles, but it's a good bet it will be done with subcontractors.

FCC ENFORCEMENT

Pirate FM: $10k, Snubbing FCC: $5k

An FM pirate radio operator in Fort Myers, Florida received considerable attention after his well publicized unlicensed station, operating on 107.5 MHz was shut down. The FCC was apparently irked at the openness with which he operated, giving interviews to local media, for example. This may have prompted the agency to take more drastic steps than usual in closing the station down. Normally, one or two field agents locate the offending unlicensed operation and take signal strength readings on two different occasions (this establishes the fact that the transmissions weren't a one-off and qualifies the pirate for the charge of "willful and repeated" violation of the law).

According to an article in the Ft. Myers News-Press from this past January, the pirate operator, a retired military Air Traffic Controller, watched as "four police cars, a blue sedan and an unmarked SUV" assembled in front of his home. A team for four policemen, two FCC agents and a police detective "swarmed" his home, arresting and handcuffing the accused, and confiscating the transmitter and associated equipment. Radio piracy charges were later dropped. The first week of June, however, the FCC handed the operator a $15,000 fine; $10k for unlicensed operation and $5k for "deliberate disregard" for FCC rules.

AM Op Blames Computer

It's long been public knowledge, at least to AM band DXers, that many AM radio stations exceed their authorized broadcast limits at night by simply not reducing power and/or switching to directional antenna arrays, as required by their licenses. With thousands of stations on the air and so few FCC field agents to see that the stations are in compliance, it seems that most stations see it as a good bet that they won't be caught.

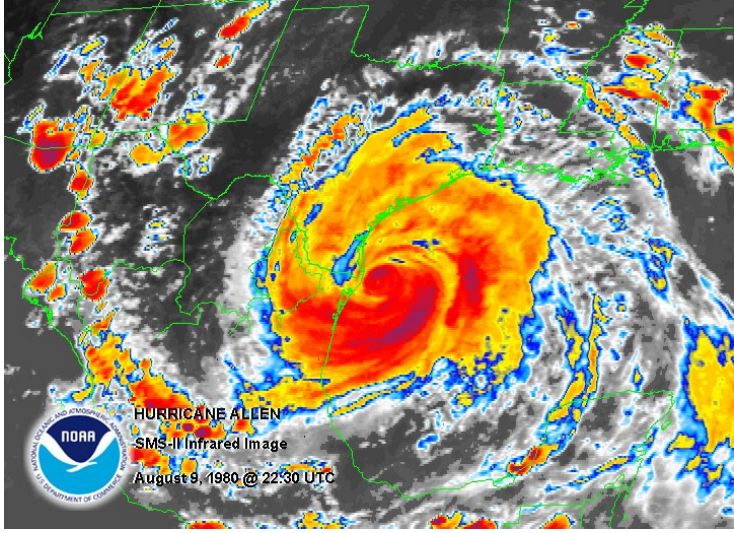
The owner of radio station WIPC-AM 1280 kHz, a Spanish language station programming regional Mexican music from Lake Wales, Florida, was issued a Forfeiture Order by the FCC June 6 for "failure to operate its station in accordance with the terms of its station authorization." The station, licensed to operate 1,000 watts from a non-directional antenna during the day and 540 watts after sunset with a directional antenna array, was found to have "no significant change in signal strength" at night, according to FCC documents.

The station owner, Super W Media Group, blamed faulty automation equipment used to switch antennas and drop transmitter power. The FCC, citing "willful and repeated," hit the station with a $4,000 fine. The station in turn cited financial hardship and asked for a reduction of the fine. The FCC examined the station's financial records and agreed to knock $500 off the fine.

Communications is compiled by Ken Reitz KS4ZR (kenreitz@monitoringtimes.com) from clippings and links provided by our readers. Many thanks to this month's fine reporters: Anonymous, Rachel Baughn, Bob Grove, Norm Hill, Steve Karnes, Doug Smith and Larry Van Horn.

WX4NHC: The National Hurricane Center's Vital Radio Link

By Ken Reitz KS4ZR



Hurricane Allen just before landfall at Brownsville, Texas August 10, 1980. (Courtesy: NHC)

Julio Ripoll WD4R has lived in Miami, Florida for some 45 years and received his introduction to the power of hurricanes as a kid in 1965 when Hurricane Betsy pounded his family's home, an old-fashioned, L-shaped, wood frame structure, built on concrete block pylons. "Right at the L, the valley of the roof cracked in half," Ripoll remembers.

But, it was 30 years ago this month in 1982 that he remembers Hurricane Andrew, a category five storm that tore into the south Florida coast. "I was about 15 miles north of the eye, which had gone over the Florida Power & Light nuclear power plant they call Turkey Point," Ripoll recalls, "We lost half the roof of my house and it was scary and noisy with water pouring in from everywhere, light fixtures, ceiling fans, everything falling down from the soaked drywall ceiling including the insulation in the attic."

After the storm passed, all the roads were blocked by trees and downed power lines; street lights were gone. "The whole landscape changed," Ripoll said, "everything was completely different. It took me three days to be able to secure the house, move the family to my in-laws' house, and get to the Emergency Operations Center (EOC) to handle the emergency communications. At the EOC a lot of people from the U.S. Army came down and we were able to do a radio link by putting hams in helicopters, ambulances and police cars, because the various agencies couldn't communicate with each other. If you lived in Miami, Homestead or anywhere in south Florida, you mark time from before and after Andrew."

Amateur Radio comes to NHC

In 1980, Dr. Neil Frank, then Director of the National Hurricane Center, was looking for a way to contact areas of the Caribbean affected by hurricanes. Few meteorological stations would stay functional in those locations during hurricanes because they were dependant on local power lines and phone service. There were long periods when vital information about storm development was hard to come by.

It was thought that amateur radio might be a way to relay this information, so Frank contacted the Dade County Amateur Radio Public Service Corporation for help. The NHC told the group they were looking for someone who could set up a station at the hurricane center at a moment's notice.

At the time, Julio Ripoll was an architecture student at the University of Miami, president of the university's ham radio club, and happened to live in one of the dorms on campus, right across the street from NHC headquarters. Ripoll became the NHC's first amateur radio coordinator. "We would take our equipment in a cardboard box across U.S. 1 to the Hurricane Center on foot and we would set it up on the desk of one of the hurricane forecasters and that's how we did it for the first few years."

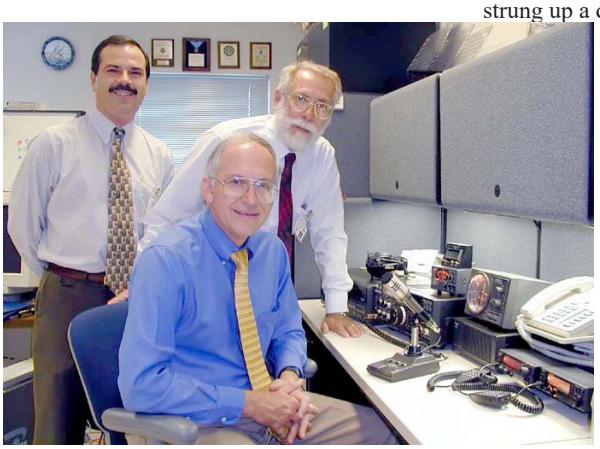
At the time, the NHC was on the sixth floor of a twelve story building, and on top of that building the NHC had a 60 foot Rohn tower with several antennas mounted on it. The hams strung up a dipole from the tower to the roof.

"We only had three volunteer operators, besides me," Ripoll recalled, "and we would take shifts sometimes for twelve hours straight. Now we've grown to 30 volunteers, so our shifts are three hours."

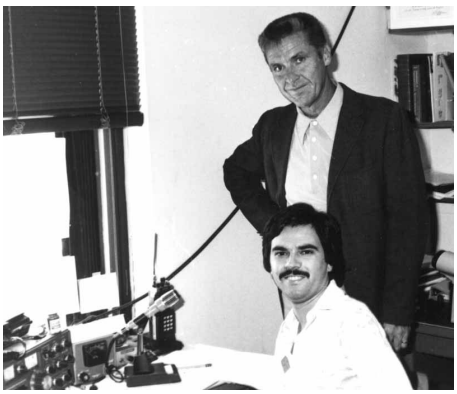
At the end of July 1980 Dr. Frank called Ripoll, and asked him to bring his equipment to NHC. He told Ripoll, "I think this is going to be a major hurricane." The storm, named Allen, was the first named storm of the 1980 season, originating around Cape Verde and becoming the second most severe Atlantic hurricane up to that time. According to NHC records, Allen reached category 5 strength three times during its life and obtained the lowest pressure ever recorded in the eastern Caribbean at 911 mb on August 5 over Puerto Rico. Later, reconnaissance aircraft would record a pressure of 909 mb, the lowest pressure to that date over the western Gulf of Mexico.

Ripoll remembers it well, "It was the first hurricane I had ever worked, the first time I'd ever done any kind of emergency communications and I think we sat there around the clock for about three weeks." Luckily for Ripoll, it was summer and he had some time off from school. "We were still using 'radiograms' and people on the islands didn't know what the heck a radiogram was, but we had incredible communications.

"When Allen hit the island of St. Lucia it did major damage and in the aftermath there were a lot of injuries suffered by those on the island. A ham on the island called in saying they were in desperate need of medical assistance. By coincidence, a British hospital ship, called the *HMS Glasgow*, came on frequency, identified itself and advised that they could provide medical assistance with hospital beds and helicopters and that it was about one day out from the island. But, since St. Lucia had recently achieved its independence from Great Britain, the ship would need formal approval to land. The ham in St. Lucia told the *Glasgow*, 'Don't leave



Hurricane Season Opening Day June 1, 2000 with Max Mayfield, then NHC director (front), Julio Ripoll WD4R (left) and John McHugh then KU4GY, amateur radio coordinators for WX4NHC.



Dr. Neal Frank, NHC Director, with Julio Ripoll, then WD4JNS, taken August, 1980. The station featured a Yaesu FT101, a Heathkit SWR meter feeding an inverted- V antenna, a standard VHF HT and a bottle of aspirin. (Photo by Andy Clark W4YT, courtesy: WX4NHC)

the frequency; I'm coming back with the Prime Minister.' Minutes later the Prime Minister got on the air and granted permission for the ship to land."

Hurricane Allen tracked through the Caribbean and into the Gulf of Mexico with a final landfall August 10 at Brownsville, Texas. Luckily, the 15 foot storm surge would occur over the least populated part of the region, but it was not without drama.

"It was at night and I remember we were in the offices where the specialists were housed; we had one desk, the room next to us had about 30 Teletype machines and we were separated by one wall which was all glass. The machines were just rattling away and the hurricane forecaster on duty and Dr. Frank came in and said, 'Look at this.' It was the last Teletype message from the chief meteorologist at the National Weather Service (NWS) office in Brownsville and it said, "Getting ready for landfall, God help us all.' That's when their communications link went dead."

Dr. Frank asked Ripoll if there was a ham in the area and if it would be possible to get him on frequency. "We were able to locate one and get him to the Brownsville Weather Service office and the chief there was able to talk to Dr. Frank, relaying weather data throughout the whole landfall. It showed me the power of ham

ON THE AIR AT WX4NHC

Each year WX4NHC launches the hurricane season with a well publicized test of the station's HF and VHF/UHF capabilities. June 2 was the test date for 2012, and the station racked up 200 contacts which included 60 contacts on EchoLink/IRLP (EchoLink allows amateur radio stations to contact each other via Internet connection and IRLP, Internet Radio Linking Project, uses Voice-Over-IP custom software to link various amateur radio systems such as repeaters with the Internet). For the last nine years WX4NHC has had a Hurricane Net that cross-links EchoLink and IRLP so that it can also be linked to the Internet through repeaters.

During this year's test, the main computer that controls EchoLink and APRS had an overheating problem and shut down. Within ten minutes their backup computer was put into service and operations continued. It's why they run the test: they never know what will go right and what will go wrong.

Though the station has the capability to use BSPK31, a low-power, weak-signal mode, they don't use it because most stations in affected areas during a storm don't operate that mode. WX4NHC assistant coordinator Julio Ripoll WD4R explains, "Due to our limited manpower and equipment during most hurricanes that are in the Caribbean or making U.S. landfall, we have at most three operators at a time. The operator priorities, in a non-local landfall are HF (Hurricane Watch net on 14.325 MHz or night-time 40 meter backup 7.286 MHz); VoIP Hurricane Net (EchoLink WX_Talk Conference / IRLP), and computer operations (including ON-NHC Online reports, HF-VHF APRS Reports, CWOP Mesonet Weather Data, WX4NHC e-mails and HWN Net Coordination Chat Room).

"You can see how busy three operators can be during a hurricane in the Atlantic, Caribbean or Gulf, which can last for over a week, with three hour shifts. During a local landfall, our operations change to a more localized mode using all the above methods and modes plus local VHF and UHF to local hurricane shelters, local ham nets and local governmental agencies while maintaining HF links outside of our local area."

Ripoll explains how EchoLink can serve as a vital tool, relaying timely information from place to place. "People think, 'EchoLink, well, it's Internet-based so, once the Internet goes out it's gone,' but that's not true. First, the Internet stays up much longer than you would think. Secondly, they link other stations that could not be reached any other way. For example, in 2004 during Hurricane Ivan, we did not have any propagation from Miami to Georgetown University in Grenada, where a station was located. But, there was a station in St. Lucia talking to Grenada on 40 meters and he was on EchoLink, so he was able to take all of the reports from Grenada and retransmit them on EchoLink which got back to us.

"During one hurricane that hit St. Croix, a local ham, John Ellis NP2B, whose antennas and everything else went down, found that the only thing that was operable was his FAX machine. So, during the eye of the storm he was FAXing his reports."

Station equipment is not new. Their main transceiver is a Yaesu FT990 that's about 17 years old. Ripoll reports that it still works great and, even though they have a newer FT100 as a backup, they still use the FT990. The station also has seven antennas on the roof including HF, VHF/UHF verticals, beams and wire antennas, including a multiband dipole strung up as a sloper to favor the Caribbean. They even have an extra hundred feet of copper wire in a desk drawer along with an antenna tuner that they can take out and string up in the event they're hit with a Category 5 hurricane and lose all the antennas on the roof.

When a storm with tropical storm force winds is pending, the entire NHC building gets locked down. "Once the steel shutters roll down," Ripoll says, "whoever's in, stays in and you're there for the duration of the event whether it's eight hours or a whole day." In the event of commercial power failure, the building can be powered off the grid by two massive diesel generators for up to two weeks.

WX4NHC HF Frequencies
20 Meters: 14.325 MHz Hurricane Watch Net (Main Frequency during hurricanes)
40 Meters: 7.268 MHz Water Way Net (Secondary frequency) Maritime Mobile Net
80 Meters: 3.815 MHz Caribbean Net (Alternates: 3.950 North Florida/3.940 South Florida)

VHF/UHF Frequencies
147.470 MHz Simplex (Coordination Frequency for NHC operators: Official use only)
147.000/147.400 Repeater (146.925 backup repeater PL 94.8 Hz)
444.600/449.600 Repeater (PL 94.8 Hz)

APRS Mode Frequencies
HF 30 Meters: 10.151 MHz (LSB)
VHF 2 Meters 144.390 MHz Simplex

Amateur Radio EchoLink/IRLP
EchoLink Conference: "WX-TALK" Node 7203
EchoLink Alternate Conference: "VKEMCOMM"
IRLP Node 9219, Alternate Node: 9508 or 9123

The WX4NHC home page is here: **www.wx4nhc.org/**
An online hurricane weather report form is found here: **www.wx4nhc.org/WX-form1.html**
You may email WX4NHC here: *wx4nhc@wx4nhc.org*
You may contact the WX4NHC coordinators directly here:
John McHugh K4AG *k4ag@arrl.net*
Julio Ripoll WD4R *wd4r@arrl.net*

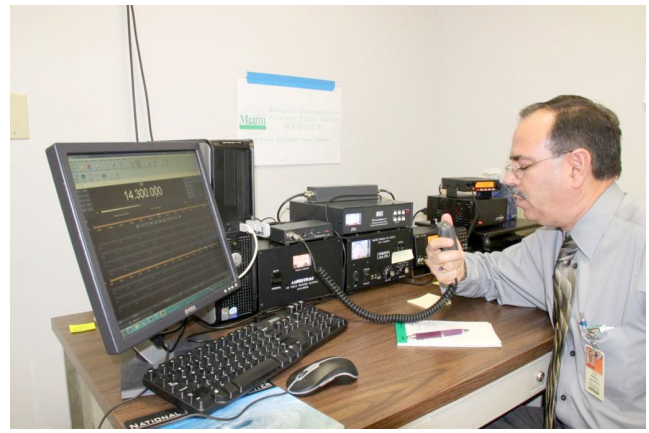
radio, that one of the most basic, old-fashioned communications systems is the only one that stood up. By the time we closed down, we had filled 20 pages of radio log and sent more than 90 radiograms."

Since that baptism by storm, Ripoll has worked over one hundred tropical storms and sees the same scenario played out again and again. He notes, "Even with the Internet and satellite phones, with all the modern technology, when all of their links go down, for whatever reason, ham radio still gets through."

By 2005 Ripoll and the volunteers at WX4NHC found another big challenge in a hurricane named Katrina. "We were on the air when Katrina was just about to make landfall near Slidell, Louisiana. The building we're housed in is jointly occupied by NHC, the NWS and the Tropical Prediction and Marine Forecast Branch. Our room is right off the main hurricane room so we had access to all of the products that you see provided for the Internet. The head of the NWS Miami came in and said, 'We've lost contact with Slidell, St. Charles and several others, we have no contact, can you get through?'

"We set everybody on the Hurricane Watch Net to looking for a ham from Slidell, found one, brought him up to the net frequency and meteorologists from both offices were able to talk to each other during the landing of the eye and for six hours after that. It was the same scenario that happened in 1980 and here it was 2005. I can name dozens of hurricanes where the same scenario happened and it will happen again in the future."

Asked how WX4NHC gets funded, Ripoll says, "It's dual funding. All the equipment is donated by commercial companies. There's a list on our website of all the manufacturers who donated their equipment. They even maintain it; for instance, we have Heil headsets and when our headsets break, we send it up to Bob Heil K9EID and a week later we get a new set. We had Hustler design some antennas for us that would withstand 150 mph winds; Yaesu supplies our major equipment: HF, amplifiers, VHF-UHF, even a satellite communications transceiver. For other funding, for many years it's basically been me and sometimes fellow WX4NHC director John McHugh K4HE."



Julio Ripoll WD4R at University of Miami Haiti communications center talks to HH2/WX4NHC located at field hospital in Haiti. (Courtesy: WX4NHC)

WX4NHC Aids Haitians in Earthquake Aftermath

Julio Ripoll finished his architecture degree, became a professional architect and the architect for the University of Miami School of Medicine. Following the Haitian earthquake in February 2010, the School of Medicine sent a large field hospital to Haiti that included some 120 volunteer physicians and medical staff along with 40 satellite phones, two VSAT systems and their IT techs to support it.

In short time the satellite phones were useless because so many people were trying to use them that the circuits were quickly jammed. Of the two VSAT systems, one broke down almost immediately and the other became intermittent.

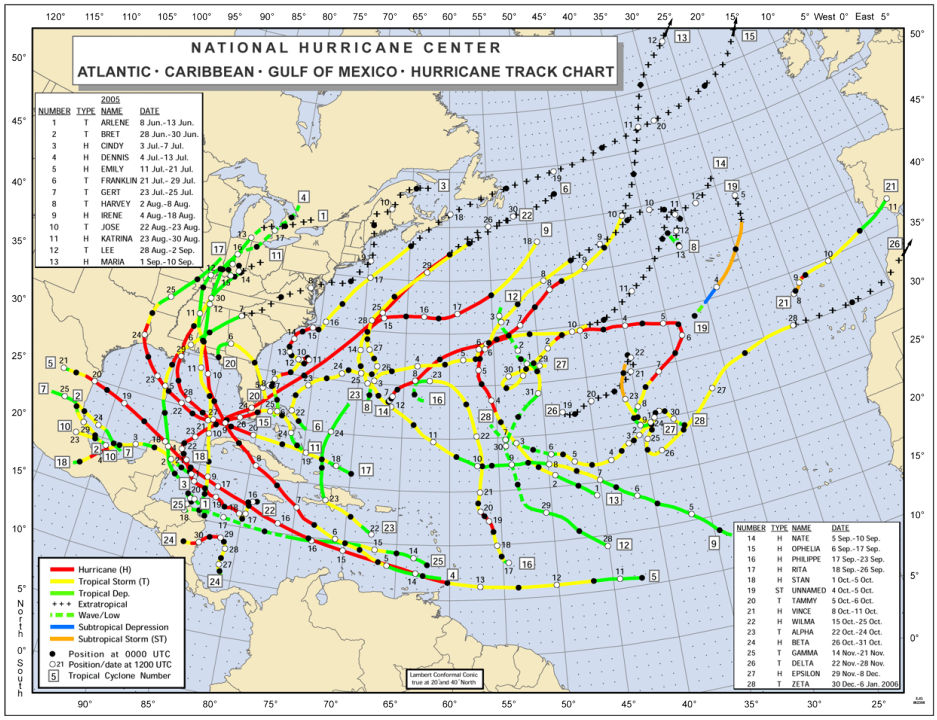
"They had no way to coordinate the schedules of their charter planes, the volunteer schedules, as well shipping equipment and medicine supplies," Ripoll explained, "One of the big problems was that there was a U.S. hospital ship, the *U.S.N.S. Comfort*, just two miles off shore, and they had no way of communicating with them. The *Comfort* had a lot of operating equipment and the capacity that the field hospital did not. So, a vice-president of the School of Medicine, who knew of my work with WX4NHC, called me and said, 'Can you put together a ham radio station for Port-Au-Prince and one at the University of Miami Hospital Haiti Command Center here in Miami? Can you do it in two days?'"

Because of his experience doing amateur radio hurricane preparedness, Ripoll went immediately into action. "The first thing I did was call my partner at the hurricane center, John McHugh K4HE, who has been the NHC coordinator working with me since 1997, an incredible asset to WX4NHC and a very close friend. I asked him to prepare a list for two complete HF/VHF stations. We also wanted to use WinLink [a worldwide system of volunteer resources supporting e-mail by radio] because we knew the volunteers were going to need to be able to use some sort of HF-capable e-mail to coordinate schedules, shipping supplies, etc."

His next call was to the ARRL because, as the national amateur radio organization, he thought they should be part of it. He asked them to send him an HF "go-kit," which they did, and he asked them to coordinate a call with the FCC to secure ability to work outside the usual boundaries of amateur radio traffic. The ARRL put him on a conference call with Laura Smith, Special Counsel for amateur radio at the FCC.

"I told her I wanted to make sure we're not going to break any laws. We're going to be doing communications on ham radio frequencies that are not typical. We're going to be handling commercial-like communications, coordinating airplane schedules, ordering medical supplies; we may have doctors in Port-Au-Prince talking with doctors in Miami about patient care. She said, 'You have a mandate from the President of the United States to do whatever it takes.' Just hearing those words I said, 'OK, that's it! Now, I don't have to worry.'"

They had teams of two operators fly down



2005's busy Atlantic storm season ran through the alphabet and featured the devastating Hurricane Katrina. (Courtesy: NOAA)

every week and they had teams back in Miami supporting them. When the first team arrived they realized that the head doctor was trying to communicate to the *Comfort* using a Blackberry. It wasn't working.

"One of my volunteers at the Hurricane Center is also a pilot for a group called Brothers to the Rescue, who fly the Florida Straits looking for Cuban rafters, so he was very familiar with talking to the Coast Guard," Ripoll relates, "He went to Haiti, taking along a VHF rig capable of marine band frequencies and on the first call to the *Comfort* they came back. That became the primary link for five weeks between the Comfort, the University of Miami Hospital and all the neighboring medical centers that popped up from other countries."

Love Leads to Ham Ticket

While Ripoll's life as a long-time amateur radio emergency operator seems like a well planned mission, it was a series of happy coincidences that brought him to his first amateur radio license. When he was in high school, the father of a young woman he was dating, who would later become his wife, had a Hallicrafters SX-100 receiver in their living room with a long-wire antenna on the ridge of the roof.

"That radio kind of caught my eye," Ripoll remembers, "her dad would tune around and listen to the Voice of America, BBC World Service, different broadcast stations and he showed me what the BFO knob did when applied to the ham radio frequencies.

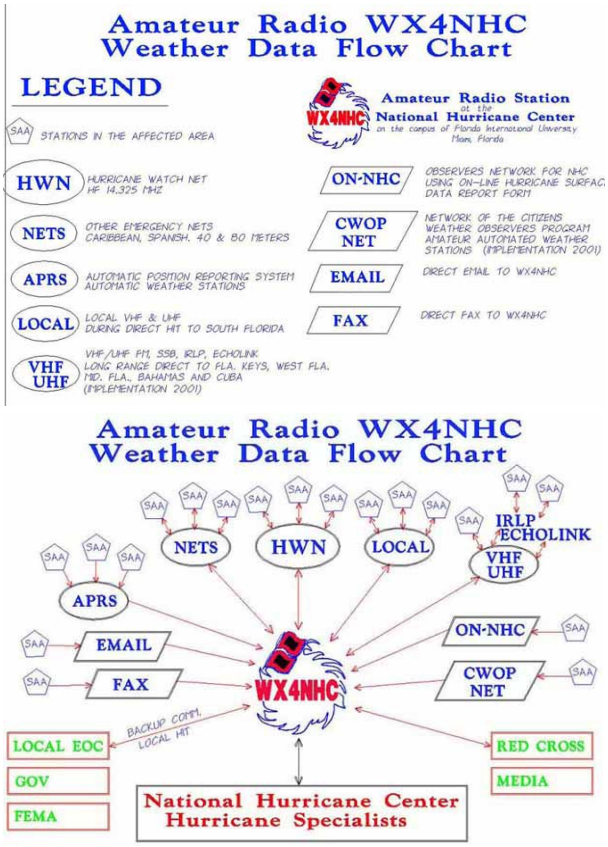
"I remember tuning around on 20 meters and I heard this noise that sounded like Donald Duck and, when I played with the BFO, I heard hams talking to each other. And, this is 1974, so there was great propagation and I was hearing people from all over the states and the Caribbean and it was incredible. That got me interested."

Ripoll was soon attending a ham radio class at one of the high schools in Miami that was taught by one of the FAA radio operators who was a CW expert. Six years later Ripoll found himself at the controls of the first amateur radio station at the National Hurricane Center.

At the time the station used his original call sign WD4JNS/P (for "portable" operation). Later the NHC station received its own call W4EHW in 1981 under the FCC random call assignment. That call was issued to the Dade County Amateur Radio Public Service Corporation (ARPSC), which was a branch of ARES (Amateur Radio Emergency Services).

The current call sign was issued in 1993 after the vanity call sign program was instituted and the WX prefix became available. A surge of weather stations around the country snapped up the call signs and WX4NHC (Weather For National Hurricane Center) was a perfect fit.

Ripoll understands the urge all hams have, as they monitor the Hurricane Watch Net, to help. "The most important thing hams can do when the Hurricane Watch Net is active," Ripoll says, "is to listen and relay. If you're not inside the affected area, just be on frequency and listen, because during certain times of the day, people in other parts of the country can hear a signal that we can't in Miami. That's why it's so important.

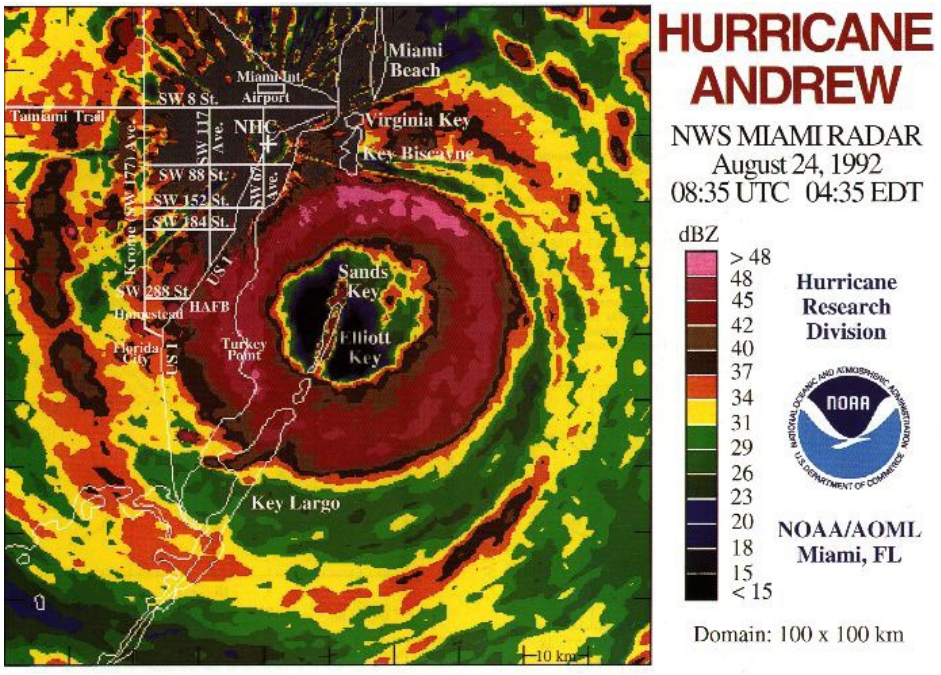


WX4NHC Flow Chart: How storm-related information is collected and dispersed. (Courtesy: WX4NHC)

"It happened when Hurricane Fabian hit Bermuda; we had zero propagation to Bermuda but we had a ham in Canada who could hear the ham in Bermuda clear as a bell. He would relay down to another ham in Texas who would relay back to us. So, we had two relays between us and Bermuda and we were able to get all the reports we needed. That's the main thing; you can't have too many listening stations, because propagation can change rapidly, especially in the last few years when conditions have been so poor."

He has this final advice to hams monitoring the frequency: "Expand your capabilities; don't just sit on one frequency. We always ask people 'Please go down to 40 and 80 meters, there's a Caribbean net down there that we don't hear that could have important information. Bring that information up to 20 meters. We can't be on all frequencies all the time. We sit on the Hurricane Watch Net frequency 14.325 and it's fantastic when other people go to other frequencies and bring back information. It also works in reverse to spread the word about hurricane advisories."

According to the National Hurricane Center, 2012 is expected to be a "typical" hurricane season. But, NHC forecasters know to expect the unexpected. And, when the next Allen or Katrina starts forming somewhere off Cape Verde or deep in the Gulf of Mexico, watch developments at the National Hurricane Center's hurricane watch page, and wherever and whenever landfall threatens, listen for WX4NHC on 14.325 MHz on 20 meters.



The last radar image taken from the National Hurricane Center before the radar was blown off the roof by Hurricane Andrew at 0835Z on August 24, 1992 (Courtesy: National Hurricane Center)

The Zanzibar Broadcasting Corporation Returns!

By Eric Bryan

They're back! The Zanzibar Broadcasting Corporation (formerly Radio Tanzania and the Voice of Tanzania) transmitter hadn't been operating since December 2009. There were a few sporadic and tentative reports last February, but by March our hopes were dashed again. Then, in late April, accounts from Europe, the UK, Japan, the U.S. and elsewhere confirmed that this exotic domestic broadcaster was definitely reactivated on 11735 kHz.

Though their English programming is limited to about 8 to 15 minutes of news at 1800 UTC, this broadcaster is renowned for its varied and evocative music programs which express the influences of the cultural heritage of Zanzibar. Despite being considered a domestic station, at times the English news and music have been listenable with reasonable reception here in the Pacific Northwest. It can be a mood-changing experience to pull in a colorful transmission of ZBC, with its interval signal of hand drums and Middle Eastern woodwind and lamellophone (or some version of a "thumb piano") notes, and its mixture of African, Arabian, and Hindi music.

It would be difficult to dream of a more remote, far-flung locale from which a shortwave signal could originate – this is ethnic shortwave broadcasting at its most flavorful. In the current climate of English program shutdowns by major international broadcasters, despite the ZBC only having a sliver of daily English, the return of this station is something to celebrate for shortwave DXers: It's what shortwave listening and DXing are all about.

Geography, Resources, Population, & More

The island of Zanzibar is part of the United Republic of Tanzania, but it practices a high level of autonomy. It lies 20 miles off the East African coast in the Indian Ocean. It is 56 miles long (north-south) and 27 miles wide (east-west), with an area of 640 square miles.

The Palace Museum in Stone Town, Zanzibar. Photo by Xlandfair.

Zanzibar is a low-lying coral island covered in lush tropical vegetation. Temperatures average 75 to 81 degrees year round. Part of the Zanzibar Archipelago, the island's proper name is Unguja. The archipelago is made up of Zanzibar, Pemba Island, and other islets (only two of the latter being inhabited). The Zanzibar Archipelago used to be known as the Spice Islands. (Other islands given that name were Grenada, and the Maluku Islands in Indonesia.)

The island's economy depends on agriculture and tourism. Zanzibar grows cloves, bananas, raffia palms, cinnamon, nutmeg, pepper, and coconuts. The islands used to be the source of 90% of the world's cloves, though this figure has dropped to 7-10%. With a population of nearly one million, the island's main urban center is the west coast port city of Zanzibar. Most of the residents are black Africans descended from the Tumbatu, Hadimu, and Pemba tribes, collectively now known as the Shirazi and considered indigenous. The immigrants were drawn by the island's plentiful fresh water and rich soil.

Arabs, largely from Oman, began to settle on the island in the 10th century. Zanzibar was under Arabian political and economic influence from the 10th century until the 1964 revolution expelled most of the Arabs. Though Swahili is the dominant language, English and Arabic use is also substantial. Most of the inhabitants practice Sunni Islam, and a small Indian population includes Hindus and followers of Shia Islam.

After the revolution in 1964, Zanzibar united with Tanganyika to form the new state of Tanzania.

Zanzibar connects to Dar es Salaam via regular ferries across the Zanzibar Channel, and also has an international airport. The 18th century Arabian Stone Town or Old Town section of the port of Zanzibar, built primarily for Omani traders, is a main tourist attraction.

Modern archaeology claims Zanzibar has been occupied by humans for 50,000 years or more. The first known textual recording of the island is in the Greco-Roman Periplus of the Erythraean Sea made sometime in the first to third centuries AD, where Zanzibar is referred to as Menuthias.

Ancient pottery shows that Zanzibar was on a trading route as early as the time of the Assyrians of antiquity. Historians surmise that sailors from India, Arabia, and Iran probably began trade with Zanzibar in the first century AD.

The Sultan's Palace, Stone Town, Zanzibar, as seen from the upper floor of the House of Wonders. Photo by Vincent van Zeijst.

Wildlife

Zanzibar is abundant with tropical birds. One of Africa's scarcest primates, the Zanzibar red colobus, numbers perhaps 1500 or fewer on the island. Even rarer is the now almost legendary Zanzibar leopard. Though rumored to inhabit the island's forests, the species may be extinct. A newly discovered subspecies, the Zanzibar servaline genet, was reported in 1995 and was verified to exist in 2003.

Zanzibar is also home to civets, monkeys, a small type of antelope, bush pigs, several species of mongoose, and a variety of butterflies.

The Persians

As early as the first century AD, Persian traders found Zanzibar by sailing with the monsoon winds across the Indian Ocean. They established a post on the island to use as a base for routes between India, the Middle East, and Africa. It was located at what is now Zanzibar City, because it was a sheltered port ideally situated for trade with towns on the East African coast. The Persians built a fort as well as mosques and Zoroastrian temples on Zanzibar.

The Portuguese

Portuguese adventurers and colonists started to land on Zanzibar in the latter 15th century. While maintaining a headquarters on the Kenyan coast at Mombasa, the Portuguese founded settlements on the island.

The Portuguese held sway over Zanzibar from the 16th to 18th centuries. But by the mid-1600s they were competing with other European influences and the Omanis, who ejected the Portuguese in 1729.

The Arabs

Zanzibar was one of the major East African trading points for Arabs and Africans by the 1400s. While under control of Sayyid ibn Sultan, the Sultan of Oman and Muscat in the first half of the 19th century, the sultan had clove plantations created on Zanzibar.

The introduction of cloves to the island (from the Maluku Islands, Indonesia) was Zanzibar's entrée into the spice trade. This project resulted in the island becoming a major commercial hub for the trading of goods from Europe, America, and Africa.

The Sultan maintained control of the region through economic domination of most of the neighboring coastland and a heavy military occupation of Zanzibar. An effect of the Arab's presence on Zanzibar was that the island became a source of Arabian cultural influence on the east-central African continent.

The British

Because of Britain's colonial dominance in the Indian Ocean region in the 19th century, Zanzibar's economic rise didn't escape British notice. They had already operated in close cooperation with Sayyid's government in Oman, so were aware of – and interested in – the sultan's projects on Zanzibar and the island's growing status in the world trading market.

British influence on Zanzibar began in 1841, when British administrators started to assist the Arab leaders with organizing and running the island. The British opposed the Arab use of African slaves on the plantations, as well as Zanzibar's active slave trade under Sayyid's rule: East and Central Africans were forcibly taken to Zanzibar from where they would be exported for sale as slaves, primarily to southwest Asia.

Plantation working conditions were so harsh that there was a regular breakdown of the health of the slaves. The Sayyid administration's response to this situation was to continually import more people from East and Central Africa to replace slaves who were ill or had died.

The British continued to pressure Sayyid and his successors to stop using slave labor and trade in slaves, finally succeeding in their efforts in the 1870s. At times perhaps as much as 90% of Zanzibar's populace was comprised of African slaves.

The British oversaw the division of Zanzibar and Oman into separate sultanates in 1860. As Britain and Germany gained imperial hegemony over East Africa in the 1880s, the sultanate of Zanzibar lost dominion over its territories on the mainland. In 1890, Zanzibar became a British protectorate. The British reorganized the government and constructed the Legislative Council, though its policies favored Zanzibar's Arabs over its Africans.

As the economies of the European colonies on the East African mainland grew, that of Zanzibar diminished. Though the British nurtured trade on the island, Zanzibar slowly devolved into a backwater of the British Empire.

Post World War II, as many African colonies made advances toward independence, Zanzibar's political system evolved. The first free elections for seats in the Legislative Council were held in 1961. Because of the domestic African-Arab hostilities, members of the African populace rioted after the elections.

In the 1963 elections, the Arabs prevailed and won independence for Zanzibar. A violent African-supported coup in 1964 led to the evacuation of the last sultan and the bulk of the Arabian inhabitants. Zanzibar's plantations were subdivided and dispersed to smaller-scale property owners, reorganizing the island's agricultural systems.

After uniting with Tanganyika to create the union called Tanzania, Zanzibar reserved its own government to administer island issues.

The Port City of Zanzibar

Zanzibar City is the capital of the Urban/West Region of the Zanzibar Archipelago. It was founded perhaps in the 8th century as a trading port for Indian Ocean commerce. Sayyid ibn Sultan moved his principal home from Muscat, Oman to Zanzibar City in 1840, when trading traffic from North America, the Indian Ocean region and Europe was on the increase. It became the main slave trading market of the East African coast.

When under British colonial administration from 1890, Zanzibar City functioned as the capital for Zanzibar and Pemba. Because the island evolved into a major world trading hub, the port drew an international population of not only East Africans and Arabs, but South Asians as well.

One of the shortest conflicts in military history occurred in 1896 with the Anglo-Zanzibar War: When the island's Omanis rebelled, the Royal Navy began to fire on Stone Town, resulting in the sultan's surrender 45 minutes later.

Through the 1964 revolution, Zanzibar City continued as the seat of administration of the island and archipelago. The port exports cloves and clove oil, citrus fruits and coconuts. The port can serve large ships and the island's road network extends from it.

Programming

Though the ZBC is a domestic broadcaster ("regional broadcaster" might be more accurate), you will surely hear news in their English segment you won't find anywhere else, and their news coverage isn't limited to domestic topics. Notes from my past loggings of Radio Tanzania (all done via a Degen DE1103 and an indoor, very random-wire antenna) reveal that, much like a major international broadcaster, ZBC's news coverage was often of a global scope. From notes taken over several broadcasts, all on 11735 kHz at 1800 UTC, I recorded a dizzying list of 27 countries, from Latvia to Venezuela, covered in Zanzibar's English news program.

Of the varied music you'll hear on ZBC, some of it will be of a genre called taarab, an Arabic word meaning "feeling joy with music." The influences in this musical melting pot are not only Middle Eastern, but European, North and Sub-Saharan African, and South Asian. Traditional taarab uses poetry – sometimes ancient texts – as lyrics.

Taarab became especially popular in the late 1920s, and later began to absorb aspects of Lebanese and Egyptian art music and Indian movie soundtracks. Following the revolution, East African and Latin rhythms entered the genre. The instruments which make up a traditional taarab orchestra include European guitar, East African percussion, and various East Asian and Middle Eastern stringed instruments.

The House of Wonders, Stone Town, Zanzibar, in the early 20th century, built by the Second Sultan of Zanzibar in 1883.

In a general sense, when you tune into ZBC's broadcasts, you'll usually hear what sounds like traditional Middle Eastern instrumental or call-and-answer music, alternated with that which sounds like percussion-heavy East African music, and some which seems to be a blend of both. You can really feel the heritage of the island through the traditional music which ZBC plays.

Tune in and Contact

Though sign-on and sign-off times seem to vary, the invaluable resource **www.eibi.de.vu/** lists the following schedule for ZBC Radio:

1500-2100 UTC	11735 kHz	Swahili to East Africa
1800-1810		English
0300-0600 UTC	6015 kHz	Swahili to East Africa

The antennas for both frequencies are reportedly Chinese, and of recent vintage. The power of each shortwave transmitter is apparently 50 kW. Now that they are recently back on air, the ZBC might be interested to hear how their signal is doing, even if you are outside their target zone. If you'd like to send a reception report or just let them know they are being heard in your area, you can reach them via:

Sauti Ya Tanzania Zanzibar
P.O. Box 1178
Zanzibar, Tanzania
karumehouse@tvz.co.tv

Be prepared to include cash, gifts, postage, and a pre-prepared card if you want a QSL from Zanzibar. As the sometime destination of pirates such as George Booth and John Bowen, one of the famous Spice Islands with a rich history of influences from Arabian and Portuguese to East African and British, there could hardly be a more exotic location than Zanzibar to listen to on your shortwave receiver.

And, though it might refer to the ocean breezes carrying the sound coastward, when you tap the rich vein of music which the ZBC offers, you can consider the island's proverb, "When you play the flute in Zanzibar, all Africa dances"

MT

Using Pro-Grade Radios as Scanners: The Good, the Bad, and the Ugly....

By Chris Parris

Almost everyone seriously involved in the scanning hobby will eventually find his or her interests in electronics and radio communications expanded. Some may pursue the amateur radio hobby while others develop more curiosity and interests in improving their monitoring equipment and capabilities. Both of these avenues will undoubtedly lead to acquiring more professional radio equipment and likely involve commercial two-way radios as opposed to consumer scanning receivers.

As for amateur radio, buying and using radio communications gear is at the heart of the hobby. After all, talking over the radio with fellow amateurs is the goal. But what about the hobby of monitoring radio communications? Can it be improved by actually using professional two-way radio equipment? It can indeed, but the pursuit of the monitoring hobby by utilizing pro gear has its pitfalls and complications.

Pros and Cons of Pro Radios

This article is not a "how-to-do-it" piece, as it would take more space than we have here to adequately cover. I do have some personal experience when it comes to programming various transceivers for monitoring. But, I did want to try to sort through some of the urban legend and just plain "BS" that gets posted on various places around the Internet concerning this topic.

For some years now, there has been sort of a cult-like community of radio enthusiasts who enjoy programming professional two-way radios, both mobile and hand-held models, for amateur radio use, or to use as monitoring receivers instead of consumer grade scanners. In some cases these radios are modified, either by software or hardware changes, to allow the radios to operate in frequency bands that they may not have been designed to operate in. In other cases, the radios are simply programmed to receive-only on certain police, fire or other public safety radio systems.

With the availability of programmable radio equipment and the ease of buying and selling such gear on line, the number of hobbyists involved in such things seems to have gone up. The increased use of trunking technology in mobile radio systems has also pushed some electronics hobbyists into radio hardware hacking.

From my past personal experience, my first commercial transceiver was purchased specifically in order to monitor my local 800 MHz Motorola trunked radio system. This was necessary as there were no trunk-tracking scanners available at that time, and trying to follow the action by listening to the 800 MHz frequencies in a standard scanner radio was difficult and frustrating. I did not program the radio myself, but a local radio shop set it up for receiving only and added a selection of talk groups for local law enforcement agencies. And they charged a premium price for this setup, too!

Often one can see postings on some of the popular radio related web site forums from someone who just bought a nice commercial two-way radio off of the Internet and wants to program it to listen to the local police. The resulting discussions often fall into two camps – don't do it, buy a scanner instead. Or the other side that says go ahead, it's easy and don't listen to those other guys. Which side has it right?

Well, both sides have some valid arguments. There are some good reasons to want to use a professional transceiver for monitoring, but there are some downsides and warnings in doing this, as well.

First off, is this legal? Can you have a radio transceiver if you are not licensed to transmit?

There are no laws against buying, selling or possessing a radio transceiver, even if you have no license. It IS against the law to use that radio to transmit on frequencies that you are not licensed to be transmitting on. So as long as the radio is programmed or modified to receive only, you are fine. But there are still some gray areas involving software and trunked radios that have potential to cause legal trouble, and I will cover later in this article.

Why would someone want to use a real two-way radio as a scanner? The simple fact is that most scanners are not as good at picking up weak signals or rejecting unwanted interference as commercial two-way radios. The performance of professional radio gear is often superior to even the best consumer grade scanning receivers. And there are other advantages as well. The audio quality and clarity of the received signal is often superior on professional radios. Most commercial radios are designed and built to be much sturdier than consumer grade scanner radios. Some radios are even designed for extremely rough duty, including being in the water or in an explosive atmosphere.

Another reason for having a real radio instead of a scanner may be something more intangible. For example, there is a certain type of person who finds it irresistible to be carrying around a real radio, just like the police or fire

An assortment of professional-grade public service band radios. A more sensitive receiver and better quality audio come with a price: Hard to program, not necessarily all the bands you want to hear and may not be frequency agile. (Courtesy: Author)

department. While this can be harmless, some take this too far and install lights and other accessories on their personal vehicles that might give some people the wrong impression. And some even step over the line and try to play cop or firefighter and eventually end up in trouble. But, I don't want to lump all radio enthusiasts in one pile, that's for sure.

GRE PSR-600 ($350) and Uniden HomePatrol® ($490) scanners have a lot of advantages over a professional-grade radio: They're frequency agile, cover all the bands you want to hear, and they are easy to program. (Courtesy: Grove Enterprises)

On the other side, there are some shortcomings to using a pro radio as a scanner. First, in most cases you are limited to one band of frequencies. Current scanners are designed to cover as many different frequency bands as they can. VHF-low band, aircraft, VHF high band, UHF, military air, 700, 800, and 900 MHz are all pretty standard for today's scanners.

Two-way radio transceivers are designed to operate on a specific frequency band. An 800 MHz trunking radio can only do 800 MHz frequencies and a VHF radio can't do UHF frequencies. Only recently have some multi-band or wide band transceivers come onto the market (not including amateur transceivers that often include dual band capabilities).

Secondly, you can't easily change frequencies or do programming in the field. Adding or changing a frequency or trunking talk group requires a computer with software and programming cables to accomplish. Some newer model radios do sometimes offer an option of FPP or Front-Panel-Programming. This option does allow for the user to add or modify frequencies in the radio without using a computer. But again, this feature comes at a price.

Another problem is the limited number of channels you can effectively scan. While scanner radios can offer hundreds of channels that can all be scanned in sequence, most commercial radios may only offer 10, 12 or 16 channels that can be scanned, and often at a slower speed than you may be used to. Again, newer, more expensive radios do offer larger "scan lists."

Tangle of Money and Legal Issues

Keep in mind that it can be an expensive hobby, for sure. You must start by buying the radio itself. And, since new professional radio equipment can go for thousands of dollars, even used radios will still often out-price brand new scanner radios. Bargains can be found on some online auction sites, but buyers beware! Many times radios may be sold with any number of defects or jacked up firmware that may make getting it programmed for your use difficult. Be very careful and get as much information about the radio and its capabilities as well as the seller before investing your money.

And once you get a radio, you will probably want a new battery, charger and any accessories that were not included with your purchase. You will also need to get the radio programmed to receive the desired frequencies. In some cases, local radio sales and service shops will program a radio for a fee, but some will not unless you are the licensed user of the frequencies.

Some hobbyists will want to invest in programming cables and software to program the radio on their own. Most radio programming cables are plentiful on the Internet, but accessing radio-programming software for private, legal use can be difficult, if not impossible for older model radios. And most of the time, each radio model requires very specific versions of programming software. This can add up to lots of money.

Of course, the Internet has all sorts of dark places where bootleg software can be found, but one runs the risk of downloading a virus-infected bundle of worthless code as well. Motorola has a history of being very protective of its programming software and takes Intellectual Property Rights very seriously. Admittedly, the chances of being caught are slim, but there have been cases of prosecutions involving Motorola software being improperly acquired by private parties.

And, this is where more of the controversy comes in. Trunked radio systems operate a lot like closed computer networks. The radios using the system must be known and registered with the system in order to work with the trunked system. Even though the radio hacker might wish to only receive traffic on a trunked system, there is a danger of the radio transmitting accidentally or without the user's knowledge.

Some newer digital trunked radio systems actually require a radio to transmit, or affiliate with the trunked site before the radio will ever receive anything. Those in the radio hacking community say they have figured out some possible ways around this, but under many state laws, programming an unauthorized radio to operate on a private trunked radio system is illegal. These laws consider radio systems akin to computer networks and, technically, programming a radio to work with the system could be a violation of state law, whether the radio transmits or not.

In order to program trunking radios, one must have what is called a "system key" to access the trunked programming area of the software. This is an attempt to keep unauthorized users from doing just what radio hackers have been doing for years, programming radios to access the trunked systems.

This key (not a brass key, but an encrypted string of computer code) is supposed to be kept by the system administrator and not allowed out for anyone to have, but there have been some efforts on the part of the radio hacking community to work around this as well. There are programs out there that will actually generate the required system key to unlock the programming software and allow trunked radio programming.

Trying to understand programming a trunking system into a commercial trunked radio will positively make your head explode. There are so many variables and system settings that things can get easily fouled up if one doesn't fully understand what they are doing. And, if the person programming the radio doesn't really know what they are doing, they can, in theory, cause all manner of difficulties with the legitimate users on a trunked radio system.

If the radio is programmed with the same radio ID number as a legitimate user, having two radios active on the system at the same time can cause neither to work. And in some cases, hackers have programmed a radio with the same ID as a dispatch console, causing all sorts of headaches for the system operators.

If a trunked system administrator discovers a bootleg radio trying to access their trunking system, they can take steps to stop it. They can remove that radio ID from the allowed radios or they can disable or "stun" the radio, so it simply stops working. I have seen more than a few inquiries from people who have stunned radios and want to know how they can get them working again, so I know that it happens.

Even if you do everything right and get everything programmed to receive only, getting stopped or caught with the same radio as your local police department in your possession can get you in some hot water. In spite of the fact that it may be perfectly legal, the police will want to know why you have such a radio and what you are up to. With all the paranoia these days about on-line Internet feeds of police communications, catching someone with what they might believe to be one of their very own radios may cause some monumental hassles. Don't say I didn't warn you.

Bottom line: Please, if you decide to take the plunge and try getting a real radio programmed to work as a scanner, be careful. Take the time to read, study and learn as much as you can about what you are trying to do. Read up on what it takes to actually program the radio and ask questions of those with experience in the matter.

Check out web sites that deal with this subject, such as "Batlabs" **http://www.batlabs.com;** Repeater Builder **http://www.repeater-builder.com/rbtip/;** or the commercial radio sections of the Radio Reference forums **http://forums.radioreference.com/**.

Chris Parris writes MT's Fed Files column and may be contacted at chrisparris@monitoringtimes.com

LOW POWER FM: Helping Your Community find its Voice

By Brad Gibson, Prometheus Radio Project

When the Federal Communications Commission (FCC) established a new Low Power FM (LPFM) radio service in 2000, schools, churches, and community groups across the nation thought their dreams of taking to the airwaves had become a reality. But pressure from larger broadcasters pushed Congress to pass legislation severely limiting the opportunity to acquire an LPFM license.

Finally, after more than a decade of grassroots pressure, Congress has loosened these restrictions and freed the FCC to issue thousands of licenses for LPFM stations. Now, groups all around the country are once again scrambling to prepare their applications and build their stations from the ground up. For those interested in helping their own communities get a slice of the airwaves, there are some key steps ahead.

Know the Rules

In order to start your own station, you need a basic understanding of LPFM rules and regulations. For a primary source, go to Subpart G of the FCC's broadcasting rules website, at **http://transition.fcc.gov/mb/audio/bickel/amfmrule.html#LPFM**. Though the FCC regulations include a good deal of technical language, the most important rules regarding LPFMs are relatively simple.

Since LPFM is non-commercial, only incorporated, non-profit organizations such as schools, churches, local governments, and community groups can apply for licenses. Your organization need not be a 501c3 corporation, but must be registered as a non-profit with your state.

Even so, if you are not affiliated with a non-profit, there's no need to despair. Reach out to your local representatives and community leaders about your idea for a station, and they may be able to direct you to a local group to serve as a parent organization. For instance, Joe Steinberger from Rockland, Maine was gathering support to start a community radio station when he found a willing partner in Penobscot School, a local language school and international exchange center that now holds the license for WRFR-LP 93.3 FM. After over a decade on the air, WRFR-LP now features over 50 programs run by dozens of volunteers.

However, if you can't find a pre-existing non-profit to partner with, you can always start a non-profit of your own, just be sure to check your state's rules for registration at **http://foundationcenter.org/gainknowledge/map/start-up-map.html**. Once you are affiliated with a non-profit, your board of directors must define the educational mission of your station, which is a requirement for an LPFM license.

Young residents of Portsmouth, New Hampshire, get in on the action at WSCA 106.1 Low Power FM. (Credit: Aliza Simons)

The FCC does not define what constitutes an educational mission, so many LPFMs create missions that relate to the educational value of their programming, including local music, news, or public affairs. Some stations offer educational programming in the form of life-saving resources, such WQRZ-LP 103.5 FM in Hancock County, Mississippi, which was the only source of information for many local residents in the wake of Hurricane Katrina, as broadcasts updated listeners on recovery efforts and locations to find drinkable water. On the other hand, the Rockland, Maine station provides educational content through poetry readings, science fiction discussions, and short lessons on the history of the town. Other stations might have an educational mission related to jazz preservation, environmental stewardship, or civic engagement.

While these regulations may offer stations a great deal of latitude, every non-profit should draft a mission statement that clearly outlines the values and goals of the organization. This exercise will not only clarify the required educational mission, but it will also help the board identify the target audience for their prospective LPFM station, a crucial component of effective fundraising, volunteer recruitment, and community engagement. A clear mission, agreed upon by stakeholders in the station, will also prevent miscommunication and conflict down the line. Take the time to craft a mission that works for your group.

Along with this educational mission, LPFM applicants must also be local, meaning that their headquarters are required to be within ten miles of their proposed antenna site in the top 50 urban markets, and within 20 miles outside of these most populous regions. Stations can also fulfill this requirement by demonstrating that 75% of their board members reside within ten miles of the proposed antenna site in the top 50 urban areas, and within 20 miles outside of these markets.

LPFMs must also be non-commercial and may not air paid advertisements. However, they are permitted to acknowledge contributions from businesses on air, as long as these acknowledgments are short and contain value-neutral descriptions of the participating businesses.

The Road to New LPFM

It seemed an impossible task: Battling mega-media companies *and* the FCC in order to give communities a voice via Low Power FM radio stations amid the clamor of dollar-driven, spectrum-grabbing pros. Who would play David to the broadcast Goliaths? Since we're talking myths and legends, why not Prometheus?

Like the Prometheus of legend, who brought fire to mortals, today's Prometheus Radio Project, as indicated by the organization's logo, seeks to bring radio (at least LPFM) to mortals (well, non-commercial broadcasters, anyway).

Begun in 1998 as a small group of Philadelphia-based, local-radio activists, Prometheus has had a huge impact on America's FM band. Thanks to their relentless efforts battling commercial broadcast interests and the FCC, in court and out of court, this small organization managed to slip a wedge into the microscopic crack between big-time broadcast lobbyists and the FCC.

That wedge was the Local Community Radio Act which had originally been introduced as legislation in 2005 and 2007. The big break came in October 2009 when the Act was passed out of the House Subcommittee on Communications, Technology and the Internet by a 15-1 margin. One week later it passed the House Energy and Commerce Committee by a voice vote. Less than one month after that it was passed by the Senate Committee on Commerce, Science and Transportation. And, by December 16, 2009 it passed the full House by voice vote. But, it would take another full year to be passed by the full Senate. The payoff came when the Act was signed into law, January 7, 2011. -- Ken Reitz KS4ZR

Finding a Frequency

To apply for an LPFM license, you must specify the frequency and location your station will use. This is more complicated in urban areas, where the radio dial is more crowded, and you will likely need to hire an engineer to produce an exhibit demonstrating the availability of your channel. Unfortunately, even an engineer may not be able to find a frequency in some of the nation's most crowded markets, such as New York City and Los Angeles. However, most rural areas will have many more open frequencies, and in some cases you can specify the channel without paying an engineer.

The availability of any given frequency cannot be guaranteed until the FCC issues its final set of rules and procedures for LPFM. Still, there are a few ways to gauge your chances of finding a frequency in your area. You can do a quick check for channel availability in your zip code at **http://prometheusradio.org/zipcode-check**. For a more thorough search, check the REC Networks LPFM channel search tool at **http://cdbs.recnet.com/lpfm.php**.

The results of this search will designate your proposed location for an antenna as green if a channel is easily available, red if a channel is definitely not available, and yellow if one may be found with an engineer's help or a second adjacency waiver. If the REC Networks search tool cannot find a frequency for you, you can also employ a radio engineer to perform a study to look more closely for any open frequencies, which you'll need to do in most cases anyway to produce the engineering study required in your application. The cost of one of these surveys varies from $500 to as much as $3,000 for more complex studies (often in urban areas) that must navigate interference or geographic obstacles with directional antennas.

The rules on finding an available frequency are among the most important and unresolved issues the FCC must handle before accepting new applications. Flexible rules, similar to those already used by translator stations, could allow thousands of new LPFM stations nationwide. The most crucial (and likely most contested) issue has to do with granting LPFM stations waivers of the FCC's minimum distance spacing on the second adjacent frequency.

These waivers would open up the dial by permitting LPFMs to use frequencies that are two clicks away from other stations on the radio dial, instead of the current requirement of three. The Local Community Radio Act authorized second adjacent frequency waivers in cases where LPFMs are not predicted to cause interference, but the FCC must decide how and when such waivers will be granted, and what sort of showings applicants will need to make in order to receive a waiver.

A flexible waiver standard would free up channels in more crowded markets that might otherwise have no room for community radio. In many of the larger markets, second adjacency waivers could double or triple the number of open channels, giving local groups a much better chance to get on the air.

Crafting an Application

Though there is no fee for applying for a noncommercial license, the FCC will only accept applications when the LPFM filing window is open. Since the FCC is currently formulating new rules (and new applications) for LPFMs, station hopefuls will have to wait for that process to conclude and new applications to be released.

However, an Internet search of the term "FCC Form 318" will produce the instructions form for the old LPFM application, which may give you a sense of the process. An important part of the procedure is the point system by which the FCC selects among multiple applicants vying for the same channel, whose applications are considered "mutually exclusive."

According to this system of "preference points," competing applicants could increase their chances of being awarded a license on the basis of three possible points: pledging to broadcast at least 12 hours every day, committing to broadcast at least eight hours daily of locally originated programming, and having established local presence of at least two years.

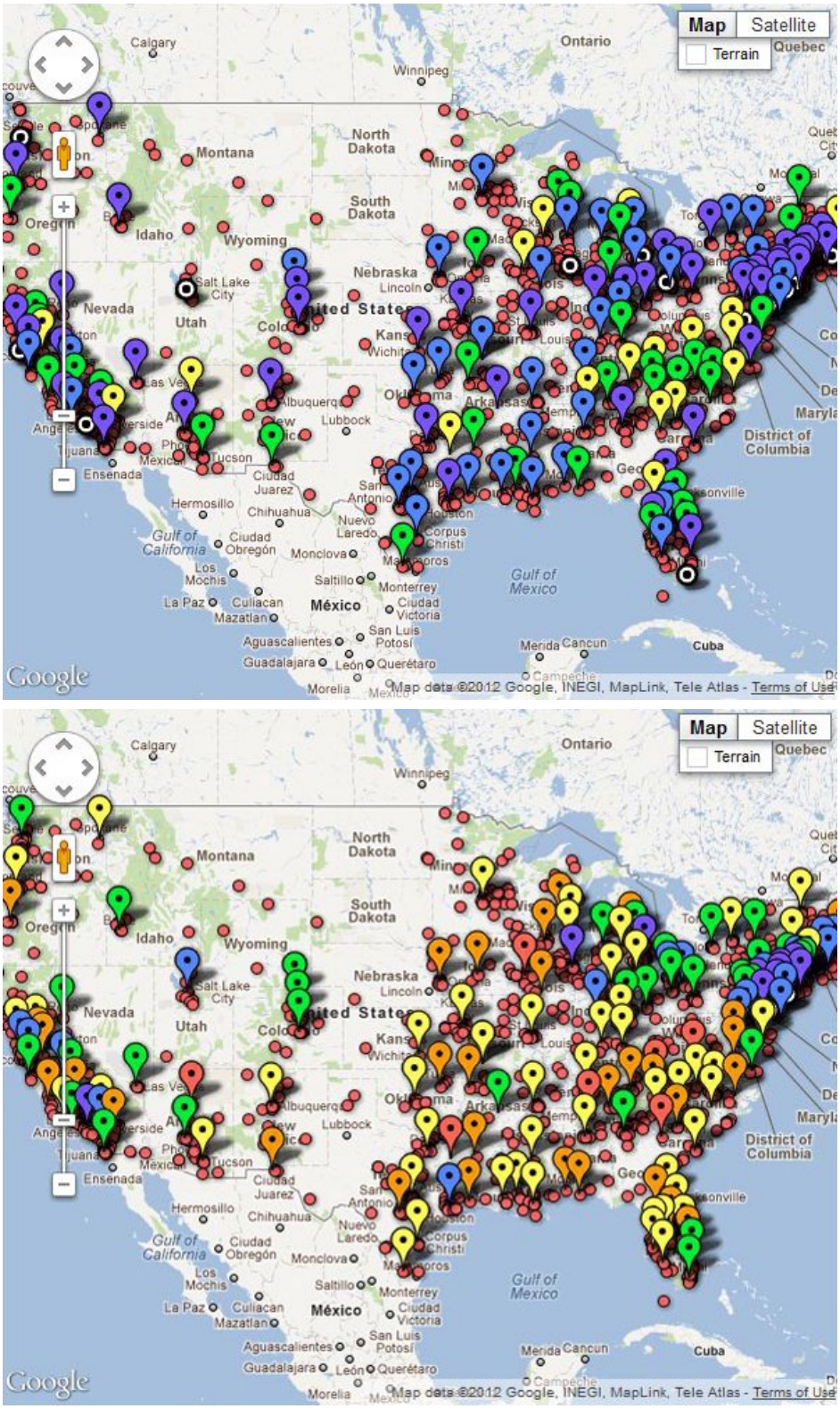
As a result, if you are still planning to incorporate as a non-profit or have just recently registered, you may want to consider supporting a more established group to serve as the station's licensee. Also, keep in mind that these preference points may change for new LPFM stations.

The FCC has released proposed rules that suggest placing additional emphasis on local presence (perhaps increasing the duration from two years to four). The proposed rules also suggest placing additional emphasis on localism, by adding a second point for stations who pledge to produce local programming or even making local programming an eligibility requirement.

Building a Station

Even after you've submitted your application and (hopefully) received an LPFM license, there isn't much time to celebrate. Once you've obtained your license, you have a lot of equipment to buy and only 18 months to get your station on the air. The cost of this shopping spree can vary widely, based on where you look for your equipment. Starting a studio with new, state-of-the-art technology could easily cost over $50,000. On the other hand, a studio filled with consumer grade equipment could be built on a budget of under $10,000.

People from all walks of life in Rockland, Maine, volunteer at WRFR-LP 93.3 and 99.3 MHz FM, the only local radio station in Knox County. (Credit: Johanna Lindsay)



Available channels under current rules (top) vs 2nd and 3rd adjacent waivers. (Courtesy: Prometheus Radio Project)

Quality used equipment can be found easily on eBay, or by checking with local radio stations, as they often cycle out older models. Though cheap and used equipment may be less durable and user-friendly than newer professional technology, it should suffice for a studio on a shoe-string budget.

Still, given the limited durability of used equipment, as well as the fact that it is often easier to raise money for start-up costs than maintenance, some higher quality equipment may be worth considering. Since more expensive models tend to be more user-friendly, prioritize spending money on complex equipment that requires training to use, such as audio mixers or consoles, which can purchased new for around $3,000.

Meanwhile, more basic studio equipment such as microphones, CD players, and turntables should be relatively easy to operate regardless of their age or quality. Along with these standard items, a radio studio will also need audio cables, headphones, a telephone to take calls on the air, and an FM tuner, which allows the DJ to hear the station's signal. A computer allows stations to stream their broadcasts online, play recorded music, automate programming, as well as edit and produce audio.

Finally, the FCC requires that each station have an emergency alert system (EAS), which monitors the airwaves for emergency alerts and rebroadcasts them on your station. This piece of equipment generally costs around $3,000 and may be difficult to buy used because other radio stations rarely replace them.

Once you have your studio set up, you will still need a transmitting system to broadcast your signal. LPFM radio must operate at 100 watts or less, which provides coverage over a radius of approximately 3.5 miles, though high quality radios may pick up the signal from up to ten miles away. In order to take to the airwaves, you will need a transmitter, an antenna, an audio processor, transmission line, and a place to hang the antenna with a lightning arrestor.

The cost of this transmission system ranges from around $4,500 to $12,000, largely depending on the quality of the transmitter and antenna, and whether there is an existing structure to mount an antenna. Though there is some variance in the cost of transmitting equipment, it is more difficult to find used because the FCC enforces specific requirements for certified LPFM transmitters, making them much more scarce than the equipment found in radio studios.

Once your antenna is up and your station is finally on the air, there is also a licensing fee of about $600 per year to Performance Rights Organizations (PROs), which support the artists who create licensed content. For a more comprehensive account of the equipment needed to operate an LPFM station, check out the Prometheus Radio Project's Radio Equipment Guide at **www.prometheusradio.org/studio_info**.

To have a successful community-driven LPFM station, you'll need to build your community as well as your studio. Since LPFM stations are required to broadcast at minimum 36 hours weekly and at least five hours per day for six days a week, programming often comes from a wide variety of sources. For example, WSCA 106.1 LPFM in Portsmouth, New Hampshire, fills out its weekly schedule by featuring shows on subjects as diverse as disabled living, writing, the environment, holistic health, and pet ownership.

By drawing in participants from every corner of your community, you will not only benefit from the increased capacity for programming and station management, but you will also be able to build a station that serves a wider range of listeners. A station that's truly responsive to the needs of your community will be valued and supported by that community – keeping you relevant and on the air.

Getting Help

Although starting an LPFM station clearly

requires significant planning and organization, there are a few places you can turn to for help. Groups anywhere in the country can consult the Prometheus Radio Project website, which offers information on the numerous steps required to start a station as well as interactive webinars at **http://prometheusradio.org/webinars**.

Prometheus has a particular focus on supporting stations with a strong community engagement or social justice ethos, and groups that fit this description are eligible for more hands-on help from Prometheus staff and volunteers. If you're a prospective community station located near the Pacific Northwest, an organization named Common Frequency may be able to provide cheap or even free help with navigating FCC bureaucracy and other legal issues that arise during the application process.

For assistance with handling the regulatory and legal challenges in starting a community radio station, many law firms and Certified Public Accountants do pro-bono work for non-profits. Find a list of state-by-state resources at **http://prometheusradio.org/state-legal-support-non-profit-organizations**.

For help with the technical side of radio, broadcast engineers can not only perform frequency searches, but can also help with choosing and setting up equipment. Those on a tight budget should also look for a local non-profit resource center, which can offer information on available funding for non-profits in your area, and local community foundations, which may be interested in funding your project in order to support civic engagements, arts, or community development.

WQRZ-LP FM post-Katrina 2005. This LPFM station was somehow able to serve its community in the aftermath of the hurricane. (Courtesy: WQRZ-LP)

It is important to take advantage of any help you can find, because starting a community radio station is no simple task. Successful applicants must be resourceful and well-organized to meet eligibility requirements and raise the funds to build a station. But the most crucial part of starting an LPFM is forming a mission that can inspire a community to join in the effort. With the help of a committed group of supporters, your community radio station can become not only a possibility, but a powerful reality.

Brad Gibson is a Community Radio Organizer at the Prometheus Radio Project. His job includes managing relationships with representatives from radio stations, non-profit organizations, and community groups, as well as providing support for LPFM station hopefuls. MT

SCANNING REPORT

THE WORLD ABOVE 30MHZ

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Decoding Digital Data

Modern scanners have a feature that can add a new dimension to monitoring. This month we take a look at the details of the feature, discuss why it is useful, and finish up with a brief discussion of an encryption scheme in use in many public safety radio systems.

Dear Dan,

Hello from South Carolina! I have a couple of good questions that have been on my mind lately, so here goes.

The first involves the use of proprietary monitoring software that can decode data about P-25 systems straight from your scanner. One freely available software title allows me to monitor the traffic flow in and out of the tower, including talkgroups that I can see actively pop up on my computer screen, almost like a 911 emergency center console. I can even save all of this data in a log for later reference. But, from a practical standpoint, I don't see where it's useful. I mean, what can I do with this information?

Specifically I am referring to Pro96com and I'm using that in conjunction with my Radio Shack Pro-197 and Pro-106 handheld. I am using these to monitor two P-25 systems. One is the York County, South Carolina P-25 system and the Charlotte Mecklenburg (North Carolina) P-25 system. The latter is a new system intended to replace the existing Motorola system which, as I understand, was originally commissioned in 1985 or thereabouts. If you can recommend other decoding tools I'd like to know about them. I happened across Pro96com because I use PSREdit500 to program both of my scanners, and I found it on Mike Vander Veer's website.

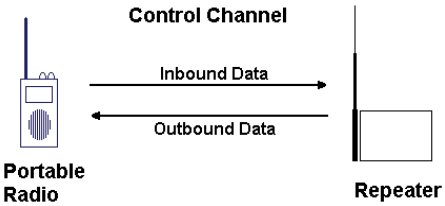
The second question has to do with serialization of talkgroups. Specifically, in programming my scanner, I have noticed that talkgroup numbers skip every other number quite often. Do agencies publish ALL talkgroups on their systems or just the ones they want the public to see? Are there secret talkgroups we don't know about? Should we be monitoring with more wildcards programmed into our scanners, or should we program the "in between" numbers in and listen that way? Any advice you could give would, as always, be greatly appreciated.

Kevin in South Carolina

Before we can answer Kevin's questions we need to go over some background that is often taken for granted by experienced hobbyists but seems a mystery to newcomers.

Trunked radio systems, at a fundamental level, involve computers talking to each other. A computer located at a repeater site transmits digital information to portable and mobile radios, where a computer inside the radio processes that information. When prompted, the computer inside the radio transmits a burst of digital information back to the repeater.

Digital information in trunked radio systems is transmitted on *control channels*. The *outbound* control channel, carrying data from repeaters to radios, is typically continuous and is the usual target for scanner listeners since it is relatively strong and comes from towers or other sites with good coverage characteristics. The *inbound* control channel carries data from radios to repeaters and is shared by all active radios within range. Radios take turns using the inbound control channel as instructed by the repeater via commands sent on the outbound control channel.



The digital data carried on control channels are made up of binary digits, called *bits*, where each bit is either a '0' or a '1'. These bits are organized into meaningful chunks of information according to a well-defined protocol. Each protocol specifies a number of short instructions and responses that define various actions and states a radio might experience. Each manufacturer typically has their own proprietary protocol, although there are some exceptions – for instance, the protocols for APCO Project 25 are published and available for anyone to read and use.

Bits are transmitted over the air one after another at a certain rate, measured as bits per second (abbreviated as *bps*). The table below lists the control channel protocol and data rate for several common trunking systems.

Trunking System	Protocol	Rate
Motorola Type I	Motorola	3600
Motorola Type II	Motorola	3600
EDACS Narrowband	EDACS	4800
EDACS Wideband	EDACS	9600
Logic Trunked Radio	LTR	300
MPT-1327 MPT	1200	
APCO Project 25	P-25	9600

Outbound control channels carry information related to activity on the system, including specific groups of conversing users (called *talkgroups*) and the radio frequencies on which those conversations are taking place. Modern scanners receive this stream of information and process it in order to track trunked conversations. The computer (actually a small microprocessor, but a computer nonetheless) inside the scanner is programmed with the knowledge of particular trunking system protocols and thus can receive control channel bits and convert them into understandable instructions and responses, which it then uses to track conversations.

❖ Data Stream

All trunking scanners use the received protocol messages internally to perform tracking. Some scanners also make those protocol messages available on an external connector that can be attached to a personal computer. This personal computer interface (PC/IF) connector is usually used for remote control of the scanner and for importing and exporting programming settings. Some models also support firmware upgrades through this same connector.

Most recent GRE-built scanners have an optional "CCDump" (control channel dump) feature that streams received control channel data over the PC/IF connector. By connecting the scanner to a computer with the proper cable and running an appropriate software program, the hobbyist can see trunking messages in real-time as they appear on the system.

As an example, the manual for the GRE PSR-500 handheld scanner includes an Appendix that details the CCDump data stream. It describes seven different types of stream messages. Two of them provide weather-related messages, specifically the Specific Area Message Encoding (SAME) and the warning alarm tone (1050 Hz). The remaining five are control channel data messages for Project 25 ("P25"), Motorola ("M36"), Logic Trunked Radio ("LTR"), EDACS Wideband ("EDW") and EDACS Narrowband ("EDN").

Computer software can read these messages and display the meaning and associated parameters (frequency, talkgroup numbers, system identifiers, and so on) of each message. This traffic can also be stored in a file to be reviewed later or shared with other hobbyists.

❖ Trunking Message Decoders

Kevin mentions a program called "Pro-96Com." The Radio Shack PRO-96 is a handheld scanner that was introduced in 2003. It came with a special mode that, when activated, sends Project 25 control channel data messages out via the PC/IF connector port without the need for any modifications or additional hardware. This

feature motivated Rick Parrish to write a computer program called "PRO96DMP" that interpreted the P25 messages and displayed them on the screen.

Mike Vander Veer took the next step and wrote a more comprehensive program, Pro96Com, and has continued to refine it. You can read more about it at **www.psredit.com/pro96com** and download a free copy from there. As with most packages, there is also a Yahoo! interest group at **www.groups.yahoo.com/group/Pro96Com**.

The current Pro96Com software works with a number of scanners, including these models:

Make	Model
GRE	PSR-500
GRE	PSR-600
Radio Shack	PRO-96
Radio Shack	PRO-106
Radio Shack	PRO-197
Radio Shack	PRO-2096
Uniden	BCD396XT
Uniden	BCD996XT

In addition to Pro96Com, several other software programs are available that are capable of interpreting the CCDump data stream. UniTrunker is a Windows program, available at **www.unitrunker.com**, that provides control channel monitoring for Motorola, EDACS, and Project 25 from the PC/IF port on GRE PSR-500, GRE PSR-600, Radio Shack PRO-106 and Radio Shack PRO-197 scanners. It can also monitor Motorola and EDACS control channels using a Uniden BC346XT or Uniden BCT15X scanner, which are both analog trunk-tracking units.

Eric Carlson has written LTRLogger, a Windows command line utility to display LTR messages from Uniden BCD396XT, BCD996XT and BCT15X scanners. You can find it at **www.ericcarlson.net/ltrlogger**

If you're more software development inclined, there is a set of Java libraries that support the GRE PSR-500 and PSR-600 (and the Radio Shack PRO-106 and PRO-197) PC/IF data port available at **http://sourceforge.net/projects/galena.pdf**, although they have not been updated in quite some time.

❖ Why?

To finally answer Kevin's first question, these P-25 decoding tools allow someone to see "under the hood" of a trunked radio system and observe all of the underlying activity that makes the system actually work. For someone who really wants to understand the inner workings of a system, it is an invaluable tool.

Such software is also very useful to capture and store all of this activity for later review, allowing the discovery of rarely used talkgroups and radios. It also helps to quickly build up a list of associations between talkgroup activity and individual radio identifiers to try and understand which departments use which talkgroups. It may also help in the discovery of other active frequencies on the system that might not have been known just normal or casual monitoring.

With software like Pro96Com or UniTrunker, you can set up your scanner and computer to log trunked system activity 24 hours a day and thus capture talkgroup identifiers regardless of whether you are there to hear them or not. This continuous monitoring of the control channel also avoids a drawback of ordinary monitoring, where the listener hears the conversation from a single talkgroup but may miss other active talkgroups. Since all active talkgroup numbers are sent on the control channel, a monitoring program can capture all of the identifiers even if they appear simultaneously.

❖ Talkgroup Publication

Most agencies do not actually publish their talkgroup numbers. A few agencies might be paranoid that the release of such information could somehow be harmful, but the majority of trunked system operators simply don't need to make the list public. They have an internal staff of radio technicians, or subcontract maintenance to an outside service company, who assigns talkgroup numbers and programs them into radios.

Talkgroup lists that you find on the Internet or (more rarely these days) published in books are largely by hobbyists who monitor the system and put together reports of what they've heard with what talkgroups their scanner or software reports. While gathering this kind of information, the hobbyist will operate their scanner in "open" mode, which will cause it to stop on every transmission and thus capture each active talkgroup. It is similar in concept to the "wildcard" character used in many computer searches.

❖ Charlotte-Mecklenburg, North Carolina

The new Charlotte-Mecklenburg system that Kevin mentions covers three counties in south-central North Carolina, specifically Gaston, Mecklenburg, and Union. About two dozen repeater sites in various locations cover the 1,500 square miles of service area.

The Federal Communications Commission (FCC) license database at **http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp** lists the following frequencies under several call signs:

County	Licensed Frequencies (MHz)
Gaston	851.3375, 851.4750, 851.7375, 852.4625, 852.6500, 852.8375, 852.8750, 853.4625, 853.5875
Mecklenburg	851.1500, 851.2375, 851.2625, 851.3125, 851.3375, 851.4750, 851.7000, 851.7375, 851.7625, 851.8125, 851.8750, 852.0875, 852.2375, 852.3125, 852.3750, 852.4625, 852.5875, 852.6500, 852.8125, 852.8375, 852.8750, 852.9125, 853.0625, 853.1000, 853.1500, 853.2625, 853.3125, 853.3500, 853.4625, 853.5875, 853.6500, 853.8125, 853.8500, 853.8750, 853.9000, 853.9250, 853.9375
Union	851.2625, 851.3125, 851.7625, 851.8750, 852.3125, 853.1500, 853.3125, 853.6500, 853.9000, 853.9375

Because this is a "pure" Project 25 system – meaning all voice activity is digital and the trunking control channel follows the P25 standard – you will need a newer digital-capable scanner to monitor it. The good news is that it also means you can track it by programming just the control channel frequencies. The scanner will use the information

in the outbound control channel to determine the correct voice frequency to monitor.

County Subsystem	Control Channel Frequencies
Gaston	852.8375, 853.5875
Gaston	851.7375, 852.6500, 852.8750, 853.4625
Mecklenburg	852.9125, 853.1000, 853.2625, 853.3500, 853.8125
Union	853.3125, 853.6500, 853.9000, 853.9375

Such a large system also has a significant number of talkgroups; some of them are listed below.

Dec	Hex	Description
41	029	Mecklenburg Events (Operations)
43	02B	Mecklenburg Events (Fire)
45	02D	Mecklenburg Events (Emergency Medical Services)
47	02F	Mecklenburg Events (Police)
49	031	Mecklenburg Events (Public Works 1)
51	033	Mecklenburg Events (Public Works 2)
53	035	Mecklenburg Events (Charlotte Fire)
55	037	Mecklenburg Events (Volunteer Fire)
57	039	Mecklenburg Events (North Mecklenburg 1)
59	03B	Mecklenburg Events (North Mecklenburg 2)
61	03D	Mecklenburg Events (South Towns 1)
63	03F	Matthews Police (Dispatch)
147	093	North Carolina Highway Patrol
153	099	Mecklenburg Events (South Towns 2)
155	09B	Mecklenburg Events (Mecklenburg Sheriff 1)
157	09D	Mecklenburg Events (Mecklenburg Sheriff 2)
159	09F	Mecklenburg Events (Charlotte Fire)
161	0A1	Mecklenburg Events (Charlotte Fire)
185	0B9	Mecklenburg Emergency Services
287	11F	Helicopter Landing Zone Coordination 1
289	121	Helicopter Landing Zone Coordination 2
403	193	Mecklenburg Emergency Medical Services (Dispatch)
405	195	Mecklenburg Fireground
407	197	Mecklenburg Fireground
409	199	Mecklenburg Fireground
411	19B	Mecklenburg Fireground
413	19D	Mecklenburg Fireground
415	19F	Mecklenburg Emergency Medical Services (Administration)
417	1A1	Mecklenburg Fireground
421	1A5	Ambulance to Presbyterian (Pediatric)
423	1A7	Mecklenburg Fireground
425	1A9	Mecklenburg Fireground
427	1AB	Mecklenburg Fireground
429	1AD	Mecklenburg Fireground
453	1C5	Mecklenburg Fire (Dispatch)
455	1C7	Mecklenburg Fire Operations
457	1C9	Mecklenburg Fire Operations
459	1CB	Mecklenburg Fire Operations
461	1CD	Mecklenburg Fire Operations
527	20F	Charlotte-Mecklenburg Police (Steele Creek)
529	211	Charlotte-Mecklenburg Police (Steele Creek Dispatch)
531	213	Charlotte-Mecklenburg Police (Westover Dispatch)
533	215	Charlotte-Mecklenburg Police (Freedom Dispatch)
543	21F	Charlotte-Mecklenburg Police (Providence Dispatch)
545	221	Charlotte-Mecklenburg Police (South Dispatch)
547	223	Charlotte-Mecklenburg Police (Independence Dispatch)
551	227	Charlotte-Mecklenburg Police (Independence)
555	22B	Charlotte-Mecklenburg Police (North)
557	22D	Charlotte-Mecklenburg Police (North Dispatch)
559	22F	Charlotte-Mecklenburg Police (Eastway Dispatch)
561	231	Charlotte-Mecklenburg Police (Hickory Grove Dispatch)
571	23B	Charlotte-Mecklenburg Police (Detectives)
573	23D	Charlotte-Mecklenburg Police (Property Crimes Detectives)
597	255	Charlotte-Mecklenburg Police (Vice Detectives)
659	293	Charlotte-Mecklenburg Police (Central Dispatch)
661	295	Charlotte-Mecklenburg Police (Metro Dispatch)
663	297	Charlotte-Mecklenburg Police (North Tryon Dispatch)
687	2AF	Charlotte-Mecklenburg Police (University City Dispatch)
769	301	Mecklenburg Medical Services (Non-Emergency)
771	303	Mecklenburg Emergency Medical Services
787	313	Ambulance to Steele Creek
789	315	Ambulance to Huntersville
793	319	Ambulance to Presbyterian (Main)
795	31B	Ambulance to University
797	31D	Ambulance to Pineville
799	31F	Ambulance to Mercy
801	321	Ambulance to Presbyterian (Matthews)
803	323	Ambulance to Presbyterian (Huntersville)
805	325	Ambulance to Lake Norman Regional Medical Center (LNRMC)
811	32B	Ambulance to Union Memorial
815	32F	Charlotte-Mecklenburg Police (Tactical)
983	3D7	Charlotte Fireground
985	3D9	Charlotte Fireground
987	3DB	Charlotte Fireground
991	3DF	Charlotte Fire
1027	403	Charlotte Fire (Dispatch)
1029	405	Charlotte Fireground
1031	407	Charlotte Fireground
1033	409	Charlotte Fireground
1035	40B	Charlotte Fireground
1037	40D	Charlotte Fireground
1039	40F	Charlotte Fireground
1041	411	Charlotte Fireground
1149	47D	Regional Emergency Medical Services
1151	47F	Regional Operations
1153	481	Regional Fire Operations
1155	483	Regional Fire Operations
1157	485	Regional Fire Operations
1159	487	Regional Law Enforcement Operations
1161	489	Regional Law Enforcement Operations
1225	4C9	Regional Calling
1227	4CB	Regional Pursuit
1229	4CD	Regional Operations 1
1231	4CF	Regional Operations 2
1233	4D1	Regional Operations 3
1635	663	North Mecklenburg Police (Dispatch)
2101	835	Mint Hill Police (Dispatch)
45500	B1BC	Union County Sheriff (Operations)
45537	B1E1	Union County Events 1
45538	B1E2	Union County Events 10
45539	B1E3	Union County Events 11
45540	B1E4	Union County Events 12
45541	B1E5	Union County Events 13
45542	B1E6	Union County Events 2
45543	B1E7	Union County Events 3
45544	B1E8	Union County Events 4
45545	B1E9	Union County Events 5
45546	B1EA	Union County Events 6
45547	B1EB	Union County Events 7
45548	B1EC	Union County Events 8
45549	B1ED	Union County Events 9
45551	B1EF	Union County Fire ("Bravo")
45582	B20E	Common Emergency Operations Center 1
45583	B20F	Common Emergency Operations Center 2
45584	B210	Common Emergency Operations Center 3
45585	B211	Common Emergency Operations Center 4
45586	B212	Union County Fire ("Charlie")
45587	B213	Union County Fire ("Delta")
45588	B214	Union County Fire ("Echo")
45589	B215	Union County Fire ("Foxtrot")
45590	B216	Union County Fire ("Golf")
45591	B217	Union County Fire ("Hotel")
45592	B218	Union County Fire ("India")
45593	B219	Union County Fire ("Juliet")
45594	B21A	Union County Fire ("Kilo")
45595	B21B	Union County Fire ("Lima")
45596	B21C	Union County Sheriff (Dispatch)
45597	B21D	Monroe Police (Dispatch)
45599	B21F	Union County Fire
45602	B222	Monroe Fire Emergency
45604	B224	Union County Emergency Medical Services (Dispatch)
45640	B248	Union Sheriff Detention Center Secondary
45641	B249	Union Sheriff Detention Center Primary
45648	B250	Union Emergency Operations Center 1
45649	B251	Union Emergency Operations Center 2
45650	B252	Union Emergency Operations Center 3
45651	B253	Union Emergency Operations Center 4
45657	B259	Monroe Fire Dispatch
45668	B264	Union County Police Mutual Aid
45670	B266	Union County Fire (Dispatch)
45574	B206	Monroe Police (Tactical)
45675	B26B	Union County Events 14
45676	B26C	Union County Events 15
45677	B26D	Union County Events 16
45729	B2A1	Union County Transportation Operations 1
45730	B2A2	Union County Transportation Operations 2

❖ Encryption Weakness

As a follow-up to the Leon County information in the *Scanning Report* column last month, it appears the encryption method used in Leon County (and by many other Motorola customers) is called "Advanced Digital Privacy" (ADP). It is not one of the standardized and approved P-25 methods; rather, it is a proprietary alternative offered by Motorola at a lower cost. ADP does not interoperate with any other manufacturer, so the customer is locked in to Motorola despite using P-25 standards in other parts of the system. Agencies using proprietary, non-standard features may also jeopardize federal grant money, since one of the conditions for receiving such grants is sticking to standards.

ADP is built around an algorithm called RC4 (Rivest Cipher 4), designed by Ron Rivest more than 20 years ago. RC4 is used in some commercial products, including several Internet software packages and many wireless routers. The algorithm is small, simple and efficient to implement, but a number of security weaknesses in RC4 have been discovered over the years. ADP appears to avoid most of the wrong ways to use RC4; however, it still has a fundamental problem.

Encryption algorithms typically have a secret piece of information, called a *key*, which is crucial to overall security. While not always strictly true, the length of the key can often be used to estimate the strength of the algorithm.

Algorithm	Key Length (bits)
Advanced Digital Privacy (ADP)	40
Data Encryption Standard (DES)	56
Triple DES	112 or 168
Advanced Encryption Standard (AES)	128, 192 or 256

The Data Encryption Standard (DES), originally designed in the 1970s, uses a 56-bit key that is now considered too short – making the use of DES risky and therefore insecure for many applications. In contrast, the more recent Advanced Encryption Standard (AES) has been determined by the government to be sufficiently strong to protect information at the SECRET classification level (and TOP SECRET with the longer key lengths).

The 40-bit key of ADP appears to have been chosen to meet a legal restriction on the export of encryption technology. That restriction is no longer in force, but the vulnerability of such a short key remains, especially with the increasing speed of computers. Because some digital P25 messages are often predictable, it is within the realm of possibility for a sufficiently motivated hobbyist to crack ADP-encrypted transmissions in a reasonable amount of time.

That's all for this month. Enjoy these dog days of summer, and when you're inside cooling off you can send me electronic mail with your questions, comments, and latest frequencies and talkgroups to **danveeneman@monitoringtimes.com**. You can also find scanner comparison charts, links and other radio-related information on my web site at **www.signalharbor.com**. Until next month, happy scanning!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
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Q. *I'm going to put up an inverted V wire antenna. I have looked for stand-off insulators for the 450 ladder line which will run down the telescoping mast support but have not been able to find any on the market. Do you know of any source for commercially made insulators of that sort? How far from the mast does the open-feeder ladder line have to be kept? (Gary Britten, W4GNB, Wilmore, KY)*

A. I haven't seen any since most folks are now using coax cable leading up to resonant antennas, and HF dipoles are usually end supported and center fed so that a standoff isn't necessary. So far as the inverted V, the line usually tapers from the feed point down to the shack; it isn't fastened to the center mast.

Remember those TV standoff insulators that ran down the mast for 300 ohm ribbon line? I wonder if a few of those would work, simply running the ladder-line spacers through their round ends. You'd probably have to cement or clamp the intersection of the spreader insulator where it runs through the round end of the standoff; otherwise, during windy weather, the ladder line would keep slipping back and forth, allowing the open wire to touch the metal and be grounded or at least electrically unbalanced.

The spacing of open line from large metal surfaces is good at just a few inches, not even a foot. I'd go with 4 inches minimum.

Q. *My antenna analyzer shows a bad impedance match (high SWR) between my horizontal HF loop antenna and my rig. I calculated the loop to be 254 feet long at 3.9 MHz using insulated wire. What could be wrong? (Rick - KF5LSN)*

A. Your original calculation was very close. Dividing 1005 by the lowest frequency in megahertz gives the correct circumference in feet. Since you are using insulated wire, you should reduce the circumference by 4%. This would be 247 feet.

The feedpoint impedance of such a loop (or a dipole) is about 100 ohms, a 2:1 SWR if you're using coax feed. In some cases, changing the length of the transmission line is as important as the correct antenna length.

It's a good idea to use open-wire feeders (twin lead or ladder line) for antennas with a high or variable feedpoint impedance, especially multiband antennas. Because of the separation of the conductors and the amount of insulation between them, there's almost no loss whatsoever under high SWR. The tuner adjusts the impedance mismatch between the antenna system and the rig.

Here's a good article on HF loops: **www.k5rcd.org/hor%20loop%20instruct.htm**

Q. *If the PAR End Fedz antenna is properly tuned, can it be used for transmitting in the 10-40m bands? I autotuned it the other night on 7.200 MHz and came up with a respectable SWR. (Matt, email)*

A. Autotuners work well within certain SWR limits, but if it's excessive, then you will need a manually tuned transmatch. Still, keep in mind that the mismatch is still present between the coax and the antenna feedpoint; the properly adjusted match is made only at the transmitter/tuner junction.

Since the PAR End Fedz is designed for receiving only, there may be some components within the insulated housing that would be vulnerable to excessive impedance mismatch as well as proper RF current and thus be damaged by the heat.

You should check with the manufacturer for their recommendations regarding maximum RF power and SWR vulnerability. You are probably all right at low power (10-20 watts), but check regularly to see if you can feel heat being generated in the housing.

Q. *I was wondering about the differences between ceramic and monolithic capacitors. Do they function differently? Are certain circuits or functions better suited for one or the other? (Van Wilshire, email)*

A. Ceramic merely refers to the insulating material as compared to paper, mica, polyester, resin, or Mylar for example. Monolithic simply means that several layers of the insulation are alternately interleaved with layers of the metal. Then the whole block is compressed into a monolith (single chunk) as compared to being rolled into a cylinder (tubular).

Yes, different styles work better at different frequencies. An excellent illustration of these differences and their applications can be found at **www.gqrp.com/na5n.pdf**.

Q. *My new digital scanner is not picking up signals as well as my old analog scanner. What sort of antenna should I put up? (Gregg Fear, email)*

A. Can you hear analog signals as well on your new scanner as you did with the old scanner? In a side-by-side comparison there should be no difference in reception since you are listening to the same signals. If there is, then I'd suspect the scanner.

Are you having to use a different adapter on your antenna cable than you were before? Make sure it's not loose and is making a good contact with the scanner receptacle.

Digital signals must be stronger than analog to be heard properly. As with TV, analog signals can tolerate some static and still be seen, but digital needs all the pulses and no noise to get a TV picture and sound.

For scanner coax, don't use RG-58/U in long runs; it's very lossy at VHF and especially UHF. Use RG-6/U outdoor TV coax or, in the worst cases, more expensive low-loss cables like RG-8/U, Belden 9913, or LMR400.

The lowest cost, high performance scanner antennas include the Grove Scanner Beam III (which is directional) and the ScanTenna (omnidirectional). You can see their specifications at **www.grove-ent.com/scannerbeam3.html** and **www.grove-ent.com/ANT7.html**.

Q. *My new floor lamp takes standard light bulbs, 60 watts maximum. But the instructions say not to use CFLs exceeding 13 watts! CFLs are known for operating much cooler than incandescent and I'd like to use some bright 30 watt CFL's. (Judy May, W1ORO, Union, Kentucky)*

A. There's nothing wrong with putting in those 30 watt CFLs; they will operate cooler than the 60 watt incandescents, and provide brighter light as well!

(Note: Judy let us know that she went ahead and tried the 30 watt CFL, and then a 42 watt CFL, and both stayed cooler than the 60 watt incandescent!)

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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Beating the Short Wave Summer Time Blues

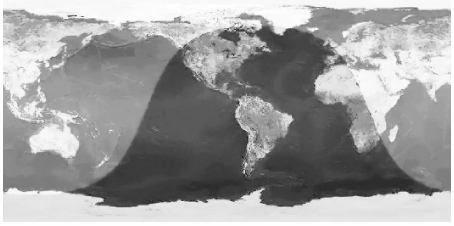
Summer is associated with many things. There's swimming, camping, warm nights… and mediocre short wave. Even when hunching over a radio does not lose out to these outdoor activities, it's just not as good as it will be in the autumn months to come. While the ionospheric E region can be stronger in summer, the more important F region is usually weaker.

Despair not, however. There are still possibilities for hot fun in the summer time.

❖ Grey Line Propagation

One way to get relatively efficient F-region propagation is to listen around the local grey line. This is the period before sunrise and after sunset when the high-altitude F region is illuminated by the sun, but the lower regions and the ground are not. At this time, propagation to other places on the planet with a similar situation can be extremely efficient.

The result of this phenomenon is the grey-line – a "twilight zone" on a great circle linking these areas. In summer, central Europe is on our grey line here in Southern California, allowing some nice catches from a continent that is otherwise not the easiest to hear. This is especially true around 10 megahertz (MHz) in the evening, when standard F-region propagation also favors this frequency.



Typically, the German weather transmissions in radio teletype (RTTY) pop in like magic on 10100.8 kilohertz (kHz). These have a speed of 50 baud, with the unusual shift of 450 hertz. Surely, something similar happens in other parts of the United States, and Europe too, for that matter.

The uneven illumination that causes the grey line also accounts for the International Space Station viewing opportunities at that time of day. This huge spacecraft orbits at an altitude in or near the F region. When it is illuminated by the sun, and the ground is not, it will appear amazingly bright as it moves rapidly across a dark sky. On a clear evening, it is really spectacular.

❖ Hurricane/ Tornado Season

Another way to beat the propagation blahs is to look for emergency activity related to severe weather. Nowadays, cell phones and the Internet usually hold up, and they are great. Sometimes, though, they don't, and people still take to the radio.

While amateurs ("hams") are not technically utilities, some of their activities qualify at these times. Everyone listens to the Hurricane Watch Net frequency on 14325 kHz, in upper sideband (USB). It activates whenever a named storm comes within 300 miles of land, or upon request by the National Hurricane Center in Florida. In past years, government and military stations have used this frequency, as have hams and other stations getting the first word out of stricken areas.

Last year, Hurricane Irene weakened before tracking directly through Atlantic City and New York. Even so, it still caused severe flooding farther up in New England. Emergency agencies activated in a large number of states. Most of these now use Twitter, and it melted down for days. Presumably the higher "scanner frequencies" were extremely active as well.

On the shortwave radio, however, there was mostly an eerie silence. A storm that would have had the bands hopping for days as recently as two years ago caused nary a peep. If summer of 2012 is this dead, this column's Hurricane Frequency List will need some serious editing down. Meanwhile, however, the old list remains intact on the Utility World web site. This is **www.ominous-valve.com/uteworld.html** .

One bright spot may be a U.S. government net called COTHEN. This stands for Customs Over-The-Horizon Enforcement Network. It's old. In fact, it was around before the invention of Automatic Link Establishment (ALE), using another scanning system.

Now, though, all communications on this net are in ALE, and it has grown considerably in size and scope. It can really light up in incidents requiring US Coast Guard assistance. Often, the ALE is followed by voice comms from the same cutters and helicopters that frequently appear on all those TV reality shows.

The expanded COTHEN net uses the following frequencies, all USB: 4614.5, 5250, 5732, 5909.5, 7527, 8912, 10242, 11494, 12222, 13312, 14582, 15867, 18594, 20890, 23214, and 25350 kHz. All are worth putting into the scan.

Mark Cleary, our Coast Guard expert, has an absolutely indispensable list of COTHEN call signs and their users. It can be found on *MT* military editor Larry Van Horn's blog at **mt-milcom.blogspot.com/p/us-cbp-cothen-net-by-mark-cleary.html** . There is also a long list of Coast Guard assets on this blog.

❖ New Orleans Fax Changes

According to the US National Weather Service, it has made significant changes in its Gulf/ Caribbean/ tropical Atlantic radio fax schedule. These fax charts are transmitted in four daily blocks from the US Coast Guard station NMG in New Orleans. They become especially important in hurricane season.

The time slots used by this station have remained the same. It's the content that has changed. Here are the re-ordered charts, by time slot, in Coordinated Universal Time (UTC):

0635/1835	48 Hr Wave Period/Swell Direction
0645/1845	Rebroadcast of 0215/1415 (Sea State)
0655/1855	24 Hr Surface Forecast
0705/1905	48 Hr Surface Forecast
0715/1915	72 Hr Surface Forecast
0725/1925	24 Hr Wind/Wave Forecast
0750/1950	48 Hr Wind/Wave Forecast
0815/2015	72 Hr Wind/Wave Forecast
0835 only	Rebroadcast of 0215 (Sea State)

The frequencies are 4317.9, 8503.9, 12789.9, and 17146.4 kHz, in upper sideband (USB) mode. 17146.4 is only used from 1200 to 2045, while the rest are up at all broadcast times.

The mode is technically frequency modulation (F3C). However, since fax is tuned in USB mode, the frequency shown on the radio will be 1.9 kilohertz (kHz) below the listed one. The best tuning for these is at or near 4316.0, 8502.0,

12788.0, and 17144.5 kHz USB.

The schedule was changed by the NWS, which originates the charts. The reason given was, "to better align workflow with the suite of enhanced text products which are to be implemented at that time." Presumably, this relates to the order in which these forecasts and observations are processed by the office staff.

The web link for the relevant NWS page is **http://weather.noaa.gov/fax/gulf.shtml** .

This page also has links to all the charts, and a new hypertext schedule with links embedded right in it. It's at **www.nws.noaa.gov/om/marine/hfgulf_links.htm**

❖ Boston Ice Chart Changes

Ice season will be long over by the time this column runs, but there is always next year. Schedules older than February of 2012 show the wrong times for the North American Ice Service charts from the US Coast Guard's Boston station (NMF).

The new times are 0438, 1039, 1600, and 2239 UTC. 0438 and 1600 are unchanged, but 1039 and 2239 are new. Their slots were appended to two of the daily blocks. They increase the number of ice broadcasts to four per day. The vacated 1810 slot is now designated as a "spare," and it is currently being used for "experimental weather products."

The listed frequencies for Boston are 4235.0 (0230-1039), 6340.5, 9110.0, and 12750.0 (1400-2239), all in kHz and USB. The resulting dial frequencies are 4233.1, 6338.6, 9108.1, and 12748.1.

Settings are the same as for New Orleans, and all other US radio fax. These are 120 lines per minute, with an index of cooperation of 576.

Boston's web page is at **http://weather.noaa.gov/fax/marsh.shtml**.

The new schedules have been added to this column's web site. See you in September.

ABBREVIATIONS USED IN THIS COLUMN

ALE ..... Automatic Link Establishment
ARQ..... Automatic Repeat reQuest
CAMSLANT ..... Communications Area Master Station, Atlantic
CAMSPAC ..... Communications Area Master Station, Pacific
COTHEN..... US Customs Over-The-Horizon Enforcement Network
CW ..... On-off keyed "Continuous Wave" Morse telegraphy
DHFCS..... UK Defence High-Frequency Communications System
DSC..... Digital Selective Calling
FAX..... Radiofacsimile
FEMA..... US Federal Emergency Management Agency
FSK..... Frequency-Shift Keying
HFDL ..... High-Frequency Data Link
HFGCS ..... High-Frequency Global Communications System
LSB ..... Lower Sideband
MARS..... US Military Auxiliary Radio System
Meteo ..... Meteorological
MFA..... Ministry of Foreign Affairs
MX..... Generic for Russian single-letter beacons/markers
NATO..... North Atlantic Treaty Organization
Navtex ..... Navigational Telex
PACTOR ..... Packet Teleprinting Over Radio, modes I-IV
PSK..... Phase-Shift Keying
RTTY ..... Radio Teletype
S28..... Russian UVB-76 "Buzzer," probably strategic broadcasts
Selcal..... Selective Calling
SESEF..... Shipboard Electronics Systems Evaluation Facility
SITOR..... Simplex Telex Over Radio, modes A & B
Stanag 4285 ..... NATO 8-PSK multispeed data mode
UK..... United Kingdom
Unid ..... Unidentified
US ..... United States
USAF..... US Air Force
USCG ..... US Coast Guard
V13..... Taiwan "New Star," music and numbers in Chinese
VC01 ..... Robotic "Voice Chip" Chinese numbers
XPA..... Russian Intelligence, tone-coded numbers messages
WMD-CST..... US Weapons of Mass Destruction Civil Support Team

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 "D"-OXJ, Torshavn Radio, Faroe Islands; SITOR-B Navtex gale warning, at 2030 (Patrice Privat-France).

2187.5 212176000-Cyprus flag cargo vessel *Pearl River* (5BBH2), DSC to Stockholm, at 2127 (Privat-France). 9HA2161-Maltese flag vessel Crystal Skye, DSC safety test with Göteborg Maritime Rescue Coordination Center, Sweden, at 2137 (MPJ-UK).

2789.0 FUE-French Navy, Brest/Kerlouan, taking Stanag 4285 priority messages from vessels "FB" and "FD, then back to test loop, at 1954 (MPJ-UK).

3246.0 Unid-Russian Air Defense, CW null-data strings, also on 4380 and 5221.5, at 2048 (MPJ-UK).

3924.0 MTI-UK Royal Navy. Plymouth, "colors" weather forecasts, at 0741 (Michel Lacroix-France).

4168.5 XSS-UK DHFCS, Forest Moor, ALE sounding; also 8107, 8182, 9022, 9286, 14485.5, 15040, 15043, and 22571; at 1931 (Lacroix-France).

4258.0 The Chinese Robot (VC01), rapid-fire "female" machine-voice numbers at 1351 (Ary Boender-Hong Kong remote).

4350.0 Unid-Mexican Navy, Tadiran system using various voice and digital modes with a 1000-hertz beep at start of each transmission; similar activity on 4470, 4625, 4650, 4675, 4700, 4730, 4820, 4865, 4880, 4885, 4890, 4910, 4920, and 4930; at 0309 (Hugh Stegman-CA)

4553.5 ZLST-German Customs, Cuxhaven, ALE to ZHEL, Customs Boat *Helgoland*, at 1555 (Lacroix-France).

4625.0 The Buzzer-Russian military (S28), voice messages from MDZhB with callups Barash, Barvena, and Gardinol, at 0829 (Boender-Estonia remote).

4627.0 S28, voice messages from MDZhB with callups Karboratsiya, Karbitka, and Karbaktoks, at 0936 (Boender-Estonia).

4956.0 FAV22-French military, Favières/Vernon, CW Morse practice in 5-letter-group drill messages; similar on 5320, 5419, 6899, 7823, 7966, and 9213; at 1754 (MPJ-UK).

5208.0 HQ703N-US National Guard headquarters, VA, calling I070AN, IA; also on 5875, 7420, and 7549; ALE at 1930 (Jack Metcalfe-KY).

5258.0 BP24-German Federal Offshore Police Boat *Bad Bramstedt*, calling BPLEZS, Location and Operations Center, Cuxhaven, also on 8132, ALE at 0831 (Lacroix-France).

5680.0 Kinloss Rescue-UK Royal Air Force Air Rescue Co-ordination Centre, working 122, a Sea King helo, at 2018 USB (Lacroix-France).

6697.0 "T-6-W"-NATO aircraft, working MKL, UK Allied Movement Coordination Centre, at 1358 (MPJ-UK).

6712.0 B-6545-China Eastern Airlines A330, flight MU0552, HFDL log-on with Reykjavik, at 2052 (MPJ-UK).

6721.0 277184-USAF C-17 number 07-7184, ALE sounding at 1355 (Privat-France).

6996.0 Showdown 481-Unknown US agency, calling Step Mother, no joy, at 1559. Drop Kick-US exercise call, hours of clear voice coordination and long data modem transmissions with Payroll, starting at 1609 (Metcalfe-KY). *[This and similar on other frequencies is a recurring national interagency exercise involving US military, MARS, and several government agencies. -Hugh]*

7389.0 NWVC-Historic memorial on World War II US Navy vessel *LST 325*, Evansville, IN, working amateurs on 7265 kHz for annual Armed Forces Day Crossband Test, at 0150 (ALF-Germany).

7420.0 MNC55NG-55th WMD-CST, MN, calling CAC9NG, 9th WMD-CST, CA, ALE at 1735 (Metcalfe-KY).

7428.0 FC1FEM002-FEMA Region 1, MA, ALE sounding at 2100 (MDMonitor-MD).

7527.0 PAC-USCG CAMSPAC, Pt. Reyes, CA, calling 703 (USCG HC-130H #1703), COTHEN ALE at 0638 (Privat-France).

7536.0 Unid-Probable US military intercept training, broadcasting a public domain LibriVox audio book *Huckleberry Finn: Chapter 8*, alternating male and female voices, similar activity on 6950 and 6990, at 1507 (Metcalfe-KY).

7598.0 IEA661-Italian Carabinieri, Cantu/South Como, LSB net check-in at 0726 (Lacroix-France).

7801.0 RHC84-Russian Navy, coded CW message to RCV in 5-letter groups, at 0453 (PPA-Netherlands).

7811.0 "American Forces Network"-US Navy Saddlebunch Key, FL, comm station, repeating Armed Forces Radio/TV Service Interruptible Voice Channel, talk show at 0536 (PPA-Netherlands).

7815.0 RMW32-Russian Navy, calling RMW44 and RMW36, CW at 0517 (PPA-Netherlands).

7816.7 Unid-Egyptian MFA, SITOR-A Arabic diplomatic traffic; similar on 13980, 14436.7, 20126.7, and 20574.7; at 1938 (PPA-Netherlands).

7837.0 RBEG-Russian Navy vessel, calling RCV, CW at 0522 (PPA-Netherlands).

7850.0 CHU-Canadian National Research Council, Ottawa, standard time signals at 2217 (PPA-Netherlands).

7880.0 DDK3-Hamburg/Pinneberg Meteo, Germany, FAX upper-level chart at 0615 (PPA-Netherlands).

7898.0 049133-German Red Cross, sounding in LSB ALE; then calling DEK3510, DEK38, DEK40, DEK41, and DEK42 in PACTOR-I; at 1747 (PPA-Netherlands).

7959.0 REA4-Russian Air Force strategic broadcast, coded message in FSK Morse at 1940 (MPJ-UK).

8058.6 KXV 44-US Department of State, voice followed by ALE with KXV 45, at 0800. KWR 86-US Department of State, calling KWX 57, ALE at 0813 (Lacroix-France).

8060.0 BOZ-Colombian Navy, working KM2, ALE at 0655 (Lacroix-France).

8472.0 WLO-ShipCom, AL, world news in RTTY at 1142, and SITOR-B at 1145 (Mario Filippi-NJ).

8764.0 CAMSPAC-USCG, Point Reyes, CA, signing off after Pacific weather bulletin in "Iron Mike" computer voice, at 0450 (Robbie Spain-WY).

8912.0 D69-US Customs, P-3B "Slick" reg N769SK, COTHEN ALE sounding at 0249 (MDMonitor-MD).

8942.0 PK0781-Pakistan Airways B777 reg AP-BGZ, HFDL position for Shannon ground station, Ireland, at 0738 (Privat-France). GAF624-German Air Force A319 number 15+02, HFDL position for Shannon, at 1048. DAH100-Air Algérie A330 reg 7T-VJY, HFDL position for Shannon, at 1057 (MPJ-UK).

8977.0 G-VSHY-Virgin Atlantic A340 "Madam Butterfly," flight VS0603, HFDL log-on with Reykjavik, Iceland, at 1918 (MPJ-UK).

8992.0 Ali Baba-US military, likely command post aircraft in major exercise, with EAM (prefix PAUUA3), at 0010 (Jeff Haverlah-TX).

9019.0 FCSFEM3001-Unknown FEMA, calling HYR, also unknown, ALE at 1518 (Metcalfe-KY).
9090.0 KM0-Colombian Navy, ALE link checks with BAS and SEB, at 0500 (ALF-Germany).
9243.0 Unid-Russian Polytone station (XPA), multi-tone callup and message in 5-figure groups; similar on 9288, 10243, and 11488; at 1940 (PPA-Netherlands).
9253.0 Manaus-Brazil Navy, working River Patrol Vessel *Rondonia* (P-31), in Portuguese, at 0150 (ALF-Germany).
9276.0 New Star Radio Station (V13), Program #3 with music and live female with coded messages, at 0700 (Boender-Hong Kong).
9278.6 Unid-North Korean MFA, short call to unknown station in 600/600 ARQ, at 0600 (PPA-Netherlands).
9295.0 TRYNY-US National Guard, Troy, NY, ALE sounding at 0435 (PPA-Netherlands).
10066.0 VP-BWG-Aeroflot A319 flight SU2232, HFDL position for Hat Yai ground station, Thailand, at 1550. UK-32012-Uzbekistan Airways A320 flight 612, HFDL position for Hat Yai, at 2049 (MPJ-UK).
10075.0 UK-32017-Uzbekistan Airways A320 flight 610, HFDL log-on with Al-Muharraq ground station, Bahrain, at 2152 (MPJ-UK).
10087.0 LAA620-Libyan Arab Airlines, HFDL position for Krasnoyarsk ground station, Russia, at 2220 (Privat-France).
10100.8 DDK9-Deutscher Wetterdienst (German Weather Office), Hamburg/ Pinneberg, RTTY marker and identification, at 0450 (Stegman-CA) DDK9, with RTTY identification DDK2/ DDK7/ DDK9, and frequencies, at 2242 (Filippi-NJ).
10150.0 Drop Kick-US exercise, came from 6996 for Payroll, but no joy, at 1623. Looking Glass, working Head Master, who had traffic for Poker Face, at 2018 (Metcalfe-KY).
10194.0 FC8FEM006-FEMA Region 8 communications, CO, ALE at 0857 (Lacroix-France).
10242.0 D43-US Customs P-3 reg N143CS, COTHEN ALE sounding at 0548 (PPA-Netherlands).
10263.0 RAL2-Russian military; CW radio checks with RRHQ2, RGH2, and RBL66; at 0608 (PPA-Netherlands).
10543.0 RCV-Russian Navy Black Sea Fleet headquarters, Sevastopol, CW traffic with vessel RMCW, at 1744 (MPJ-UK).
10585.0 NJT-US National Guard 21st WMD-CST, NJ, calling DTRA1, US Defense Threat Reduction Agency, VA; also on 12212 and 17478.5; ALE at 2016 (Metcalfe-KY).
10588.0 WGY907-FEMA Region 7, MO, patch to WGY908, FEMA Region 8, CO, at 1605 (Metcalfe-KY).
10711.0 Power Bill-Possible US Navy, testing many modes with Norfolk SESEF, at 1609 (Metcalfe-KY).
10872.3 "K"-Russian military, Petropavlovsk, CW cluster beacon (MX), at 0938 (Eddy Waters-Australia).
10872.4 "M"-MX, Magadan, at 0940 (Waters-Australia).
11039.0 DDH9-Hamburg/ Pinneberg Meteo, Germany, with RTTY identification DDH47/ DDH9 /DDH8, and weather in German, also on 14467.3, at 2236 (Filippi-NJ).
11168.6 KWA43-US State Department, ALE with KXV45, at 0739 (Lacroix-France).
11175.0 Navy Lima November 45A-US Navy P-3C, radio check with Offutt HFGCS, NE, at 1125. Navy Lima Lima 16, radio check with Puerto Rico HFGCS, PR, at 1152. Skull 23-USAF B-52, radio check with Offutt HFGCS, at 2247 (Stern-FL).
11220.0 Pack 93-Possible NH Air National Guard tanker, came from 11175 for coded traffic from Andrews HFGCS, at 1612 (Stern-FL).
11232.0 Lima Lima 56-US Navy P-3C, working Canadian Forces Trenton Military, ONT, for weather, at 1325 (Stern-FL).
11430.0 New Star (V13), Program #4 with music and numbers, at 0500, 0600, 1200, and 1300 (Boender-Hong Kong).
11450.0 EPA-Colombian Navy, calling KM3, ALE at 0709 (PPA-Netherlands).
11481.0 GWPWB33-Brazilian Navy, Belem, calling GWPWIN, vessel *Independencia* (F44), at 0618 (PPA-Netherlands).
11494.0 09X-COTHEN remote transmitter, Omaha, NE, ALE sounding at 0340 (PPA-Netherlands).
12070.5 Desert Eagle-US exercise, clear voice data coordination with Head Master, passing unencrypted modem transmissions of MARS regional weather information, at 2043 (Metcalfe-KY).
12087.0 N010HN-US National Guard, NH, calling N011HNEMERGEN, NH emergency, ALE at 1756 (Metcalfe-KY).
12222.0 VAI-USCG Cutter *Valiant* (WMEC 621/ NVAI), COTHEN ALE sounding, at 0734 ALE (Lacroix-France).
12577.0 235089094-Gas tanker *Tracy Kosan* (2EYB2), DSC to Olympia Radio, Greece, at 0758 (Privat-France). 3FAZ3-Panama flag vessel *Louise Bulker*, DSC test with Madrid rescue center, Spain, at 1338 (MPJ-UK). Unid-Unknown vessel with selcal MKCV for TAH, Istanbul Radio, Turkey, listening on 12654, at 2242 (PPA-Netherlands).
12581.5 WLO-ShipCom, Mobile, AL, CW identification in SITOR-A marker, at 0407. XSV-Tianjin Radio, China, CW in SITOR-A marker, at 2159 (PPA-Netherlands).
12584.5 WLO, CW identification in SITOR-A marker, at 0440 (PPA-Netherlands).
12585.0 NRV-USCG, Guam, CW identification in SITOR-A marker, at 1627 (PPA-Netherlands).
12590.5 KLB-ShipCom, Seattle, WA, CW identification in SITOR-A marker, at 0445 (PPA-Netherlands).
12593.0 PNIM-Russian military, CW tactical calling marker to KALE, at 0456 (PPA-Netherlands).
12599.5 UAT-Russian military, Moscow, SITOR-B marker for listening on 8431.5, 8391.5, 12497, and 12599.5; holding no traffic, at 0855 (PPA-Netherlands).
12603.5 SVO-Olympia Radio, Greece, SITOR-B news in Greek, at 1312 (Lacroix-France).
12613.0 XSQ-Guangzhou Radio, China; SITOR-A test with sync bursts, "quick brown fox," tones, and count 012345678; identified in CW, at 2204 (PPA-Netherlands).
12629.0 TAH-Istanbul Radio, Turkey, testing in SITOR-A with test tones and slow reversals, at 1632 (PPA-Netherlands).
12637.5 XSG-Shanghai Radio, China, CW identification in SITOR-A marker, also on 12649.5, at 1631 (PPA-Netherlands).
12641.0 SAB-Goeteborg Radio, Sweden, hex identifier 0xDE in Globe Dataplex channel-free marker, at 0506 (PPA-Netherlands).
12788.0 NMG-USCG, New Orleans, LA, "Iron Mike" voice weather forecast, at 1128 (Filippi-NJ).
12823.5 CTP-Portuguese Navy, RTTY channel availability marker, at 0604 (Waters-Australia).
13303.0 G-VRED-Virgin Atlantic A340 "Scarlet Lady," flight VS652W, HFDL position for Canarias ground station, Canary Islands, at 1452 (MPJ-UK).
13312.0 D44-US Customs P-3 reg N144CS, COTHEN ALE sounding at 1905 (MDMonitor-MD).
13315.0 ZS-SNG-South African Airways A340 flight SA0204, HFDL log-on with Santa Cruz ground station, Bolivia, at 2122 (MPJ-UK).
13371.0 7W6A-Russian military net control station, passing CW message in 30 5-letter groups to OR8H, at 1336 (MPJ-UK).
13527.7 D-MX, Odessa/Seva, CW at 1300 (MPJ-UK).
13527.8 P-MX, Kaliningrad, CW at 1301 (MPJ-UK).
13528.3 K-MX, Petropavlovsk/ Kamchatskiy, CW at 1302 (MPJ-UK).
13528.4 M-MX, Magadan CW at 1303 (MPJ-UK).
13900.0 BMF-Taipei Meteo, Republic of China, FAX fishery forecast at1520 (PPA-Netherlands).
13902.0 72-Singapore Navy vessel *Stalwart*, calling CN4, ALE at 1730 (PPA-Netherlands).
13907.0 ROS-USCG Cutter *Spencer* (WMEC 905/ NROS), COTHEN ALE sounding at 1745 (PPA-Netherlands).
13920.0 VMC-Charleville Meteo, Australia, FAX wind chart at 0633 (PPA-Netherlands).
13927.0 Skier 92-NY Air National Guard LC-130 equipped with retractable skids, passing maintenance status alpha-2 in patch via MARS station AFA9AY, CA, at 1739 (Stern-FL).
13988.5 JMH4-Japan Meteo Agency, two FAX prognostic charts at 1746 (PPA-Netherlands).
13993.0 AFA1FF-USAF MARS Transcon Net, working AFA1MP and AFA1CJ, at 1903 (PPA-Netherlands).
14438.0 RDL-Russian Navy, CW flash message at 1612 (PPA-Netherlands).
14484.0 Green Acres-US exercise, passing same coded message to Desert Eagle, Big Top, Horse Trader, Looking Glass (airborne command post?), Poker Face, Head Master, and WGY9136 (FEMA); at 1524. Showdown 455, line-formatted exercise message for Head Master, who then called Granite Sentry and Showdown 645 for checks, at 1646. Horse Trader, went to 14876 with WGY914 (FEMA, GA) to pass traffic, at 2004 (Metcalfe-KY).
14670.0 CHU-Canadian National Research Council, Ottawa, standard time signals at 0642 (Waters-Australia).
14710.0 HKI2-Finnish MFA, Helsinki, working RIA, Riyadh embassy, Saudi Arabia, at 1701 (MPJ-UK).
14822.5 S1B-Lithuanian Navy, working P1G, also on 14447, ALE at 1808 (MPJ-UK).
14876.0 Head Master, came from 14484 for Poker Face, then RTTY passing an unclassified exercise message concerning a "nuclear event," at 2025 (Metcalfe-KY).
14885.0 NGHFON-Unknown US military, working MNC, MNT, and WYT; all with ALE text messages, at 1615 (Metcalfe-KY).
15025.0 CS-TFX-Hi-Fly A340 flight 5K0101, HFDL position for Reykjavik, at 1519 (MPJ-UK).
15867.0 LNT-USCG CAMSLANT Chesapeake, VA, calling N10, USCG HC-144A #2310, at 1535 (MDMonitor-MD).
15937.0 ZLO-New Zealand Navy, Irirangi, 7-channel RTTY (BR 6028 mode), at 0620 (Waters-Australia).
16258.3 Unid-Possible Indonesian military, calling FORMUSA in PACTOR-I, then went to PACTOR-II for encrypted text, at 0711 (Waters-Australia).
16261.7 Unid-Possible Indonesian military tsunami alert, calling NAUTILUS in PACTOR-I, at 0230 (Waters-Australia).
16332.2 "F"-MX, Vladivostok, CW cluster beacon at 0943 (Waters-Australia).
16898.5 XSG-Shanghai Radio, China, SITOR-B traffic list and bulletins, at 0651 (Waters-Australia).
17116.7 PBB-Van Helder Radio, Netherlands, RTTY channel availability marker at 0602 (Waters-Australia).
17145.0 NMG-USCG, New Orleans, LA, new FAX broadcast schedule *[Changed April 3, 2012 -Hugh]*, at 2036 (Filippi-NJ).
17468.0 RIW-Russian Navy, Moscow, calling RHL80, no joy, at 1456 (MPJ-UK).
17901.0 SU-GCE-Egyptair A330 flight MSR568, HFDL position for Panama ground station, at 2128 (MPJ-UK).
17912.0 "14"-HFDL ground station, Krasnoyarsk, Russia, uplinks and squitters at 0855 (Waters-Australia). B-6516-China Southern Airlines A330 flight CZ0308, HFDL log-on with Krasnoyarsk, at 1314. VQ-BFW-Ural Airlines flight U60385, HFDL log-on with Krasnoyarsk, at 1452 (MPJ-UK).
17928.0 A7-ACK-Qatar Airways A330 flight QR0087, HFDL position for Canarias, at 1356 (MPJ-UK).
17967.0 4K-AZ81-Azerbijan Airlines B767 flight J20077, HFDL log-on with Al-Muharraq, at 1435 (MPJ-UK).
18954.0 CN3-Singapore Navy, calling 209, ALE at 0758 (Waters-Australia).
21949.0 "08"-HFDL ground station, Johannesburg, South Africa, squitters at 0855 (Waters-Australia). G-VSHY-Virgin Atlantic Airbus A340 "Madam Butterfly,"' flight VS0023, HFDL log-on with Johannesburg, at 1507 (MPJ-UK).
21955.0 JY-AYJ-Royal Jordanian A321 flight RJ0542, HFDL log-on with Canarias, at 1458 (MPJ).
21982.0 "15"-HFDL ground station, Al-Muharraq, Bahrain, uplinks to many flights, at 0814 (Waters-Australia). HS-TNC-Thai Airways A340 flight TG0941, HFDL log-on with Al-Muharraq, at 1425. B-6133-Hainan Airlines A330 flight CHH492, HFDL position for Al-Muharraq, at 1548 (MPJ-UK).
21997.0 N975AV-Avianca A330 flight AV0021, HFDL log-on with Santa Cruz, at 1231 (MPJ-UK).
22445.8 KSM-Maritime Radio Historical Society commercial coastal station, Pt. Reyes, CA, CW marker "VVV de KSM…" at 2016 (Filippi-NJ).
22542.0 Unknown-Kyodo News, Japan, transmitter not known, FAX Japanese newspaper (60 lines per minute), at 0800 (Waters-Australia).
22544.6 FUM-French Navy, Tahiti, encrypted Stanag 4285 text, at 0757 (Waters-Australia).
22673.5 Unid-North Korean MFA, Pyongyang, encrypted text in 600/600 ARQ, at 0407 (Waters-Australia).
23005.0 HBD-Swiss MFA, link-protected ALE and encrypted data modem traffic, at 0640 (Waters-Australia).
25685.0 Unid-Males in Spanish, with CB-style chatter punctuated by various electronic beeps and noises, AM, faded abruptly at 0031 (Stegman-CA).

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Rivet and a New Decoder

Last month I detailed the venerable CCIR493-4 or "Australian" 4 or 6 digit selcall system. This is a versatile mode supported by many different radio manufacturers to set up HF radio links, send text messages, GPS fixes, and a number of other useful functions for today's busy world.

❖ The Rivet Decoder

Ian Wraith, based in the UK, has been steadily adding new modes to his free software decoder called "Rivet." Choosing a number of lesser-known Russian systems and working largely from first principles, Rivet now supports the following modes:

- CIS 36-50 aka BEE, a common Russian Naval FSK system (see ***Digital Digest***, March 2009)
- CROWD-36, the Russian multitone system used by Diplomatic and Intelligence stations
- FSK200/500, a Baudot-based system used by Russian Intelligence
- XPA and XPA2, a slow, multitone, 10 or 20bd mode used by Russian Intelligence stations to send five figure group off-line encrypted traffic to agents in the field

Rivet has the capability to read and decode audio from a standard soundcard input in real-time or from an 8bit, WAV off-line file or recorded audio. Received traffic can be saved to a text file and settings saved to computer, too.

One of the more unusual and pleasing aspects of Rivet is that, rather than demand the user to precisely tune a given signal, Ian lets the computer do the hard work and has the software automatically detect the tones, synchronization and other key parameters that the user might otherwise have to enter. Bravo!

Also unusual, is that Ian chose to write his software in the Java programming language. The advantage of Java is that it is available on hundreds of operating systems from simple "embedded computers" in TVs, set-top boxes and automobiles, to the usual Windows, Linux and OS X operating systems. One version of the "run time" or executable code can be distributed to users who then simply need to install Java for their operating system of choice and can immediately run the program. Bravo again.

Since releasing the first version in 2011, Rivet has grown steadily and Ian has received plenty of input from fellow listeners on the Utility DX Forum (UDXF) internet mailing list. He's also been extremely responsive to that feedback, releasing fixes and new features often within hours of the original request.

❖ Rivet and CCIR493-4?

Around the time that I was writing the July edition of this column, I saw a growing number of UDXF listeners report channels with CCIR493-4 selcall activity but with no way to decode it. Like other selcall or ALE (Automatic Link Establishment) systems, they support radio networks across multiple channels, so the more users you have with the capability to decode the identifiers, the more chances you have of being able to piece together the network structure in addition to the basics of how many channels are in use.

To my knowledge, the CCIR493-4 mode is only supported by the original radios themselves or by high-end decoders like WaveCom and Hoka, despite it being a relatively simple system. Having used Rivet for a while, I wondered if Ian might be up to the challenge of adding CCIR493-4 to his software to open up this interesting system to more users. I contacted Ian, asked if he would be interested in building a decoder, and sent him a link to the detailed specifications.

To my delight, I got a reply from Ian in very short order saying that he'd give it a go. I think it was within a week of my sending that email that the first version was in my hands and running under Windows XP and Mac OS X Lion. Unfortunately, the initial versions proved to have a bug that prevented proper decoding, which Ian spotted and corrected. Within another week or so I was decoding the selcall activity on the Colombian Navy channel of 12230kHz USB.

You can see a saved text file of Rivet decoding CCIR493-4 activity below:

Rivet (Build 24) by Ian Wraith
6:10:56 PM CCIR493-4 Individual Selective Call Station 9201 Calling 9213 (Routine)
6:34:30 PM CCIR493-4 Individual Selective Call Station 9218 Calling 9201 (Routine)
7:10:38 PM CCIR493-4 Individual Selective Call Station 9201 Calling 9214 (Routine)
7:24:19 PM CCIR493-4 Individual Selective Call Station 9218 Calling 9201 (Routine)
8:06:06 PM CCIR493-4 Individual Selective Call Station 9207 Calling 9201 (Routine)
8:17:41 PM CCIR493-4 Individual Selective Call Station 9207 Calling 9201 (Routine)
8:24:56 PM CCIR493-4 Individual Selective Call Station 9201 Calling 9213 (Routine)
8:31:34 PM CCIR493-4 Individual Selective Call Station 9201 Calling 9203 (Routine)

Check out the Resources section for details of where to download Ian's software, and happy CCIR493-4 hunting! We can certainly do with more testers, since most of the networks I can hear are only using the selcall feature, and not other functions like GPS fix, telephone call, fax, etc. The more testers and feedback, the better the software will be!

❖ Algerian Army Update

As I mentioned in the May 2012 edition of this column, the Algerian Army ALE networks have changed identifiers every so often over the past years. Unsurprisingly, no sooner was the May column published, than I began to see reports of different identifiers in use. The new series of the letter-letter-number-number identifiers appears to include:

BD10
FN20, 40
JE42
MX40, 43, 47, 48, 50, 52, 53, 54, 56, 57, 60, 61, 62
PT01, 40
WA01
XA01
XL13, 15, 18, 21, 22
XT01
XV01
ZB20
ZT02

❖ Taiwanese Navy Update

The Taiwanese Navy appears to have reactivated its MIL-188-141A ALE network using some amusing six letter identifiers familiar to many a Scrabble® addict. How Apple2 got in there, is something I'd love to know. Nevertheless, here they are:

ABACUS, ABDUCT, ABJECT, ABLAZE, ABOARD, ABOUND, ABROAD, ABSEGC, ABSURD, ACACIA, ACCEDE, ACCENT, ACCESS, ACTUAL, ADJUST, ADMIRE, ADROIT, AFFORD, AGHAST, AIRGUN, AIRPLE, AJRENN, AMBUSH, AMOUNT, ANSWER, ANTENN, ANYHOW, ANYWAY, APHALE, APPCEF, APPEAL, APPEAR, APPLE2, ARIGHT, ASLANT, ASSAIL, ASSORT, ASSURE, ASTYRE, ATTEND, AWHILE, AWNING and AZALEA

Frequencies in use include:
5123, 5433, 6066, 6659, 6747, 7137, 7216, 7508, 7642, 7841, 8051L, 8171, 8173, 8251, 8777, 9169, 9202U/L, 9330, 9392U/L, 9881, 10109, 10180U/L, 10410, 10660U/L, 10755U/L, 11218, 11261, 12184, 13410, 14350L, 14360, 14919L, 16000, 16180, 17420, 17460, 18035U/L, 19160, 19180, 20190, 21860kHz USB (unless denoted by L for LSB or U/L for both)

Data is sent using the MIL-188-110A HF serial tone modem.

That's all for this month. The best of digital DX to you!

RESOURCES

Rivet Decoder: **github.com/IanWraith/Rivet/downloads**

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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Of Mics and Men: Transmit Audio, Part 2

In anticipation of this month's topic, I was playing around in the June VHF QSO Party and paying extra attention to transmit audio quality – other ops' and my own. Thanks to the spectrum display on my FLEX-1500 software-defined transceiver, it was interesting to watch the "shape" of each transmitted SSB signal as I listened to it. Using a "hills and mountains" analogy, some signals looked wide and lazy, with gently sloping "skirts" on each side (hills), while others jutted sharply out of the noise, with little or no RF energy outside their defined pass-bands (mountains).

The audio quality (sound quality) of these signals didn't seem to vary whether hill or mountain, but I suspect that mountain-type signals have better signal-to-noise ratios because all of the transmitted signal energy is contained and well-organized in a more tightly defined area. I suspect, but I can't say definitively, that the mountain-type signals were generated by newer radios with Digital Signal Processing or Software Defined Radio/DSP-based transmitters (more on that later).

As for my own signals, since last year's QSO Party and Field Day (the only times I really use Single Side Band), I had updated the firmware on my radio, which reset some of the rig's many settings, including those that defined audio gain, equalization, TX bandwidth, compression, etc. I hadn't written down the settings I'd been using before, so I had to "guesstimate." Because I was running late to the party, I didn't have time to work a buddy or two on the air to test all of my SSB settings. You could say that I was in a very typical situation!

Because I was running only 5-7 watts, I hastily prepared a "contest oriented" TX profile with a little equalizer (EQ), some compression and a slightly restricted TX bandwidth, and I carefully set the mic gain to get the proper readings for voice peaks on the ALC (Automatic Level Control) scale when transmitting. I then dove into the contest...

Things were really slow for most of the first day, so I did manage to ask a couple other ops if my signal sounded okay. They both said it sounded fine, but on day two, after completing a QSO made difficult by interference and noise, the other op remarked that my signal was difficult to understand. Yikes! Did he mean my TX audio, or was he just commenting on the crowded band conditions? I guess I'll never know!

The experience illustrates the fact that, at least to some degree, TX audio quality is somewhat subjective. Everyone has different ears and different neurology, and we all have at least slight variations in "what sounds good to us." In balancing those individual factors, though, you can't argue too much with the physics of transmitting human speech to human ears via SSB.

After more than 100 years of amplifying and transmitting human speech electronically, we know an awful lot about what it takes to get the job done right, but putting all of the pieces into place for the average ham can still be maddening. When it comes to TX audio, we all want a simple thing (in theory) that can, unfortunately, get very complex (in practice). My assumption is that we all want great-sounding TX audio that's optimized for the task at hand. How we achieve that varies widely from voice to voice, rig to rig, etc, and is the topic of this month's column.

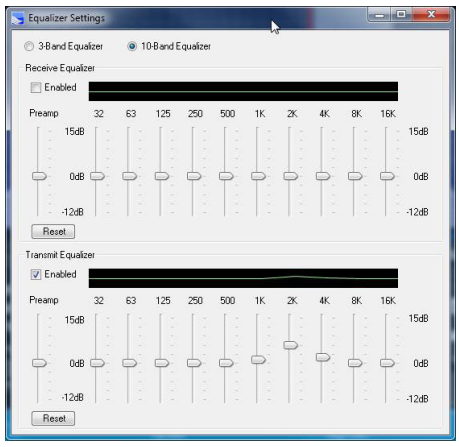
Before we get too far, it's important to remember that when it comes to TX audio, one size doesn't fit all. Broadcasting and, to some extent, ragchewing, emphasize clarity and fidelity, but contesting and DXing rely mostly on clarity, with fidelity taking a back seat. The punchy, focused clarity of a signal crafted to – above all else – break through a crowded pileup, isn't the same audio you'd like to use for extended ragchews with your buddies. It's very effective for DXing and contesting, but it's outright annoying for "easy listening."

In Part 1, back in the January 2012 issue, we looked at mics, connectors and impedance matching, and referenced the *2012 Buyer's Guide*, which compared several mics (and mic types) across several usage categories and price points. If you can, go ahead and review these before we move on.

❖ Lots of Variables!

Even if we know the sound we're looking for (listening for?) and our exact usage scenario, accommodating all of the variables required to achieve "perfect audio" can be almost overwhelming. Consider these (knowing that I've left some factors out):

- ***Voice types*:** A deep, booming male voice contains audio frequencies and amplitudes that are quite different from a higher-pitched female voice, for example. Every voice is unique, but some voices are easier to reproduce faithfully over SSB circuits. Voice types in the middle of the two extremes mentioned above are a lot easier to work with.
- ***Mic types*:** As we learned in Part 1, mics come in a variety of configurations, including dynamic, electret, crystal, etc, in a variety of characteristic impedances, with a variety of connectors. For optimal results your radio must be designed to work with your mic, or you're way behind from the get-go.
- ***Mic element*:** Mics can be designed for a broad frequency response (stage or broadcast mics) or a much narrower "communications grade" response (telephones, aircraft radios, etc). You can restrict or modify the response of a wide-range mic, but you can't practically "expand" the frequency response of a communications mic.
- ***Mic positioning***: How a mic "sounds" with your particular voice can vary widely with how it's positioned relative to your mouth (and, secondarily, to how you speak). Placing the mic right in front of your mouth, for example, often emphasizes "plosives" (P and B sounds), while placing it off to the side can eliminate these issues and produce a much more natural sound.
- ***How you talk*:** Speaking with a wide dynamic range (softly, loudly and everything in-between) sounds great for classical music announcers, but you'll have better results as a ham if you apply a little "built-in AGC," keeping your voice output level and well-modulated.
- ***Speech amps*:** It's not talked about much, but the characteristics of your rig's speech amplifier can help or hinder your efforts to achieve the best possible TX audio. In some rigs, especially older rigs, the speech amp is almost an afterthought. But its frequency response and distortion characteristics can be important – especially if they're bad!
- ***Mic EQs***: Many newer radios, especially those with TX DSP, incorporate full-range audio equalizers right in the radio. These can be difficult to adjust on the fly, but can really



Many modern DSP-based rigs include some type of RX and TX equalization. Shown here is the RX/TX equalizer built into the FLEX-1500 SDR, which offers up to 10 EQ bands and +15/-12 dB control range. – NT0Z

compensate for "other issues" in the audio chain. These internal EQs are definitely desirable, but external EQs are often easier and more convenient to adjust.

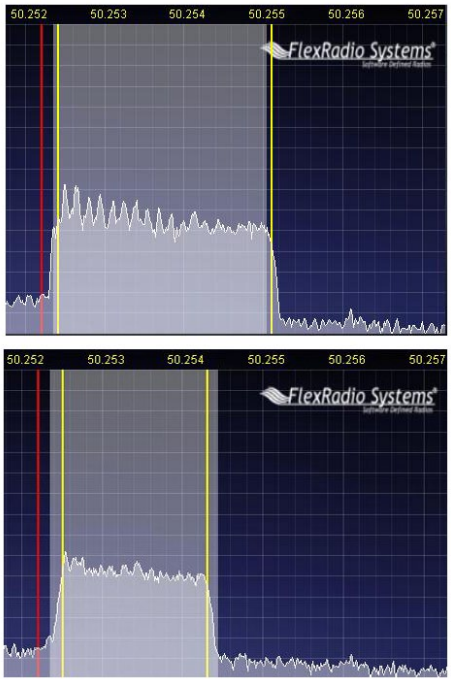
- ***Speech processors***: Many rigs have built-in audio or DSP speech processors. A little compression goes a long way. Too much compression really spoils the soup.
- ***Interstage coupling*:** Even if your mic and speech amp are top notch, if the speech amp isn't coupled correctly to follow-on stages (especially to the TX mixer and TX IF amplifier), your sound can be degraded. More than a few rigs suffer from audio coupling issues (in RX and TX amplifiers).
- ***TX mixer*:** Once your rig's audio, whatever shape it's in at this point (influenced by all preceding factors), gets converted to RF in the TX mixer, it's still far from being free from undue influence. The accuracy and fidelity of the TX mixer (linearity, distortion, amplifier class, harmonic content, etc) directly colors your TX audio. High performance is desirable at this stage of the game!
- ***TX IF filters***: Conventional transmitters use crystal IF filters (one or more) to directly shape the bandwidth (and hence, the audio frequency response) of the transmitted SSB signal. In most cases this is a "non-negotiable, law of physics" factor: If your rig's TX IF and filter is designed to pass audio signals from 300 to 2700 Hz, signals outside that range will be greatly attenuated.
- ***TX drive and carrier power***: Too much drive and too much carrier power make it difficult or impossible to achieve perfect SSB signals.
- ***RF amplifiers, internal and external***: The linearity and distortion characteristics of your radio's TX RF circuits (or external linear amplifier) affects the "sound" of your transmitted signal. Manufacturers have been paying more attention to these circuits lately, as TX IMD and other "TX cleanliness" factors are ways to differentiate contest-grade rigs from the masses. In-depth reviews in *QST* and elsewhere are detailing TX IMD and related characteristics, making it easy to spot expensive radios that have awesome, high-performance receivers but bargain-basement transmitters!

This list, as big as it is, isn't exhaustive. There are other factors to consider, but I'm sure you get the idea! You can't even rely on the SSB monitor built into higher-end transceivers. It only samples the TX audio before it's converted to RF – useful, but not a complete picture.

❖ Tune Up and Test, Test, Test!

- Instructions that cover how to handle all of the above-mentioned factors are far beyond the scope of this column (and require access to oscilloscopes, calibrated power meters and two-tone generators, etc). Let's focus on a few key practices that will put you far ahead of the average ham.
- Before optimizing your SSB TX audio, make sure your rig is in good working order and that you are familiar with how to use it, tune it up (if necessary) and access any and all controls relating to TX audio (gain, bandwidth control, processing, etc). Read the manual, and then read it again!
- Make sure your mic is of good quality, has a response that's appropriate for your needs (ragchewing, DXing, contesting), and can be appropriately connected to your radio.
- For initial tests, use a dummy load! Don't test on the air, especially on an open band, unless your call sign happens to be TEST...
- If your rig has internal EQs, set them for a "flat" response. Turn off any speech processing for now.
- Make sure your TX is tuned up and set an RF power output to a point that is well below the rated maximum (to avoid IMD, splatter and the chances of overdriving the RF amplifiers).
- Scour your rig's user manual to learn how to adjust your mic gain for proper modulation. When transmitting, the meter on your rig can usually be switched to "ALC mode," which helps you set the audio/modulation levels properly. *This is a critical adjustment!* If you mess up here, everything else gets worse. Too little modulation reduces RF output power, while too much causes distortion. You want the sweet spot, which is what the ALC meter will help you achieve.

At this point, you should have a properly adjusted mic/radio transmitting a clean SSB signal into your dummy load. If you have a second receiver and a pair of headphones you can listen to your own signal. You may have to disconnect the antenna or use just a short piece of wire as an antenna to keep signal levels appropriate. You should also turn off noise blankers and receiver-based DSP to provide an "undoctored" signal. Remember: This is the "baseline sound" for your particular voice, mic and radio, with no EQ and no processing (remember that the sound can be "colored" by the particular receiver you're using). At this point, some setups sound great. If so, congratulations! If not, there's work to be done!



Unlike conventional radios that use fixed-bandwidth crystal filters to ultimately define their TX bandwidths, DSP-based rigs and SDRs can offer adjustable TX bandwidths (in addition to any audio equalization or speech processing, etc). Shown here is the 6-meter SSB TX output of my FLEX-1500 transceiver (looks like I need to work on my personal EQ settings!). The top trace shows a typical output bandwidth of about 3 kHz. The bottom trace shows a narrower output of about 2.1 kHz that may prove useful for QRP contesting (not yet tested). – NT0Z

Improving your baseline sound involves adjusting the audio equalization settings of an internal or external equalizer and, optionally, adjusting your radio's TX bandwidth, which is adjustable on many DSP-based radios. The EQ settings required to improve "your" sound will vary according to your voice, your mic and your rig. Experiment with the EQ settings as you transmit to get a feel for the changes that may be required.

In general, for ragchewing or other "full sound" applications, you want a reasonably flat response from 200 to 2800 Hz. For DXing and contesting a 400- to 2600-Hz response works best, with boosts of 4 to 10 dB at 1600 and 2100 Hz. Your particular mic will affect these settings, so you really do have to test, test, test.

Once you have the sound (or sounds) dialed in from your perspective, it's time to enlist an on-air helper or two to get some feedback and make further adjustments. Initial on-air tests with local hams on a dead band are best. If your helper is experienced in these matters, that's all the better. Remember to keep your RF power output within specs, and to keep your ALC settings "spot on" throughout your tests.

After your EQ settings are dialed in you may want to add a bit of compression (no more than 6 dB, please) to increase average power. With compression on you may have to readjust your mic gain/ALC settings. Have your helpers listen carefully while making compression adjustments. A little goes a long way, and you don't want to spoil all of your hard work by adding too much processing!

These are just the basics, of course, but if you follow these relatively simple steps you will be *way ahead* of the game when it comes to generating a sweet SSB signal. In a future Part 3, I will expand on equalization (TX and RX), applicable communication theory and various types of compression and audio processing.

RESOURCES

A detailed and informative presentation on SSB bandwidths and TX equalization by Bill Leonard, N0CU, can be found at **www.na0tc.org/Equalization_Presentation,_Nov_6_2010.pdf**.

Useful commercial sites: **www.w2ihy.com**, **www.heilsound.com**.

Although it's aimed primarily at "enhanced," high-fidelity SSB, **www.nu9n.com** has a gigantic collection of information and links about SSB equalization and set-up.

GETTING STARTED

THE BEGINNER'S CORNER

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The Curious World of HF Pirate Radio

At a time when the list of international broadcasters is shrinking, commercial broadcasting is numbingly predictable and other radio sources require special devices and subscriptions, it's somehow good to know that HF pirate radio continues. It's a tradition that's decades old, has a dedicated following and occupies a unique niche in broadcasting in America.

There's no way to know how many listeners tune in each day to the typical HF pirate frequency 6925 +/- 50 kHz. There's no way to know how many stations are operating, but the latest edition of the *Pirate Radio Annual* (see review below) lists more than 150 domestic HF pirate broadcasters heard last year alone.

While that may seem like an impressive number, some are one-time broadcasts, never to be heard from again, while others transmit very short programs and some make an appearance only once a year, Radio Cinco de Mayo, for example. Still, many staples of the genre, WBNY, the Voice of the Rodent Revolution, are active and prolific QSLers; their solid signals easy to tune in and reception reports can be rewarded with batches of strange ephemera. This year the Commander is running for President and will apparently do anything to get your vote.

Tips on Tuning In

While I'm not a dedicated listener, nearly every day that I do tune in during the late afternoon, evening or late at night, there will be some activity on the frequencies. Naturally, there are no schedules; length of programming varies from 10 minutes to several hours, and signal strength may be excellent or poor due to band conditions, propagation or poor engineering at the transmitter.

There is no trick to tuning in the unlicensed broadcasters, but the better your radio and antenna, the more luck you'll have. Using the general coverage receiver in my HF ham transceiver and 480 foot horizontal loop antenna, I hear quite few pirates. When band conditions have been good I've even been able to hear them on a portable radio using a telescoping whip.

Best times to listen are around holiday weekends (Memorial Day, Fourth of July, Labor Day, Thanksgiving, etc.). But most weekends the frequencies are quite active starting Friday afternoon and going through Sunday. Another time to tune in is following the death of a noted musician when some stations, Radio Ga-Ga, for example, may do a tribute.

Many HF pirates broadcast in AM; that's the mode of choice, but USB is also heard. Sometimes switching to USB on your receiver during an AM broadcast will allow the signal to be more readable. Judging from information provided by QSL cards, most HF pirates use home-brewed transmitters; vintage ham AM gear, or modified modern ham gear and wire antennas.

SSTV image following brief WFZY broadcast on 6925 kHz one of two known to occur in 2011 (Courtesy: Author)

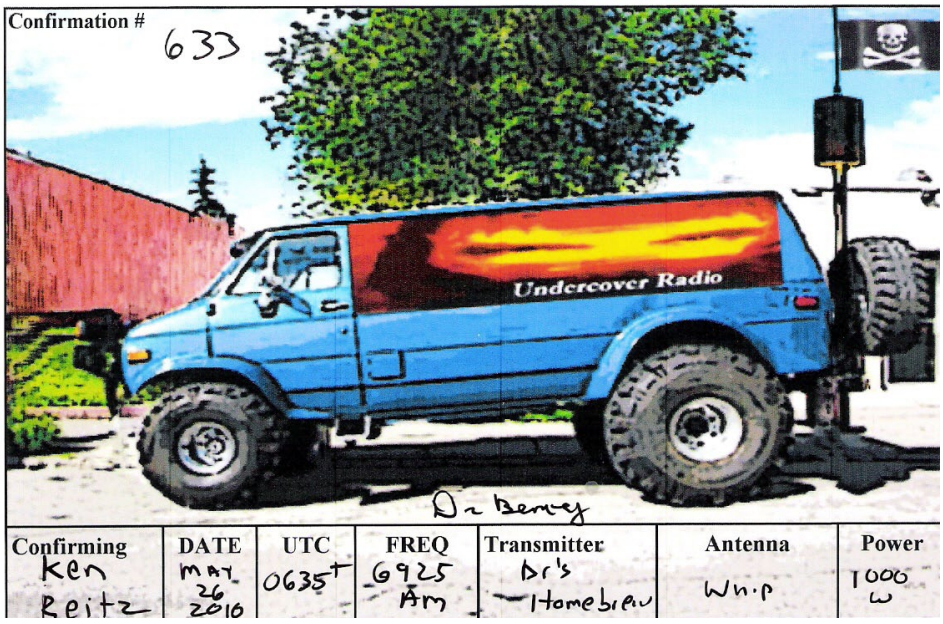
The best way to capture all the HF pirate action would be to use a Software Defined Radio (SDR) that would allow you to record a swath of frequencies for later exploring. That way you could listen to everything and not miss an SSTV image, for instance.

Without that option, you could try simply recording with a digital recorder (as I have done with moderate success) or old-fashioned cassette recorder (better audio). Set your radio to 6925 and hit the record button. The next day you can fast-forward through the gaps and catch the broadcasts. The problem with this method, of course, is that you miss broadcasts on other typical frequencies, 6930 or 6940, among others.

Sometimes, Friday evenings for example, several HF pirates can be on the air at once. I remember one time having to switch between two frequencies to try to log them both. Another problem with recording for later playback is that you have to make a note when you press the record button as to the time UTC. Otherwise, you'll have trouble keeping the transmission times straight when QSLing.

QSLing the Pirates

And that brings me to the next obvious point: QSLing the unlicensed broadcasters – which you might think impossible. Wouldn't the authorities be able to track these lawbreakers through their post office address? Yes, if they were actually announcing their street address on the air. Instead, such operators have traditionally used "mail drops," a post office box rented by a trusted individual who forwards the mail to the operators directly. Some HF pirates still receive



Undercover Radio QSL, signed by Dr. Benway, depicts a hard-to-disguise, fanciful broadcast van and took two years to arrive. (Courtesy: Author)

Wolverine Radio has a theme to their broadcasts and finish with an SSTV image depicting the theme. In this case, it was a great line-up of drinking songs. (Courtesy: Author)

QSL reports and send their QSLs in this manner.

But, it's a digital world now and HF pirates have adapted quickly to that reality which actually works out better for all involved. Most operators announce their email address on air many times during the broadcast so that, if you didn't catch it due to static crashes or fading, you'll surely be able to copy it another time. My experience is that most use the station's name followed by @gmail.com.

QSL policies vary among the pirate operators. Some will send an eQSL, which will look just like the paper version, within hours of the broadcast or the next day. Others will send eQSLs and later send hard copy versions. Many will take some time responding. Some operators will accept email SWL reports and send snail mail hard copy QSLs later, if you've included your actual mailing address. I recently received a paper QSL from Undercover Radio for a broadcast heard two years earlier that I had forgotten about. You have to be patient. Some HF pirates will not QSL, so get over it.

SWL reports to HF pirates should include: Date and frequency with a list of songs played, IDs given with the times for each listed. Give your location, receiver, antenna and mailing address. It's also helpful if you give the signal strength and quality of the audio. As explained earlier, not all pirate broadcasters will respond to a QSL request. Some, such as Wolverine Radio, never QSL, but they do end each broadcast with a different SSTV image, so have a cable handy to plug into your SSTV program to copy the image; it's all you'll ever get.

If you don't have an SSTV program for your computer you can download one for free at **http://hamsoft.ca/pages/mmsstv.php**. I've used this program for years and it does a great job. You can also get an SSTV receive-only program for your iPad at **www.blackcatsystems.com/ipad/iPad_SSTV_Pad.html**. This app is $2.99 and works quite well. In order to receive SSTV images you'll have to use a headphone attached to the speaker output of your radio. Place one of the headset cups over the microphone on top of the iPad while the app is running and tune to an SSTV frequency; an image will begin to appear. Over the years I've racked up an amazing number of stations and QSLs. If you listen regularly you will, too!

❖ Not Everyone's Cup of Grog

Pirate radio is unfettered by any rules, including decency. While many broadcasts are easily G-rated and family fun, others are laced with profanity and racism and can easily offend. If you do find such broadcasts offensive you can turn off your radio or report the broadcast to the FCC; they have an online form which lets you do so. But, the nature of such broadcasts makes it nearly impossible to catch operators in the act.

The FCC has had a spotty record of closing down such operations and recent well-publicized busts such as WEAK Radio and The Crystal Ship may be due more to field agents' luck than any planned attack. For the most part, pirate operators avoid encroaching on legitimate broadcasts from international HF broadcasters that also use the frequencies on which most pirates are found.

In order to actually close down such operations, FCC field agents have to coordinate reception from several offices and then send direction finding (DF) vehicles into a suspected area to scan the frequencies in hopes that a particular operator, who may only operate once a month, turns on their transmitter. It's not exactly a cost effective use of FCC resources. It's far more profitable to hang out in any metro area, tuning the FM band and catching FM pirates who often operate on published schedules, on the same frequency, from the same location, many times for hours, days or even weeks at a time.

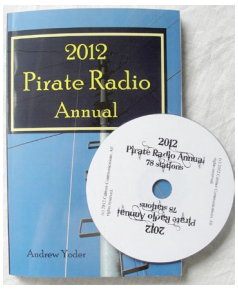
For the most part, the FCC reacts to complaints from licensed broadcasters. That's how most FM pirates are caught: A local, licensed broadcaster complains of interference from an unlicensed operator. After doing some rudimentary DF work and neighborhood sightseeing (looking for antennas), the field agents are ready to knock on the door. That's unlikely to happen to HF pirate operators. While the bands were uncharacteristically quiet following the busts last year, it wasn't long before "the usual suspects" were back on the air entertaining SWLers.

❖ 2012 Pirate Radio Annual

The 2012 *Pirate Radio Annual* by veteran HF pirate monitor Andrew Yoder was released in May and is a must read for all HF pirate enthusiasts. The book has seen increased sales from non-regular pirate listeners in the past two years, according to Yoder, so he has included more beginner-type material on how and when to best tune in. He also has written a tutorial on the issue of unlicensed HF broadcasting, the FCC's erratic reaction to such broadcasting, and what he describes as the pirate radio war that took place last year among several long-time operators which threatened to destroy the decades-old gentleman's agreement on on-air activity.

New to the 2012 edition are several articles of interest to HF pirate monitors including "A Comparison of Three Low-power AM Shortwave Pirate Transmitters" and an extensive interview with a long-time European pirate monitor.

The bulk of the 186 page book is the 121 page listing of all of the HF pirate stations heard in 2011, including a history of each station and QSL route. Some stations, such as The Crystal Ship, a long-time operator spanning several decades which was busted by FCC field agents last year, or WEAK, busted earlier in the year, warranted extensive commentary. Others, such as CQRM, an apparently one-off transmission, received only a brief mention. If you keep a log of your HF pirate catches you can check to see how active the station was that year. You may have heard the only broadcast made.



Andrew Yoder's 2012 Pirate Radio Annual with audio CD of 78 pirate radio station recordings. (Courtesy: Author)

The book includes an audio CD of 78 pirate broadcasters, most of which are actual off-air recordings which will give you an idea of what listening to these stations is like. It may also be the only chance you'll actually get to hear some of them.

The front cover of the book is a photo of the antenna system of Radio 811 in Greece and the back cover is a photo collage of 14 HF pirate QSL cards and SSTV images. The 2012 *Pirate Radio Annual* is available for $18 (includes shipping) from Hobby Broadcasting, Blue Ridge Summit, PA 17214.

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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

Summertime and the Livin' is Easy

This month we shine the *Programming Spotlight* on hot music from southern Europe, French lessons from the desert, programs beamed to Africa and much more. So hot. So cool!

❖ Diamond Jubilee

I had the opportunity to watch the coverage of the Diamond Jubilee (the 60th anniversary of Queen Elizabeth's accession to the throne) on two networks (**CBC** and **BBC World**) and later listen to the coverage on **BBC Radio 2**, via the audio archive.

The **CBC** coverage was very good. **Peter Mansbridge**, who generally hosts event coverage of this nature, had done his research, and is usually paired with someone who is an expert on the topic at hand. **BBC World** carried the coverage which was also seen in the UK. It was a bit uneven at times, focussing on trivia, and personalities. It would have been more interesting to know more about the people, events and locations than they provided.

Listening later to the **BBC Radio 2** archive, I found the radio coverage much more informative. Of course, being radio, the hosts had to be much more descriptive, describing what they were seeing as well as explaining the relevance. While it was nice to actually see the events as they took place, I think in future, I may just watch such events on the **CBC/BBC** and listen to **BBC Radio 2**.

The **World Service** also aired programming related to the occasion, which I listened to via the Internet program archive. As with most **BBC** radio programming, this is available for seven days after the broadcast, so it's very handy to go back and hear something you missed live, at your leisure.

World Have Your Say featured a debate about the relevance of the monarchy. The program ***Witness*** looked at The Sex Pistols and how they literally rocked the Queen's Silver Jubilee in 1977. The ***Art of Monarchy*** looked at objects in the Royal Collection that define the Monarchy. Live coverage of the Service of Thanksgiving was also available to be heard again. To hear any special World Service programming that is available, check out this informative web page at **www.bbc.co.uk/worldservice/specialreports/bbc_world_service_london_calling.shtml**

❖ Radio Tirana Today

Listening to Albania's **Radio Tirana** in the 1970s and 1980s was a trip and a half. Thanks to powerful Chinese-built transmitters (a legacy of Albania's break with Moscow), **Radio Tirana** was easily heard local evenings. The programming was somewhat amusing, heavy handed and loaded with Marxist-Leninist jargon and even Stalinism (Stalin was still revered here).

Enver Hoxha (pronounced Ho-dja), the Albanian leader was praised at all times. Hoxha famously proclaimed Albania the first completely atheist state in the world. For such a small nation, Albania had one of the larger shortwave broadcast operations in Europe. Their distinctive interval signal and ponderous propaganda were easily heard in North America and throughout the world. I recall being quite proud of myself when I received a QSL from the reclusive nation.

When the Berlin Wall and the Iron Curtain fell at the end of 1989, the regime in Tirana was doomed. Democracy of a sort finally came to Albania in 1991-2. It was most interesting to hear **Radio Tirana** broadcasts during this period. After decades of Communist rule, the political jargon of those days continued to be used in news reports and other programs. One report on a debate in Parliament at this time referred to (paraphrasing) "manifestations of the broad masses of M.P.s". It was also interesting to note that airtime on those powerful transmitters in the once officially atheist state was later leased to **Trans World Radio** for their Christian broadcasts!


RADIO TIRANA
TIRANA - ALBANIA

DEAR RADIO LISTENER

We acknowledge with thanks receipt of your letter dated _____. The data included in your reception report of our broadcast of _____ heard at _____ corresponds to our station log.

Looking forward to hearing from you again, we send you our greetings and best wishes.

Radio Tirana
Foreign Languages Section

Radio Tirana today is a shadow of its former self. Give it a shot on 7425 kHz evenings at 0130 UTC. Several years ago, perhaps in the late nineties or early noughts, I would listen to the Albanian programming from the country. Not sure if it was part of the external service, or a regional service, but it provided some very nice music. I would often listen for lengthy periods of time. Recently I decided to check out what one can hear online.

I went to the Radio Tirana website **www.rtsh.al/** and started poking around. Using Google Chrome, I was able to translate the various pages from Albanian to English. The translations are never perfect, but they allow one to figure out what is being talked about. The website offers three scrolling newsfeeds, the first featuring Albanian news, the second offers "Regional" news, and the third provides world news.

Upon trying to access some audio, I clicked in turn on *Kanali I Trete* (Third Channel) and *Kanali I Dyte* (Second Channel), which both returned error messages. However, when I clicked on *Kanali I Pare* (First Channel) I was able to tune in to a very enjoyable Albanian music program. It took me back to the days when I would listen to Albanian music on shortwave. Only this time it was in much better quality!

Listening to the music I was struck by the fusion of musical styles. Much of the music would not be out of place on any "dance music" station, with a definite "Euro-beat." At the same time there are folk influences, with the occasional appearance of more traditional sounding instruments, as opposed to the electronic/techno beats. There were also occasionally some very Middle Eastern sounding tunes as well as some driving rock ballads. It isn't Enver Hoxha's radio station any more. The music is similar to the "Turbo Rock" sounds one hears from neighbouring Serbia and Croatia. If the late Dick Clark could hear it he might say "It's got a good beat and is easy to dance to"!

Check it out and see what you think.

❖ RCI Requiem

Presumably, by the time you read this, **Radio Canada International** and the **CBC Northern Quebec Service** will be gone from the short waves, unless those trying to save the service prevail, which is a pretty tall order. In the broad scheme of things, the CBC has been asked to trim a significant amount of money from its budget. It appears they have decided it is easier to kill shortwave broadcasts than eliminate a few TV producers in Toronto.

As a hobbyist, I deplore this decision. As a realist, it does make sense. Canada joins a long list of countries making this same decision. But there is still shortwave from Canada, which becomes something of a DX target without the big guns broadcasting from Sackville.

CFRX continues to broadcast intermittently on shortwave on 6070 kHz. This is a relay of

clear channel Toronto radio station **CFRB**. ***Newstalk 1010***, as its name implies, is a talk radio station, which for the most parts leans right-ish. I particularly like **John Tory** from 4-6pm Eastern weekdays (20-22 UTC). Tory is an interesting guy who brings a lot to the table. He has been an executive with Rogers Communications, Canadian Football League commissioner, Principal Secretary (Chief of Staff in US terms) to the Premier of Ontario, National Campaign Manager of the PC Party in 1993 and Toronto Mayoral candidate.

He seems to have found his niche as a broadcaster. Weeknights overnight, one can hear 24/7 ***Comedy Radio*** which is certainly something different. If you like comedy, this distinctive programming is for you. For many years, the ODXA's **Steve Canney** has been the QSL Manager for CFRB. He has set up a website at **www.cfrx.webs.com/**

❖ RFI = Radio France Internet?

Radio France International is, like many other international broadcasters, more of an internet website now, instead of a shortwave radio service. The English Service is available to Africa for four hours per day, from 04-08 UTC. If one goes to **www.english.rfi.fr/broadcasts** one can access the audio in four different ways. One can simply listen online. One can add a program to a queue, so as to play a number of programs in succession. One can download a program as an mp3 file for listening later, and finally, one can subscribe using iTunes or a similar program, and automatically download the program each day/week for personal use.

What can one hear from RFI? Lots of interesting programming is at one's fingertips. To hear individual programs and their archives, go to **www.english.rfi.fr/features** This is an extensive archive of past and current shows, including some which have ceased to air on the daily service. For instance ***World Tracks***, a music program, has not aired a new episode since March 2011, but old editions are still available to hear online. As a media junkie, I particularly enjoy ***Africa Media***, a weekly Saturday discussion of media news from the continent.

One particularly odd program is the French lesson series ***Le Talisman Brise***. "Professor Omar, the man who wants to make the desert green, is kidnapped by some mysterious visitors." The subject seems a little peculiar considering the times we live in, but maybe it's just me. This program airs on Sundays. As of June 3, 23 archived episodes of the program were available. Check it out at: **www.english.rfi.fr/features/french-lesson**

Sunday seems to be the day of the week to listen, as many excellent programs are heard, such as ***Club 9516 Sound Kitchen***, featuring "music, interviews and quirky listener essays." It is a mixed menu of coolness. I used to listen to this program quite regularly when **RFI** was part of the **CBC Overnight Service**.

There is a lot to hear on the **RFI** website. And the website is pretty comprehensive, offering news reports about France, the French world, and world affairs in general. It was very interesting to follow the French Presidential election and the subsequent legislative elections as well. Also France is a major player in the European Economic Union, and the common currency, which has endured so much recent turmoil. The election of a Socialist President who opposes the previous President's policies will also shake up the EU. Stay tuned.

❖ Germany to Africa

Germany has also largely departed the shortwave bands, although one can still hear **Deutsche Welle** on shortwave, if you are lucky. Afternoons in North America, one can try 11800 kHz between 1900 and 2200. Other possible frequencies include 7365 kHz between 19 and 20 UTC, 9735 kHz from 19-1930 UTC, 9490 kHz from 20-21 UTC, 11830 and 11865 kHz from 21-22 UTC. These are all beamed to Africa.

Programming consists of ***News*** at the top of each hour, followed by ***Africa Link*** (weekdays) and ***World Link*** on Saturdays. There is a different feature program each day on the half hour. These are ***Spectrum*** on Mondays, ***Pulse*** on Tuesdays, ***World in Progress*** on Wednesdays, ***Living Planet*** on Thursdays, and ***Inside Europe*** on Fridays. Saturdays feature ***World Link*** for the hour, and on Sundays a one hour edition of ***Inside Europe*** is heard.

Spectrum is the weekly Science and Technology program. ***Pulse*** is a "half hour take of youth and lifestyle issues." ***World in Progress*** looks at development and globalization issues. ***Living Planet*** is the environment program. And ***Inside Europe*** looks at European politics. ***Africa Link*** provides analysis and background information about the stories making headlines in Africa.

Some other longstanding DW programs are available only online. These include ***Soundscape 100***. Hosted by **Gavin Blackburn**, it presents the latest from the German Top 100. A wide variety of music styles are presented.

Concert Hour presents the best of Germany's classical music concerts and festivals. Can you Handel it? There is no Hayden the fact that this is the program that gets you Bach to the best of classical sounds.

All of these programs, as well as many **DW** TV programs, are just a few clicks away. Go to **www.dw.de**, then click programs at the top of the page. Click the name of the program that you want to hear, and you are taken to its webpage where you can listen to the latest available edition. Very simple indeed. While the old **DW** website was a bit awkward to navigate, I did appreciate having all the audio links on one page. Deutsche Welle is not the shortwave powerhouse it once was, but nevertheless there are still lots to hear online from The Voice of Germany.

Before we leave the **DW** website, be sure and check out **www.Qantara.de** This is DW's "partner site" which aims to "offer a lively dialogue with the Islamic world. It is quite an interesting website, with many links to articles about culture, politics and society of both the Western and Islamic worlds. In depth analysis of the Arab Spring, Islam's image, post-Mubarak Egypt and a host of other topics grace its pages.

Qantara.de قنطرة

❖ Rest in Peace, Mr. Trololo

In 2009-10, an old Soviet music video became something of an internet sensation. It featured **Eduard Khil** singing a song without lyrics…lots of la la las…as a result he became known as **Mr. Trololo**. The video was the subject of any number of parodies. Videos on youtube had Mr. Trololo in Hitler's Bunker, and as an alien encountering the *Starship Enterprise* (**www.youtube.com/watch?v=DMoWt0wnlUw**). **The Voice of Russia** even jumped on the bandwagon sponsoring in part a contest to put lyrics to Mr. Khil's song, even providing a special email address for entries: *trololo@ruvr.ru*. If the contest ever had a winner(s) VoR did not report it. Regardless, on June 4, the Voice of Russia reported that Mr. Khil had passed away in St. Petersburg of complications from a stroke. It was an interesting example of unexpected international fame. Khil was a good sport about it, too. Thanks for the memories.

The Internet is home to any number of "broadcasts" of varying professional and artistic quality. In many ways searching out obscure audio gems on the Internet is just like DXing the shortwaves. You never quite know what you will discover.

There are audio feeds of actual stations like **6PR** in Perth, Australia or **KNBA** in Alaska. One can tune in to the external and domestic services of any number of countries. Then there are the retired and "involuntarily retired" DJs who do shows on the Internet as an alternative to the terrestrial radio that seemingly has rejected them. There are the kids and others who like to "play DJ" in their basements, and develop a sometimes small but dedicated following.

Some of these programs may be rather amateurish, but it's just as likely that they can sound pretty darn professional. The Internet allows just about anyone to become a broadcaster as well as a listener. Seek out these "radio programs" and "radio stations" online. You just may discover a real gem.

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

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

RFA Offers the Olympic Panda

To commemorate the 2012 Summer Olympic Games, Radio Free Asia is offering a special Panda bear QSL card.

The card is a reproduction of the Olympic pin that two RFA reporters will carry to London during coverage of the Olympics. This is also the third in a series of panda pin and QSL designs that began in 2008 with the Bejing Olympics. All valid reception reports will be confirmed from July 1-August 31, 2012. More information about Radio Free Asia, including the current broadcast frequency schedule, is available at **www.rfa.org/.**

RFA encourages listeners – whether general audience or avid DXer – to submit reception reports to **www.techweb.rfa.org** (follow the QSL REPORTS link). Reception reports are also accepted by email at *qsl@rfa.org*: for anyone without Internet access, reception reports can be mailed to:

Reception Reports
Radio Free Asia
2025 M. Street NW, Suite 300
Washington DC 20036
United States of America.

Upon request, RFA will also send a copy of the current broadcast schedule and a station sticker.

Summer Olympics and a commemorative QSL...a nice combination.

BONAIRE

Radio Netherlands relay, 6165 kHz. Full data ***Canal in Diemen*** card, signed by "F." Also received souvenir postcard, decals, schedule and map. Received in 73 days for an English report and two IRCs. Station address: P.O. Box 222, 1200 JG Hilversum, Netherlands (Bill Wilkins, Springfield, MO). Streaming audio **www.radionetherlands.nl/**

FRENCH GUIANA

DX-Antwerp 30th Anniversary broadcast via Montsinery, 21680 kHz. Full data E-QSL with mention of QSL card to follow by postal mail. Received in three hours for report to: ***dxaqsl@gmail.com*** (Wendel Craighead, Prairie Village, KS).

MEDIUM WAVE

France-Bretagne 5, 1593 kHz AM. Full data E-QSL from Frédéric Guyon. Received in eight days for report to: ***test@bretagne5.fr*** (Christian Ghibaudo, Nice, France/playdx).

India-AIR Kadapa, 900 kHz AM. E-QSL from B.V. Ramana Rao, Deputy Director General. Logged while in India. Received in 20 days for an email report to ***aircdp@rediffmail.com*** New postal address: 1-396, RTC Bus Stand Road, Kadapa, 516001 (A.P.) India (Vashek Korinek South Africa/playdx).

Russia-Voice of Russia via Kaliningrad, 1215 kHz AM. Full data E-QSL. Received in 120 days for an AM report to: ***kortpc@gmail.com*** (Ghibaudo).

Voice of Russia via Moldova, 1413 kHz AM. Verification card signed by Alla Molodkina. Received in 75 days from second follow-up to Moldavian transmitter site. QSL address: Pyatnitskaya st. #25, Building #1, 115326 Moscow, Russia (Patrick Martin, Seaside, OR).

Voice of Russia via Tbilisskaya, 1089 kHz AM. Station E-QSL. Received in two weeks for AM report to ***world@ruvr.ru*** (Artur Fernández Llorella, Spain/HCDX).

USA-KBLL, 1240 kHz AM. Verification letter from Stan Evans, Program Director. Received in seven days for an AM report. Station address: 220 East Broadway, Helena, MT 59601 (Martin). Streaming audio **www.kbllradio.com**

KFJL Central Point, Oregon, 1400 kHz AM. Verification letter from Bruce Fjarli, General Manager. Received in 110 days for an AM report. Station address: 670 Mason Way, Medford, OR 97501 (Martin). New religious station broadcasting Christian 3 Angels.

KSYL, 970 kHz AM. ***Talk Radio 970***. Partial data letter on Cenla Broadcasting letterhead, signed by David Graichen, Director of Operations & Engineering. Received in 11 days for an AM report, $1.00US (returned) and address label (used on reply). Station address: 1115 Texas Avenue, Alexandria, LA 71301-4836 (Wilkins). Streaming audio **www.ksyl.com/**

KXYZ, 1320 kHz AM. No data business card of Daniel Zavisch, Office Manager. Received in 15 days for an AM report, $1.00US and address label (used on reply). Station address: 1782 West Sam Houston Pkwy North, Houston, TX 77043 (Wilkins). Streaming audio **http://kxyzradio.com/**

SRI LANKA

AWR relay via Trincomalee, 15490 kHz. Full data ***Adventist World Radio Returns to Sri Lanka***-special QSL card, signed by Adrian M. Peterson, DX Editor. Religious materials, pocket calender and AWR 41st Annual DX Contest info sheet enclosed. Received in 18 days for a SASE (not used). QSL address: Postal address: Box 29235, Indianapolis, IN 46229 (Scott Barbor, Interval, NH). Streaming audio: **www.awr.org/en/listen** Email: *adrian@awr.org*

UTILITY

SGO-NDB Sagunto, 356 kHz. Full data verification letter with station stamp, signed by David Ferrer Durbá, Jeffe Mtto. Aérea Navegación de SNA del Sector Levante TACC Valencia. Received in 47 days for a utility report. Station address: AENA, Dirección Regional de Navegación Aérea Region Este, Centro de control de Tránsito Aéreo, Ctre.del Aeropuerto s/n, 46940 Manises-Valencia, Spain (Patrick Robic, Austria/UDXF).

TZSO2-Guardia Civil Córdoba, 6955 kHz. Full data verification letter with station stamp, signed by Fernando López-Rey Quintero. Received in 17 days for a utility report and prepared QSL card. Station address: Dirección de la Policia y de la Guardia Civil, Comandancia de Córdoba, Avda. Medina Azahara 2, 14005 Córdoba, Spain (Robic).

ZRA-NDB Zadar, 330 kHz. Full data verification letter with station stamp, signed by Ervin Mrkic-Pestic, Chief of ATC Zadar. Station address: Hrvatska kontrola zracne plovidbe d.o.o., Podruznica Zadar, N. Nodila bb 297, 23000 Zadar Zracna luka, Croatia (Robic).

Vietnam-Hai Phong Radio, XVG 12577 kHz. Station returned prepared form letter, signed by NTT Huyen. Received in 25 days for utility report and $2.00US. Station address: VISHIPEL, No. 02, Nguyen Thuong Hien St., Hong Bang District, Haiphong City, Vietnam (Martin Foltz, CA/UDXF). Station broadcast weather report on 8294 kHz at 0100 and 1200 UTC.

UNITED STATES

Kuwait/Northern Mariana Island-Radio Free Asia relay, 9680/9690 kHz. Full data RFA cards, signed as "your friends at Radio Free Asia." Received two cards in five days. Station address: Reception Reports, 2025 M Street NW, Suite 300, Washington, DC 20036 (Rudolf W. Grimm, São Bernardo SP, Brazil). Reports may also be sent to ***qsl@rfa.org*** or follow the QSL Reports link on the RFA website. Streaming audio: **www.rfa.org**

Radio Taiwan International relay via Okeechobee, Florida, 7570 kHz. Full data color RTI card, unsigned, plus program schedule. Received in 31 days for posting Spanish reception report online. Postal address: 55, Pei-An Road, Taipei 10462, Taiwan, ROC. (Nino Marabello, Treviso, Italy/playdx). Email: ***rti@rti.org*** Streaming audio **http://english.rti.org.tw/**

The Overcomer Ministry, 15190 kHz. Full data QSL card, unsigned. Received in 35 days for an English report and two US mint stamps (used on reply). Station address: P.O. Box 691, Walterboro, SC 29488 (Frank Hillton, Charleston, SC).

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

CONVERT YOUR TIME TO UTC

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

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

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

FIND THE STATION YOU WANT TO HEAR

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

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

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

CHOOSE PROMISING FREQUENCIES

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

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

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

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

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

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

ADDX Munich; ADXC; BCL News; Cumbre DX; DSWCI/DX Window; DX Asia; DX India; Hard-Core DX; DX Re Mix News 730-734; BCDX/WWDX/Top News.

Adrian Peterson/AWR; Alokesh Gupta, New Delhi, India; Andreas Volk, Germany; Bill Damick/TWR; Brenda Constantino/WYFR; Ivo Ivanov, Bulgaria; Nigel Holmes/R Australia; Rachel Baughn/MT; Sean Gilbert UK/WRTH 2012; Wolfgang Bueschel, Stuttgart, Germany.

SHORTWAVE BROADCAST BANDS

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

Notes

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

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

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

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

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

0000	0030		Egypt, R Cairo	6270na	
0000	0030		USA, BBG/Voice of America	7555as	
0000	0045		India, All India R/External Svc		6055as
			9705as	9950as	11670as 13605as
0000	0045	DRM	India, All India R/External Svc		9950eu
0000	0045		USA, WYFR/Family R Worldwide		11650as
0000	0056		Romania, R Romania Intl	9700na	11965na
0000	0100		Anguilla, University Network	6090na	
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, ABC/R Australia	12080pa	15160pa
			15240pa	15415pa	17795pa 19000pa
			21740pa		
0000	0100		Bahrain, R 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 R International		6020eu
			6075as	6180as	7350eu 7415as
			9570na	11790as	11885as 13750as
			15125as		
0000	0100		Malaysia, RTM Kajang/Traxx FM		7295do
0000	0100		Micronesia, V6MP/Cross R/Pohnpei		4755 as
0000	0100		New Zealand, R New Zealand Intl		15720pa
0000	0100	DRM	New Zealand, R New Zealand Intl		17675pa
0000	0100		Russia, Voice of Russia	9665va	9800va
0000	0100		Spain, R Exterior de Espana	6055na	
0000	0100		Thailand, R Thailand World Svc		15275na
0000	0100		UK, BBC World Service	5970as	6195as
			7395as	9410as	9740as 12095as
			15335as	15755as	17685as
0000	0100		USA, Amer Forces Network/AFRTS		4319usb
			5446usb	5765usb	7811usb 12133usb
			12759usb	13362usb	
0000	0100		USA, FBN/WTJC Newport NC		9370na
0000	0100	Sat/Sun	USA, WBCQ Monticello ME	5110am	
0000	0100		USA, WBCQ Monticello ME	7490am	9330am
0000	0100		USA, WEWN/EWTN Irondale AL		11520af
0000	0100		USA, WHRI Cypress Creek SC		5920va
			7315ca	9860na	
0000	0100		USA, WINB Red Lion PA	9265am	
0000	0100		USA, WTWW Lebanon TN	5755va	
0000	0100		USA, WWCR Nashville TN	4840eu	5935af
			6875af	9980eu	
0000	0100		USA, WWRB Manchester TN	3185na	5050na
0000	0100		USA, WYFR/Family R Worldwide		17580as
0000	0100		Zambia, Christian Voice	4965af	
0030	0100		Australia, ABC/R Australia	17750as	
0030	0100		USA, BBG/Voice of America	7430as	9715as
			9780as	11725as	12005as 15205as
			15290as	17820as	
0030	0100	mtwhf	USA, WRMI/R Slovakia Intl relay		9955am
0035	0045		India, All India R/Aizawl	5050do	
0035	0045		India, All India R/Chennai	4920do	
0035	0045		India, All India R/Guwahati	4940do	
0035	0045		India, All India R/Hyderbad	4800do	
0035	0045		India, All India R/Imphal	4775do	
0035	0045		India, All India R/Port Blair	4760do	
0035	0045		India, All India R/Shillong	4970do	
0035	0045		India, All India R/Shimla	4965do	
0035	0045		India, All India R/Thiruvananthapuram		5010do

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

0100	0115	Sat	Canada, Bible Voice Broadcasting		9490as
0100	0130		Vietnam, VO Vietnam/Overseas Svc		6175na
0100	0200		Anguilla, University Network	6090na	
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, ABC/R Australia	12080pa	15160pa
			15240pa	15415pa	17750as 17795pa
			19000pa		
0100	0200		Bahrain, R 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 R International		6020eu
			6175eu	9410eu	9470eu 9535as
			9570na	9580na	9675eu 9790na
			11870as	15125as	15785as
0100	0200		Cuba, R Havana Cuba	6000na	6050na
0100	0200		Malaysia, RTM Kajang/Traxx FM		7295do
0100	0200		Micronesia, V6MP/Cross R/Pohnpei		4755 as
0100	0200		New Zealand, R New Zealand Intl		15720pa
0100	0200	DRM	New Zealand, R New Zealand Intl		17675pa
0100	0200		Russia, Voice of Russia	9665va	9800va
0100	0200		Taiwan, R Taiwan Intl	11875as	
0100	0200		UK, BBC World Service	7395as	9410as
			9740as	11750as	12095as 15310as
			15335as	15755as	17685as
0100	0200		USA, Amer Forces Network/AFRTS		4319usb
			5446usb	5765usb	7811usb 12133usb
			12759usb	13362usb	
0100	0200		USA, BBG/Voice of America	7430as	9780as
			11705as		
0100	0200		USA, FBN/WTJC Newport NC		9370na
0100	0200		USA, KJES Vado NM	7555na	
0100	0200	Sat/Sun	USA, WBCQ Monticello ME	5110am	
0100	0200		USA, WBCQ Monticello ME	7490am	9330am
0100	0200		USA, WEWN/EWTN Irondale AL		11520af
0100	0200	m	USA, WHRI Cypress Creek SC		9605na
0100	0200		USA, WHRI Cypress Creek SC		9840na
			9860na		
0100	0200		USA, WINB Red Lion PA	9265am	
0100	0200		USA, WTWW Lebanon TN	5755va	
0100	0200		USA, WWCR Nashville TN	3215eu	4840na
			5890af	5935af	
0100	0200		USA, WWRB Manchester TN	3185na	5050na
0100	0200		Zambia, Christian Voice	4965af	
0120	0200	mtwhfa	Sri Lanka, SLBC	6005as	9770as 15745as
0130	0200	twhfas	Albania, R Tirana	7425na	
0130	0200		Myanmar, Thazin BC Sta	6030do	
0130	0200	mtwhfa	USA, BBG/Voice of America	7465ca	9820sa
0140	0200		Vatican City State, Vatican R	9580as	11730as

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

0200	0215		Croatia, Voice of Croatia	9925va	
0200	0230		Thailand, R Thailand World Svc		15275na
0200	0230		USA, KJES Vado NM	7555na	
0200	0230	Sat	USA, WBCQ Monticello ME	5110am	
0200	0300		Anguilla, University Network	6090na	
0200	0300	twhfa	Argentina, 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, ABC/R Australia	12080pa	15160pa
			15240pa	15415pa	17750as 17795pa
			19000pa		
0200	0300		Bahrain, R Bahrain	6010me	
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 R International		11770as
			13640as		
0200	0300		Cuba, R Havana Cuba	6000na	6050na
0200	0300		Egypt, R Cairo	9315na	
0200	0300		Malaysia, RTM Kajang/Traxx FM		7295do
0200	0300		Micronesia, V6MP/Cross R/Pohnpei		4755 as
0200	0300		New Zealand, R New Zealand Intl		15720pa
0200	0300	DRM	New Zealand, R New Zealand Intl		17675pa
0200	0300		Palau, T8WH/World Harvest R		17800as
0200	0300		Philippines, R Pilipinas Overseas		11880me
			15285me	17700me	
0200	0300		Russia, Voice of Russia	9665va	15425na
0200	0300		South Korea, KBS World R	9580sa	
0200	0300	mtwhfa	Sri Lanka, SLBC	6005as	9770as 15745as
0200	0300		Taiwan, R Taiwan Intl	5950na	9680na
0200	0300		UK, BBC World Service	6005af	6195me
			12095as	15310as	17790as
0200	0300		USA, Amer Forces Network/AFRTS		4319usb
			5446usb	5765usb	7811usb 12133usb
			12759usb	13362usb	
0200	0300		USA, FBN/WTJC Newport NC		9370na
0200	0300	Sat	USA, Overcomer Ministry	15750af	

0200	0300	Sat/Sun	USA, WBCQ Monticello ME	5110am		
0200	0300		USA, WBCQ Monticello ME	7490am	9330am	
0200	0300		USA, WEWN/EWTN Irondale AL		11520af	
0200	0300		USA, WHRI Cypress Creek SC		5920va	
0200	0300		USA, WINB Red Lion PA	9265am		
0200	0300		USA, WTWW Lebanon TN	5755va		
0200	0300		USA, WWCR Nashville TN	3215eu	4840na	
			5890af	5935af		
0200	0300		USA, WWRB Manchester TN	3185na	5050na	
0200	0300		USA, WYFR/Family R Worldwide		5985ca	
			6115na			
0200	0300		Zambia, Christian Voice	4965as		
0215	0227		Nepal, R Nepal	5005do		
0230	0300		Myanmar, Myanma R/Yangon		9731do	
0230	0300		Vietnam, VO Vietnam/Overseas Svc		6175na	
0245	0300		Australia, HCJB Global Australia		15400as	
0245	0300		India, All India R/Bhopal	7430do		
0245	0300		India, All India R/Delhi	4860do	6030do	
			7235do	11830do	15135do	
0245	0300		India, All India R/Gorakhpur		3945do	
			6030do	7235do	11830do	15135do
0245	0300		India, All India R/Guwahati	4940do		
0245	0300		India, All India R/Hyderbad	7420do		
0245	0300		India, All India R/Imphal	7335do		
0245	0300		India, All India R/Itanagar	4990do		
0245	0300		India, All India R/Jaipur	4910do		
0245	0300		India, All India R/Kolkata	7210do		
0245	0300		India, All India R/Kurseong	4895do		
0245	0300		India, All India R/Lucknow	4880do		
0245	0300		India, All India R/R Kashmir	4760do		
0245	0300		India, All India R/Shillong	4970do		
0245	0300		India, All India R/Shimla	6020do		
0245	0300		India, All India R/Thiruvananthapuram		7290do	
0250	0300		Vatican City State, Vatican R	6040am	7305am	
			9610am			
0255	0300	Sun	Swaziland, TWR Africa	3200af		

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

0300	0315		India, All India R/Imphal	7335do		
0300	0315		India, All India R/Itanagar	4990do		
0300	0315		India, All India R/Shillong	4970do		
0300	0320		Vatican City State, Vatican R	6040am	7305am	
			9610am			
0300	0325	Sun	Swaziland, TWR Africa	3200af		
0300	0330		Egypt, R Cairo	9315na		
0300	0330		Myanmar, Myanma R/Yangon		9731do	
0300	0330		Philippines, R Pilipinas Overseas		11880me	
			15285me	17700me		
0300	0330		Vatican City State, Vatican R	7360af	9660af	
			15460as			
0300	0355		South Africa, Channel Africa		5980af	
0300	0355		Turkey, Voice of Turkey	6165as	9515va	
0300	0356		Romania, R Romania Intl	9645na	11795na	
			11895as	15340as		
0300	0400		Anguilla, University Network	6090na		
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, ABC/R Australia	15160pa	15240pa	
			15415pa	17750as	21725pa	
0300	0400		Bahrain, R Bahrain	6010me		
0300	0400	twhfas	Canada, CBC Northern Quebec Svc		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 R International		9690am	
			9790na	11770as	13750as	15110as
			15120as	15785as		
0300	0400		Cuba, R Havana Cuba	6000na	6050na	
0300	0400		Malaysia, RTM Kajang/Traxx FM		7295do	
0300	0400		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0300	0400		New Zealand, R New Zealand Intl		15720pa	
0300	0400	DRM	New Zealand, R New Zealand Intl		17675pa	
0300	0400		Oman, R Sultanate of Oman		15355af	
0300	0400		Palau, T8WH/World Harvest R		17800as	
0300	0400		Russia, Voice of Russia	9665va	15424na	
0300	0400		South Africa, Channel Africa		3345af	
0300	0400	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0300	0400		Taiwan, R Taiwan Intl	5950na	15320as	
0300	0400		UK, BBC World Service	3255af	5875af	
			6005af	6145af	6190af	6195me
			9410me	9750af	12035af	12095as
			15310as	15365as	17790as	
0300	0400		USA, Amer Forces Network/AFRTS		4319usb	
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
0300	0400		USA, BBG/Voice of America	4930af	6080af	
			9855af	15580af		
0300	0400		USA, FBN/WTJC Newport NC		9370na	
0300	0400	Sat	USA, Overcomer Ministry	15750af		
0300	0400		USA, WBCQ Monticello ME	7490am	9330am	
0300	0400		USA, WEWN/EWTN Irondale AL		11520af	
0300	0400		USA, WHRI Cypress Creek SC		5920va	
			7385na	9825va		
0300	0400		USA, WTWW Lebanon TN	5755va		
0300	0400		USA, WWCR Nashville TN	3215eu	4840na	
			5890af	5935af		
0300	0400		USA, WWRB Manchester TN	3185na	5050na	
0300	0400		USA, WYFR/Family R Worldwide		11740ca	
0300	0400		Zambia, Christian Voice	4965as		
0330	0400		Australia, ABC/R Australia	15515pa		
0330	0400		Iran, VO Islamic Rep of Iran	11920eu	13650eu	
0330	0400		Vietnam, VO Vietnam/Overseas Svc		6175na	
0335	0345		India, All India R/Aizawl	5050do		
0335	0345		India, All India R/Delhi	7235do	11830do	
			15135do			
0335	0345		India, All India R/Kolkata	7210do		

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

0400	0430		Iran, VO Islamic Rep of Iran	11920eu	13650eu	
0400	0430		USA, BBG/Voice of America	9855af		
0400	0430	m	Vatican City State, Vatican R	9955ca		
0400	0457		Germany, Deutsche Welle	6180af	7240af	
			9470af	12045af		
0400	0457		North Korea, Voice of Korea		7220as	
			9345as	9730as	11735as	13760as
			15180as			
0400	0458		New Zealand, R New Zealand Intl		15720pa	
0400	0458	DRM	New Zealand, R New Zealand Intl		17675pa	
0400	0500		Anguilla, University Network	6090na		
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, ABC/R Australia	15160pa	15240pa	
			15415pa	15515pa	21725as	
0400	0500		Bahrain, R Bahrain	6010me		
0400	0500	twhfas	Canada, CBC Northern Quebec Svc		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 R International		6020na	
			6080na	17730va	17855va	
0400	0500		Cuba, R Havana Cuba	6000na	6050na	
0400	0500		Malaysia, RTM Kajang/Traxx FM		7295do	
0400	0500		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0400	0500		Russia, Voice of Russia	13775na	15760me	
0400	0500		South Africa, Channel Africa		3345af	
0400	0500	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0400	0500		UK, BBC World Service	3255af	3955eu	
			5875af	6005af	6190af	7310af
			11945af	12035af	12095me	15310as
			15365as	17790as		
0400	0500		USA, Amer Forces Network/AFRTS		4319usb	
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
0400	0500		USA, BBG/Voice of America	4930af	4960af	
			6080af	12025af	15580af	
0400	0500		USA, FBN/WTJC Newport NC		9370na	
0400	0500	Sat	USA, Overcomer Ministry	15750af		
0400	0500		USA, WBCQ Monticello ME	9330am		
0400	0500		USA, WEWN/EWTN Irondale AL		11520af	
0400	0500		USA, WHRI Cypress Creek SC		5920va	
			7385na	9825va		
0400	0500		USA, WTWW Lebanon TN	5755va		
0400	0500		USA, WWCR Nashville TN	3215eu	4840na	
			5890af	5935af		
0400	0500		USA, WWRB Manchester TN	3185na		
0400	0500		Zambia, Christian Voice	4965as		
0430	0500		Myanmar, Thazin BC Sta	6030do		
0430	0500	mtwhf	Swaziland, TWR Africa	3200af		

0435	0445		India, All India R/Delhi	4860do
0455	0500		Nigeria, Voice of Nigeria	15120af
0459	0500		New Zealand, R New Zealand Intl	11725pa
0459	0500	DRM	New Zealand, R New Zealand Intl	11675pa

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

0500	0507	twhfas	Canada, CBC Northern Quebec Svc	9625na		
0500	0527		Germany, Deutsche Welle	5925af		
0500	0530		Germany, Deutsche Welle	9470af	9800af	
			9850af	11800af		
0500	0530		Japan, R Japan NHK World	5975va	6110na	
			11970va			
0500	0530	Sat	Vatican City State, Vatican R	3975eu	6075eu	
			7250eu	9645eu	11625af	13765af
0500	0557		North Korea, Voice of Korea		13650as	
			15100as			
0500	0600		Anguilla, University Network	6090na		
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, ABC/R Australia	13630pa	15240pa	
			15415pa	15515pa	21725as	
0500	0600		Bahrain, R Bahrain	6010me		
0500	0600		Bhutan, Bhutan BC Svc	5030do	6035do	
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 R International		6020na	
			6190na	11710af	11895as	15350as
			15465as	17505va	17730va	17855va
0500	0600		Cuba, R Havana Cuba	6010na	6050na	
			6060ca	6125am		
0500	0600		Eqt Guinea, Pan Am BC/R Africa		15190af	
0500	0600		Malaysia, RTM Kajang/Traxx FM		7295do	
0500	0600		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0500	0600		Myanmar, Thazin BC Sta	6030do		
0500	0600		New Zealand, R New Zealand Intl		11725pa	
0500	0600	DRM	New Zealand, R New Zealand Intl		11675pa	
0500	0600		Nigeria, Voice of Nigeria	15120	ad	
0500	0600		Russia, Voice of Russia	13755na		
0500	0600		South Africa, Channel Africa		7230af	
0500	0600	Sat/Sun	Swaziland, TWR Africa	3200af		
0500	0600		Swaziland, TWR Africa	9500af		
0500	0600		Taiwan, R Taiwan Intl	5950na		
0500	0600		UK, BBC World Service	3255af	3955eu	
			5875af	6005af	6190af	9410af
			11945af	12095me	15310as	15365as
			15420af	17640as	17790as	
0500	0600		USA, Amer Forces Network/AFRTS		4319usb	
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
0500	0600		USA, BBG/Voice of America	4930af	6080af	
			12025af	15580af		
0500	0600		USA, FBN/WTJC Newport NC		9370na	
0500	0600	Sat	USA, Overcomer Ministry	15750af		
0500	0600		USA, WBCQ Monticello ME	9330am		
0500	0600		USA, WEWN/EWTN Irondale AL		11520af	
0500	0600		USA, WHRI Cypress Creek SC		5920am	
			7385na	9825va		
0500	0600		USA, WTWW Lebanon TN	5755va		
0500	0600		USA, WWCR Nashville TN	3215eu	4840na	
			5890af	5935af		
0500	0600		USA, WWRB Manchester TN	3185na		
0500	0600		Zambia, Christian Voice	6065af		
0530	0556	DRM	Romania, R Romania Intl	11875eu		
0530	0556		Romania, R Romania Intl	9700eu	17760eu	
			21500eu			
0530	0557		Germany, Deutsche Welle	9800af	11800af	
0530	0600		Australia, ABC/R Australia	17750as		
0530	0600		Thailand, R Thailand World Svc		17770eu	

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

0600	0627		Germany, Deutsche Welle	15275af		
0600	0630		Germany, Deutsche Welle	13780af	17820af	
0600	0630		Myanmar, Thazin BC Sta	6030do		
0600	0630	Sat/Sun	USA, WRMI/R Prague relay	9955ca		
0600	0645	mtwhf	Vatican City State, Vatican R	9955na		
0600	0650		New Zealand, R New Zealand Intl		11725pa	
0600	0650	DRM	New Zealand, R New Zealand Intl		11675pa	
0600	0655		South Africa, Channel Africa		15255af	
0600	0657		North Korea, Voice of Korea		7220as	
			9345as	9730as		
0600	0700		Anguilla, University Network	6090na		
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, ABC/R Australia	11945pa	13630pa	
			15240pa	15415pa	17750as	21725as
0600	0700		Bahrain, R 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 R International		11710af	
			11870me	11895as	13660as	15140me
			15350as	15465as	17505va	17710as
0600	0700		Cuba, R Havana Cuba	6010na	6050na	
			6060ca	6125am		
0600	0700		Eqt Guinea, Pan Am BC/R Africa		15190af	
0600	0700		Malaysia, RTM Kajang/Traxx FM		7295do	
0600	0700		Micronesia, V6MP/Cross R/Pohnpei		4755 as	
0600	0700		Nigeria, Voice of Nigeria	15120af		
0600	0700		Papua New Guinea, R Fly	3915do		
0600	0700		Russia, Voice of Russia	21800pa		
0600	0700	DRM	Russia, Voice of Russia	11830eu		
0600	0700		South Africa, Channel Africa		7230af	
0600	0700		Swaziland, TWR Africa	6120af	9500af	
0600	0700	Sat/Sun	Swaziland, TWR Africa	3200af		
0600	0700		UK, BBC World Service	5875eu	6005af	
			6190af	7355eu	9410af	12095va
			15105af	15310as	17640af	17790as
0600	0700	mtwhf	UK, BBC World Service	15420af		
0600	0700		USA, Amer Forces Network/AFRTS		4319usb	
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
0600	0700		USA, BBG/Voice of America	6080af	12025af	
			15580af			
0600	0700		USA, FBN/WTJC Newport NC		9370na	
0600	0700	Sat	USA, Overcomer Ministry	15750af		
0600	0700		USA, WBCQ Monticello ME	9330am		
0600	0700		USA, WEWN/EWTN Irondale AL		11520af	
0600	0700		USA, WHRI Cypress Creek SC		5920am	
			7385na	11910va		
0600	0700		USA, WTWW Lebanon TN	5755va		
0600	0700		USA, WWCR Nashville TN	3215eu	4840na	
			5890af	5935af		
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		Zambia, Christian Voice	6065af		
0600	0700		Zambia, CVC Intl/1 Africa	13590af		
0617	0630	Sun	Nepal, R Nepal	5005do		
0630	0645		India, All India R/Guwahati	7280do		
0630	0645		India, All India R/Hyderbad	7420do		
0630	0645		India, All India R/Kurseong	7230do		
0630	0645		India, All India R/Mumbai	7240do		
0630	0645		India, All India R/Thiruvananthapuram		7290do	
0630	0645	mtwhfa	Vatican City State, Vatican R	3975eu	6075eu	
			7250eu	9645eu	15595eu	
0630	0700		Germany, Deutsche Welle	13780af	17820af	
0630	0700		Vatican City State, Vatican R	11625af	13765af	
			15670af			
0645	0700	mtwhf	Israel, Kol Israel	9955na		
0651	0700		New Zealand, R New Zealand Intl		11725pa	
0651	0700	DRM	New Zealand, R New Zealand Intl		9890pa	

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

0700	0730		Myanmar, Myanma R/Yangon		9731do	
0700	0750		Austria, TWR Europe	6105eu		
0700	0750		Germany, TWR Europe	6105eu		
0700	0758		New Zealand, R New Zealand Intl		11725pa	
0700	0758	DRM	New Zealand, R New Zealand Intl		9890pa	
0700	0800		Anguilla, University Network	6090na		
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, ABC/R Australia	7410pa	9475pa	
			9710pa	11945pa	13630pa	15240pa
0700	0800		Bahrain, R 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 R International	11895as		
			13660as	13710eu	15125va	15350as
			15465as	17490eu	17540as	17710as
0700	0800	mtwhfa	Ecuador, HCJB/LV de los Andes	3995eu		
0700	0800		Eqt Guinea, Pan Am BC/R Africa	15190af		
0700	0800		Malaysia, RTM Kajang/Traxx FM	7295do		
0700	0800		Micronesia, V6MP/Cross R/Pohnpei	4755 as		
0700	0800		Papua New Guinea, R Fly	3915do		
0700	0800		Russia, Voice of Russia	21800va		
0700	0800	DRM	Russia, Voice of Russia	11830eu		
0700	0800		South Africa, Channel Africa	9625af		
0700	0800		Swaziland, TWR Africa	6120af	9500af	
0700	0800	Sat/Sun	Swaziland, TWR Africa	3200af		
0700	0800		UK, BBC World Service	5875eu	6190af	
			7355eu	11760me	11770af	12095af
			15310as	15400af	15575me	17640af
			17790as	17830af		
0700	0800		USA, Amer Forces Network/AFRTS	4319usb		
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
0700	0800		USA, FBN/WTJC Newport NC	9370na		
0700	0800	Sat	USA, Overcomer Ministry	15750af		
0700	0800		USA, WBCQ Monticello ME	9330am		
0700	0800		USA, WEWN/EWTN Irondale AL	11520af		
0700	0800		USA, WHRI Cypress Creek SC	5920am		
			7385na			
0700	0800		USA, WTWW Lebanon TN	5755va		
0700	0800		USA, WWCR Nashville TN	3215eu	4840na	
			5890af	5935af		
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		Zambia, Christian Voice	6065af		
0700	0800		Zambia, CVC Intl/1 Africa	13590af		
0730	0745		India, All India R/Aizawl	5050do		
0730	0745		India, All India R/Delhi	6190do	11710do	
			15185do	15260do		
0730	0745		India, All India R/Guwahati	7280do		
0730	0745		India, All India R/Imphal	7335do		
0730	0745		India, All India R/Jaipur	7325do		
0730	0745		India, All India R/Kolkata	7210do		
0730	0745		India, All India R/Kurseong	7230do		
0730	0745		India, All India R/Shimla	6020do		
0730	0800		Australia, HCJB Global Australia	11750as		
0730	0800		India, All India R/Chennai	4920do		
0759	0800		New Zealand, R New Zealand Intl	6170pa		
0759	0800	DRM	New Zealand, R New Zealand Intl	7440pa		

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

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		Australia, HCJB Global Australia	11750as		
0800	0830	Sun	Canada, Bible Voice Broadcasting	5945eu		
0800	0830		France, R France International	9955na		
0800	0845	Sat	Canada, Bible Voice Broadcasting	5945eu		
0800	0900		Anguilla, University Network	6090na		
0800	0900		Australia, ABC/R Australia	5995pa	7410pa	
			9475pa	9580pa	9710pa	11945pa
			15240pa			
0800	0900		Bahrain, R Bahrain	6010me		
0800	0900	t/DRM	Belgium, TDP Radio	6015eu		
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 R International	11620as		
			11895as	13710eu	15350as	15465as
			15625va	17490eu	17540as	
0800	0900		Eqt Guinea, Pan Am BC/R Africa	15190af		
0800	0900	Sat	Italy, IRRS SW	9510va		
0800	0900		Malaysia, RTM Kajang/Traxx FM	7295do		
0800	0900		Micronesia, V6MP/Cross R/Pohnpei	4755 as		
0800	0900		New Zealand, R New Zealand Intl	6170pa		
0800	0900	DRM	New Zealand, R New Zealand Intl	7440pa		
0800	0900	mtwhfs	Palau, T8WH/World Harvest R	9930as		
0800	0900		Palau, T8WH/World Harvest R	17650as		
0800	0900		Papua New Guinea, R Fly	3915do		
0800	0900		Russia, Voice of Russia	21800va		
0800	0900	DRM	Russia, Voice of Russia	9850eu	11830eu	
0800	0900		South Africa, Channel Africa	9625af		
0800	0900	Sun	South Africa, R Mirror Intl	7205af	17570af	
0800	0900		South Korea, KBS World R	9570as		
0800	0900		UK, BBC World Service	6190af	11760me	
			12095af	15310as	15400af	15575me
			17640af	17790as	17830af	21470af
0800	0900		USA, Amer Forces Network/AFRTS	4319usb		
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
0800	0900		USA, FBN/WTJC Newport NC	9370na		
0800	0900	Sat	USA, Overcomer Ministry	15750af		
0800	0900		USA, WBCQ Monticello ME	9330am		
0800	0900		USA, WEWN/EWTN Irondale AL	11520af		
0800	0900		USA, WHRI Cypress Creek SC	5920am		
			7385na			
0800	0900		USA, WTWW Lebanon TN	5755va		
0800	0900		USA, WWCR Nashville TN	3215eu	4840na	
			5890af	5935af		
0800	0900		USA, WWRB Manchester TN	3185na		
0800	0900		Zambia, Christian Voice	6065af		
0800	0900		Zambia, CVC Intl/1 Africa	13590af		
0815	0827		Nepal, R Nepal	5005do		
0820	0900	mtwhfa	Guam, KTWR/TWR Asia	15170as		
0830	0845		India, All India R/Aizawl	5050do		
0830	0845		India, All India R/Chennai	4920do		
0830	0845		India, All India R/Delhi	6190do	11710do	
			15185do	15260do		
0830	0845		India, All India R/Hyderbad	7420do		
0830	0845		India, All India R/Imphal	7335do		
0830	0845		India, All India R/Itanagar	4990do		
0830	0845		India, All India R/Kolkata	7210do		
0830	0845		India, All India R/Shillong	7315do		
0830	0845		India, All India R/Thiruvananthapuram	7290do		
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 Asia	11840pa		

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

0900	0910	mtwhfa	Guam, KTWR/TWR Asia	11840as		
0900	0930	mtwhfa	USA, WRMI/R Prague relay	9955ca		
0900	1000		Anguilla, University Network	6090na		
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, ABC/R Australia	6020pa	9580pa	
			11945pa			
0900	1000		Bahrain, R 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 R International	11620as		
			13790pa	15210as	15270eu	15350as
			17490eu	17570eu	17750as	
0900	1000	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
0900	1000		Malaysia, RTM Kajang/Traxx FM	7295do		
0900	1000		Micronesia, V6MP/Cross R/Pohnpei	4755 as		
0900	1000	3rd Sun	Netherlands, XVRB Radio	6045eu		
0900	1000	DRM	New Zealand, R New Zealand Intl	7440pa		
0900	1000		New Zealand, R New Zealand Intl	6170pa		
0900	1000		Nigeria, Voice of Nigeria	9690af		
0900	1000		Palau, T8WH/World Harvest R	9930as		
0900	1000		Papua New Guinea, R Fly	3915do		
0900	1000		Russia, Voice of Russia	9560as	15170as	
			21800va			
0900	1000	DRM	Russia, Voice of Russia	9850eu	11830eu	
0900	1000		South Africa, Channel Africa	9625af		
0900	1000		UK, BBC World Service	6190af	6195as	
			9740as	11760me	12095af	15285as
			15310as	15575me	17640af	17760as
			17790as	17830af	21470af	21660as
0900	1000		USA, Amer Forces Network/AFRTS	4319usb		
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
0900	1000		USA, FBN/WTJC Newport NC	9370na		
0900	1000	Sat	USA, Overcomer Ministry	15750af		
0900	1000		USA, WBCQ Monticello ME	9330am		

0900	1000		USA, WEWN/EWTN Irondale AL			11520as
0900	1000		USA, WHRI Cypress Creek SC			11565pa
0900	1000		USA, WHRI Cypress Creek SC			7315am
			7385na			
0900	1000		USA, WTWW Lebanon TN	5755va		
0900	1000		USA, WWCR Nashville TN	4840eu		5890af
			5935af	6875af		
0900	1000		USA, WWRB Manchester TN	3185na		
0900	1000		USA, WYFR/Family R Worldwide			9465as
0900	1000		Zambia, Christian Voice	6065af		
0900	1000		Zambia, CVC Intl/1 Africa	13590af		
0905	0910		Pakistan, PBC/R Pakistan	15725as		17720as
0930	1000	Sun	Italy, IRRS SW	9510va		

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

1000	1030		Japan, R Japan NHK World	9605as		9625pa
			9695pa			
1000	1030	Sat	Vatican City State, Vatican R	9955ca		
1000	1030		Vietnam, VO Vietnam/Overseas Svc			9840as
			12020as			
1000	1057		North Korea, Voice of Korea			11710ca
			15180sa	11735as	13650as	
1000	1058		New Zealand, R New Zealand Intl			6170pa
1000	1100		Anguilla, University Network	11775na		
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, ABC/R Australia	6020pa		9580pa
			11945pa			
1000	1100		Bahrain, R 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 R International			6040na
			11610as	11635as	13620as	13690as
			13720as	13790pa	15190as	15210as
			15350as	17490eu		
1000	1100	Sat/Sun	Germany, Mighty KBC Radio			6095eu
1000	1100		India, All India R/External Svc			7270as
			13695pa	15020as	15410as	17510pa
			17800as	17895pa		
1000	1100		Indonesia, VO Indonesia	9526va		
1000	1100		Malaysia, RTM Kajang/Traxx FM			7295do
1000	1100		Micronesia, V6MP/Cross R/Pohnpei			4755as
1000	1100	DRM	New Zealand, R New Zealand Intl			7440pa
1000	1100		Nigeria, Voice of Nigeria	9690af		
1000	1100		Palau, T8WH/World Harvest R			17650as
1000	1100		Russia, Voice of Russia	9560as		11500as
			15170as			
1000	1100		Saudi Arabia, BSKSA/External Svc			15250as
1000	1100		South Africa, Channel Africa			9625af
1000	1100		UK, BBC World Service	6190af		6195as
			9740as	11760me	12095af	15285as
			15310as	15575me	17640af	17760as
			17790as	21470af	21660as	
1000	1100	Sat/Sun	UK, BBC World Service	15400af		17830af
1000	1100		USA, Amer Forces Network/AFRTS			4319usb
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
1000	1100		USA, FBN/WTJC Newport NC			9370na
1000	1100		USA, KNLS Anchor Point AK	9655as		
1000	1100		USA, WBCQ Monticello ME	9330am		
1000	1100		USA, WEWN/EWTN Irondale AL			11520as
1000	1100		USA, WHRI Cypress Creek SC			7315am
			7385na			
1000	1100		USA, WTWW Lebanon TN	5755va		
1000	1100		USA, WWCR Nashville TN	4840na		5890af
			5935af	6875af		
1000	1100		USA, WWRB Manchester TN	3185na		
1000	1100		USA, WYFR/Family R Worldwide			9465as
1000	1100		Zambia, Christian Voice	6065af		
1000	1100		Zambia, CVC Intl/1 Africa	13590af		
1030	1100		Iran, VO Islamic Rep of Iran	21590va		21640va
1030	1100		Mongolia, Voice of Mongolia			12085as
1030	1100		USA, WINB Red Lion PA	9265am		
1059	1100		New Zealand, R New Zealand Intl			9655pa

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

1100	1104		Pakistan, PBC/R Pakistan	15725as		17720as
1100	1127		Iran, VO Islamic Rep of Iran	21590va		21640va
1100	1130	f/ DRM	Japan, R Japan NHK World	9760eu		
1100	1130	Sat/DRM	South Korea, KBS World R	9760eu		
1100	1130		UK, BBC World Service	15400af		
1100	1130		Vietnam, VO Vietnam/Overseas Svc			7285as
1100	1156		Romania, R Romania Intl	15210eu		15430eu
			17510af	17670af		
1100	1158	DRM	New Zealand, R New Zealand Intl			7440pa
1100	1200		Anguilla, University Network	11775na		
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, ABC/R Australia	6020pa		6080pa
			6140as	9475as	9580pa	11945va
1100	1200	DRM	Australia, ABC/R Australia	12080pa		
1100	1200		Bahrain, R Bahrain	6010me		
1100	1200	f/DRM	Belgium, TDP Radio	6015eu		
1100	1200	Sat/Sun	Canada, CBC Northern Quebec Svc			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 R International			5955as
			6040na	11650as	11660as	11750na
			11795as	13590as	13645as	13650eu
			13720as	17490eu		
1100	1200	Sat/Sun	Germany, Mighty KBC Radio			6095eu
1100	1200		Malaysia, RTM Kajang/Traxx FM			7295do
1100	1200		New Zealand, R New Zealand Intl			9655pa
1100	1200		Nigeria, Voice of Nigeria	9690af		
1100	1200	DRM	Russia, Voice of Russia	12030as		
1100	1200		Russia, Voice of Russia	9560as		11500as
			12065as			
1100	1200		Saudi Arabia, BSKSA/External Svc			15250as
1100	1200		South Africa, Channel Africa			9625af
1100	1200		Taiwan, R Taiwan Intl	7445as		9465as
1100	1200		UK, BBC World Service	6190af		6195as
			9740as	11760me	12095af	15285as
			15310as	15575me	17640af	17790as
			17830af	21470af		
1100	1200		USA, Amer Forces Network/AFRTS			4319usb
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
1100	1200		USA, FBN/WTJC Newport NC			9370na
1100	1200		USA, WBCQ Monticello ME	9330am		
1100	1200		USA, WEWN/EWTN Irondale AL			11520as
1100	1200		USA, WHRI Cypress Creek SC			7315am
			9795am			
1100	1200		USA, WINB Red Lion PA	9265am		
1100	1200		USA, WTWW Lebanon TN	5755va		
1100	1200		USA, WWCR Nashville TN	4840na		5890af
			5935af	15825eu		
1100	1200		USA, WWRB Manchester TN	3185na		
1100	1200		Zambia, Christian Voice	6065af		
1100	1200		Zambia, CVC Intl/1 Africa	13590af		
1130	1200	f	Vatican City State, Vatican R	15595as		17590as
1130	1200		Vietnam, VO Vietnam/Overseas Svc			9840as
			12020as			
1135	1145		India, All India R/Aizawl	5050do		
1135	1145		India, All India R/Delhi	9595do		11710do
			15185do			
1135	1145		India, All India R/Shillong	4970do		

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

1200	1215	mtwhfa	Vatican City State, Vatican R	13730ca		
1200	1225		Saudi Arabia, BSKSA/External Svc			15250as
1200	1230		Germany, AWR Europe	17535as		
1200	1230		Indonesia, AWR Asia/Pacific			17535as
1200	1230		Japan, R Japan NHK World	6120na		9695as
1200	1259		New Zealand, R New Zealand Intl			9655pa
1200	1300		Anguilla, University Network	11775na		
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		Australia, ABC/R Australia	5995pa		6020pa
			6080pa	6140as	9475as	9580pa
			11945as	12080pa		

1200	1300		Bahrain, R Bahrain	6010me		
1200	1300	Sat/DRM	Belgium, TDP Radio	6015eu		
1200	1300	Sat/Sun	Canada, CBC Northern Quebec Svc	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 R International	5955as		
			9460as	9645as	9660as	9730as
			9760pa	11650as	11660as	11690va
			11760pa	11980as	13645as	13650eu
			13790eu	17490eu		
1200	1300		Ethiopia, R Ethiopia/Natl Pgm	9705do		
1200	1300	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1200	1300		Malaysia, RTM Kajang/Traxx FM	7295do		
1200	1300		Nigeria, Voice of Nigeria	9690af		
1200	1300		Palau, T8WH/World Harvest R	9930as		
1200	1300	DRM	Russia, Voice of Russia	9850eu	9445as	
			12030as			
1200	1300		Russia, Voice of Russia	9560as	11500as	
1200	1300		South Korea, KBS World R	9650na		
1200	1300		UK, BBC World Service	5875as	6190af	
			6195as	9740as	11750as	11760me
			15310as	15575me	17790as	17830af
			21470af			
1200	1300		USA, Amer Forces Network/AFRTS	4319usb		
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
1200	1300		USA, BBG/Voice of America	7575as	9510as	
			12075as	12150as		
1200	1300		USA, FBN/WTJC Newport NC	9370na		
1200	1300		USA, KNLS Anchor Point AK	7355as		
1200	1300		USA, WBCQ Monticello ME	9330am		
1200	1300		USA, WEWN/EWTN Irondale AL	11520as		
1200	1300		USA, WHRI Cypress Creek SC	9795am		
			9840na			
1200	1300		USA, WINB Red Lion PA	9265am		
1200	1300		USA, WTWW Lebanon TN	5755va		
1200	1300		USA, WWCR Nashville TN	7490na	9980af	
			13845af	15825eu		
1200	1300		USA, WWRB Manchester TN	9385na		
1200	1300		Zambia, Christian Voice	6065af		
1200	1300		Zambia, CVC Intl/1 Africa	13590af		
1215	1300		Egypt, R Cairo	17870as		
1230	1245		India, All India R/Aizawl	5050do		
1230	1245		India, All India R/Chennai	4920do		
1230	1245		India, All India R/Delhi	4860do	6085do	
1230	1245		India, All India R/Hyderbad	4800do		
1230	1245		India, All India R/Jeypore	5040do		
1230	1245		India, All India R/Kurseong	4895do		
1230	1245		India, All India R/Port Blair	4760do		
1230	1245		India, All India R/R Kashmir	4950do		
1230	1245		India, All India R/Shillong	4970do		
1230	1245		India, All India R/Thiruvananthapuram	5010do		
1230	1300		Australia, HCJB Global Australia	15400as		
1230	1300		Thailand, R Thailand World Svc	9890va		
1230	1300		Turkey, Voice of Turkey	15450va		
1230	1300		Vietnam, VO Vietnam/Overseas Svc	9840as		
			12020as			

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

1300	1325		Turkey, Voice of Turkey	15450va		
1300	1330		Egypt, R Cairo	17870as		
1300	1330		Japan, R Japan NHK World	15735as		
1300	1330		Serbia, International R Serbia	9635eu		
1300	1357		North Korea, Voice of Korea	9335na		
			11710na	13760eu	15245eu	
1300	1400		Anguilla, University Network	11775na		
1300	1400		Australia, ABC NT Alice Springs	2310do		
1300	1400		Australia, ABC NT Katherine	2485do		
1300	1400		Australia, ABC/R Australia	6020pa	9580pa	
			11945pa			
1300	1400		Bahrain, R Bahrain	6010me		
1300	1400	Sun/DRM	Belgium, TDP Radio	6015na		
1300	1400	Sat/Sun	Canada, CBC Northern Quebec Svc	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 R International	5995as		
			9570na	9650na	9730as	9760pa
			9765va	9870as	11660as	11760pa
			13610eu	13755as	13790eu	15260na
1300	1400	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1300	1400		Indonesia, VO Indonesia	9526va		
1300	1400		Italy, IRRS SW	15190va		
1300	1400		Malaysia, RTM Kajang/Traxx FM	7295do		
1300	1400		New Zealand, R New Zealand Intl	6170pa		
1300	1400		Nigeria, Voice of Nigeria	9690af		
1300	1400		Palau, T8WH/World Harvest R	9930as		
1300	1400	DRM	Russia, Voice of Russia	9850eu	12095as	
1300	1400		Russia, Voice of Russia	12065as		
1300	1400		South Korea, KBS World R	9570as		
1300	1400		Tajikistan, VO Tajik	7245va		
1300	1400		UK, BBC World Service	5875as	6190af	
			6195as	9740as	11760me	15310as
			15420af	15575me	17640af	17790as
			17830af			
1300	1400		USA, Amer Forces Network/AFRTS	4319usb		
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
1300	1400		USA, BBG/Voice of America	7575as		
1300	1400	Sat/Sun	USA, BBG/Voice of America	7575as	9510as	
			9610as	12150as		
1300	1400		USA, FBN/WTJC Newport NC	9370na		
1300	1400		USA, KJES Vado NM	11715na		
1300	1400		USA, Overcomer Ministry	15190as		
1300	1400		USA, WBCQ Monticello ME	9330am		
1300	1400		USA, WEWN/EWTN Irondale AL	15615as		
1300	1400	Sat/Sun	USA, WHRI Cypress Creek SC	9795na		
			9840am			
1300	1400		USA, WINB Red Lion PA	13570am		
1300	1400		USA, WTWW Lebanon TN	9479va		
1300	1400		USA, WWCR Nashville TN	7490af	9980af	
			13845eu	15825eu		
1300	1400		USA, WWRB Manchester TN	9385na		
1300	1400		USA, WYFR/Family R Worldwide	11540as		
1300	1400		Zambia, Christian Voice	6065af		
1300	1400		Zambia, CVC Intl/1 Africa	13590af		
1330	1345		India, All India R/Delhi	6085do		
1330	1400	f	Clandestine, JSR/Shiokaze/Sea Breeze	5985as		
1330	1400		India, All India R/External Svc	9690as		
			11620as	13710as		
1330	1400		Vietnam, VO Vietnam/Overseas Svc	9840as		
			12020as			

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

1400	1430	f	Clandestine, JSR/Shiokaze/Sea Breeze	5985as		
1400	1430		Japan, R Japan NHK World	11705as	15735as	
1400	1430		Thailand, R Thailand World Svc	9395va		
1400	1430	Sun	USA, Pan Amer Broadcasting	15205as		
1400	1500		Anguilla, University Network	11775na		
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, ABC/R Australia	5995pa	9580pa	
			11945pa			
1400	1500		Bahrain, R Bahrain	6010me		
1400	1500	Sun	Canada, Bible Voice Broadcasting	17495as		
1400	1500	Sat/Sun	Canada, CBC Northern Quebec Svc	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 R International	5955as		
			9765va	9870as	11665me	11675as
			11765as	13710eu	13740na	13790eu
			17630af			
1400	1500		Eqt Guinea, Pan Am BC/R Africa	15190af		
1400	1500	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1400	1500		India, All India R/External Svc	9690as		
			11620as	13710as		
1400	1500		Italy, IRRS SW	15190va		
1400	1500		Malaysia, RTM Kajang/Traxx FM	7295do		
1400	1500		New Zealand, R New Zealand Intl	6170pa		
1400	1500		Nigeria, Voice of Nigeria	9690af		
1400	1500		Oman, R Sultanate of Oman	15140va		
1400	1500	DRM	Russia, Voice of Russia	12095eu		
1400	1500		Russia, Voice of Russia	4975va	9560as	
			11500as	11840as		

1400	1500		South Korea, KBS World R	9570as		
1400	1500		UK, BBC World Service	5845as	5875as	
			6190af	6195as	9740as	11890as
			12095af	13820me	15310as	17640af
			17830af	21470af		
1400	1500		USA, Amer Forces Network/AFRTS			4319usb
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
1400	1500		USA, BBG/Voice of America	4930af		6080af
			15265af	15580af	17530af	
1400	1500	mtwhf	USA, BBG/Voice of America	7540as		7575as
			12150as			
1400	1500		USA, FBN/WTJC Newport NC			9370na
1400	1500		USA, Overcomer Ministry	9655eu		15190eu
1400	1500		USA, WBCQ Monticello ME	9330am		
1400	1500	Sat/Sun	USA, WBCQ Monticello ME	15420am		
1400	1500		USA, WEWN/EWTN Irondale AL			15615as
1400	1500	Sat/Sun	USA, WHRI Cypress Creek SC			9795am
			9840am	21670va		
1400	1500		USA, WJHR Intl Milton FL	15550usb		
1400	1500		USA, WTWW Lebanon TN	9479va		
1400	1500		USA, WWCR Nashville TN	7490af		9980af
			13845eu	15825eu		
1400	1500		USA, WWRB Manchester TN	9385na		
1400	1500		USA, WYFR/Family R Worldwide			11540as
1400	1500		Zambia, Christian Voice	6065af		
1400	1500		Zambia, CVC Intl/1 Africa	13590af		
1405	1435	Sat/Sun	Canada, Bible Voice Broadcasting			15270as
1415	1427		Nepal, R Nepal	5005do		
1415	1430	mtwhfa	USA, Pan Amer Broadcasting			15205as
1420	1440		India, All India R/Itanagar	4990do		
1420	1455		Swaziland, TWR Africa	4760af		
1430	1445		India, All India R/Aizawl	5050do		
1430	1445		India, All India R/Delhi	6085do		9575do
			9835do			
1430	1445		India, All India R/Jeypore	5040do		
1430	1445		India, All India R/Mumbai	4840do		
1430	1445	Sun	USA, Pan Amer Broadcasting			15205as
1430	1500		Australia, ABC/R Australia	9475as		11660as
1430	1500	Sat	Canada, Bible Voice Broadcasting			17495as
1430	1500	Sat	India, All India R/Gangtok	4835do		
1430	1500		USA, WRMI/R Prague relay	9955ca		
1445	1500		Australia, HCJB Global Australia			15340as
1450	1500		India, All India R/Itanagar	4990do		
1450	1500		India, All India R/Kurseong	4895do		

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

1500	1515	Sun	Canada, Bible Voice Broadcasting			13740as
1500	1525	Sun	China, Haixa zhi Sheng/VO Strait			4940do
			9505do			
1500	1525	mhf	Guam, KTWR/TWR Asia	15200as		
1500	1530		Australia, ABC/R Australia	11945pa		
1500	1530		Australia, HCJB Global Australia			15340as
1500	1530		India, All India R/Jeypore	5040do		
1500	1530		Vietnam, VO Vietnam/Overseas Svc			7285as
			9840as	12020as		
1500	1535	twas	Guam, KTWR/TWR Asia	15200as		
1500	1550		New Zealand, R New Zealand Intl			6170pa
1500	1557		North Korea, Voice of Korea			9335na
			11710na	13760eu	15245eu	
1500	1600		Anguilla, University Network	11775na		
1500	1600		Australia, ABC NT Alice Springs			2310do
1500	1600		Australia, ABC NT Katherine	2485do		
1500	1600		Australia, ABC/R Australia	5940as		5995pa
			7240pa	9475as	11660as	
1500	1600		Bahrain, R Bahrain	6010me		
1500	1600	Sat/Sun	Canada, CBC Northern Quebec Svc			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 R International			5955as
			6095me	7325as	7395as	9720me
			9800as	9870as	11965eu	13640eu
			13740na	17630af		
1500	1600	Sat	Clandestine, Sudan R Service			17745af
1500	1600		Eqt Guinea, Pan Am BC/R Africa			15190af
1500	1600	Sat/Sun	Germany, Mighty KBC Radio			6095eu
1500	1600	Sat	Italy, IRRS SW	15700va		
1500	1600		Malaysia, RTM Kajang/Traxx FM			7295do
1500	1600		Nigeria, Voice of Nigeria	15120af		
1500	1600	DRM	Russia, Voice of Russia	6070as		7370as
1500	1600		Russia, Voice of Russia	4975va		9560as
			11840as	15640me		
1500	1600		South Africa, Channel Africa			9625af
1500	1600		Uganda, Dunamis Shortwave			4750do
1500	1600		UK, BBC World Service	5845as		5875as
			6190af	6195as	7435af	9410as
			9740as	11890as	12095af	13820me
			15310as	15400af	17640af	17830af
			21470af			
1500	1600		USA, Amer Forces Network/AFRTS			4319usb
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
1500	1600		USA, BBG/Voice of America	4930af		6080af
			6140as	7465as	7520as	9485as
			9760as	12150as	13570me	15265af
			15530me	15580af	17895af	
1500	1600		USA, FBN/WTJC Newport NC			9370na
1500	1600		USA, KNLS Anchor Point AK	9655as		
1500	1600		USA, Overcomer Ministry	13810me		
1500	1600		USA, WBCQ Monticello ME	9330am		
1500	1600	Sat/Sun	USA, WBCQ Monticello ME	15420am		
1500	1600		USA, WEWN/EWTN Irondale AL			15610eu
1500	1600	Sat/Sun	USA, WHRI Cypress Creek SC			9795am
			9840am			
1500	1600	Sun	USA, WHRI Cypress Creek SC			21630af
1500	1600		USA, WINB Red Lion PA	13570am		
1500	1600		USA, WJHR Intl Milton FL	15550usb		
1500	1600		USA, WTWW Lebanon TN	9479va		
1500	1600		USA, WWCR Nashville TN	9980af		12160af
			13845eu	15825eu		
1500	1600		USA, WWRB Manchester TN	9385na		
1500	1600		USA, WYFR/Family R Worldwide			6280as
			13690as	15520as		
1500	1600		Zambia, Christian Voice	6065af		
1500	1600		Zambia, CVC Intl/1 Africa	13590af		
1515	1530	Sat	Australia, HCJB Global Australia			15340as
1515	1530	f	Canada, Bible Voice Broadcasting			15275as
1525	1555	Sat/Sun	Swaziland, TWR Africa	4760af		
1530	1545		India, All India R/Aizawl	5050do		
1530	1545		India, All India R/Bengaluru	9425do		
1530	1545		India, All India R/Bhopal	4810do		
1530	1545		India, All India R/Chennai	4920do		
1530	1545		India, All India R/Delhi	5015do		
1530	1545		India, All India R/Guwahati	4940do		
1530	1545		India, All India R/Hyderbad	4800do		
1530	1545		India, All India R/Itanagar	4990do		
1530	1545		India, All India R/Jaipur	4910do		
1530	1545		India, All India R/Kolkata	4820do		
1530	1545		India, All India R/Kurseong	4895do		
1530	1545		India, All India R/Lucknow	4880do		
1530	1545		India, All India R/Panaji (Goa)			9820do
1530	1545		India, All India R/Port Blair	4760do		
1530	1545		India, All India R/R Kashmir	4950do		
1530	1545		India, All India R/Shillong	4970do		
1530	1545		India, All India R/Shimla	4965do		
1530	1545		India, All India R/Thiruvananthapuram			5010do
1530	1600		Afghanistan, RTV Afghanistan			7200as
1530	1600		Australia, ABC/R Australia	11880pa		
1530	1600	DRM	Belgium, The Disco Palace	15775as		
1530	1600	h	Canada, Bible Voice Broadcasting			15275as
1530	1600	Sun	Clandestine, Sudan R Service			17745af
1530	1600	smtwa	Germany, AWR Europe	15255as		
1530	1600	mtwas	Indonesia, AWR Asia/Pacific			15255as
1530	1600		Iran, VO Islamic Rep of Iran	11945va		13780va
			13720al			
1530	1600		Mongolia, Voice of Mongolia			12015as
1530	1600		Vatican City State, Vatican R	11850as		13765as
			17520as	17815as		
1551	1600		New Zealand, R New Zealand Intl			7440pa
1551	1600	DRM	New Zealand, R New Zealand Intl			6170pa

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

1600	1627		Iran, VO Islamic Rep of Iran	11945va		13780va
			13720al			
1600	1630		Australia, ABC/R Australia	9540as		
1600	1630	DRM	Belgium, The Disco Palace	15775as		

1600	1630		Vietnam, VO Vietnam/Overseas Svc	7220me	7280eu	9550me 9730eu
1600	1657		North Korea, Voice of Korea	9990va	11545va	
1600	1700		Anguilla, University Network	11775na		
1600	1700		Australia, ABC NT Alice Springs	2310do		
1600	1700		Australia, ABC NT Katherine	2485do		
1600	1700		Australia, ABC/R Australia	5940as	5995pa	7240pa 9475as 11660as 11880pa
1600	1700		Bahrain, R Bahrain	6010me		
1600	1700	Sat	Canada, CBC Northern Quebec Svc	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		China, China R International	6060as	7235as 7420af 9570af 11900af	11940eu 11965eu 13760eu
1600	1700		Egypt, R Cairo	15345af		
1600	1700		Eqt Guinea, Pan Am BC/R Africa	15190af		
1600	1700		Ethiopia, R Ethiopia	7235va	9560va	
1600	1700	Sat/Sun	Germany, Mighty KBC Radio	6095eu		
1600	1700		Malaysia, RTM Kajang/Traxx FM	7295do		
1600	1700	DRM	New Zealand, R New Zealand Intl	6170pa		
1600	1700		New Zealand, R New Zealand Intl	7440pa		
1600	1700		Palau, T8WH/World Harvest R	15530as		
1600	1700	DRM	Russia, Voice of Russia	6070as	7370eu	
1600	1700		Russia, Voice of Russia	4975as	7285me	11985me
1600	1700		South Korea, KBS World R	9515eu	9640as	
1600	1700		Taiwan, R Taiwan Intl	9435as	15485as	
1600	1700		Uganda, Dunamis Shortwave	4750do		
1600	1700		UK, BBC World Service	3255af	5845as	5975as 6190af 9410as 11890as 12095af 13820me 15400af 17795af 17830af 21470af
1600	1700		USA, Amer Forces Network/AFRTS	4319usb	5446usb 5765usb 7811usb 12133usb	12759usb 13362usb
1600	1700		USA, BBG/Voice of America	4930af	6080af	7465as 12080af 13570af 15470af 15580af
1600	1700		USA, FBN/WTJC Newport NC	9370na		
1600	1700		USA, Overcomer Ministry	15425as		
1600	1700		USA, WBCQ Monticello ME	9330am		
1600	1700	Sat/Sun	USA, WBCQ Monticello ME	15420am		
1600	1700		USA, WEWN/EWTN Irondale AL	15610eu		
1600	1700	Sat/Sun	USA, WHRI Cypress Creek SC	9795am		
1600	1700		USA, WHRI Cypress Creek SC	9840na	11630af	
1600	1700		USA, WINB Red Lion PA	13570am		
1600	1700		USA, WJHR Intl Milton FL	15550usb		
1600	1700		USA, WTWW Lebanon TN	9479va		
1600	1700		USA, WWCR Nashville TN	9980af	12160af	13845eu 15825eu
1600	1700		USA, WWRB Manchester TN	9385na		
1600	1700		USA, WYFR/Family R Worldwide	11850as		
1600	1700		Zambia, Christian Voice	6065af		
1600	1700		Zambia, CVC Intl/1 Africa	13590af		
1615	1630		Vatican City State, Vatican R	3975eu	6075eu	7250eu 9645eu 15595eu
1630	1700		Clandestine, Sudan R Service	17745af		
1630	1700		Indonesia, AWR Asia/Pacific	11740as		
1630	1700		Turkey, Voice of Turkey	15520as		
1630	1700		USA, BBG/Voice of America	9490af	11655af	13800af
1645	1700		Canada, Bible Voice Broadcasting	15215me		

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

1700	1710		Pakistan, Azad Kashmir R	3975do	4790do	
1700	1710		Pakistan, PBC/R Pakistan	11575eu		
1700	1715	mf	Canada, Bible Voice Broadcasting	15215me		
1700	1720	h	Canada, Bible Voice Broadcasting	15215me		
1700	1725		Turkey, Voice of Turkey	15520as		
1700	1730		Australia, ABC/R Australia	11660as		
1700	1730		USA, BBG/Voice of America	6080af	11795va	17895af
1700	1730		Vietnam, VO Vietnam/Overseas Svc	9625eu		
1700	1750	DRM	New Zealand, R New Zealand Intl	6170pa		
1700	1750		New Zealand, R New Zealand Intl	7440pa		
1700	1755		South Africa, Channel Africa	15235af		
1700	1756	DRM	Romania, R Romania Intl	9535eu		
1700	1756		Romania, R Romania Intl	11740eu	11740eu	
1700	1800		Anguilla, University Network	11775na		
1700	1800		Australia, ABC NT Alice Springs	2310do		
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, ABC/R Australia	5995pa	9475as	9500pa 9580pa 11880pa
1700	1800		Bahrain, R Bahrain	6010me		
1700	1800	asm	Canada, Bible Voice Broadcasting	15215me		
1700	1800	Sat	Canada, CBC Northern Quebec Svc	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 R International	6090as	6140as 6145eu 6165me 7235as	7265af 7410as 7420as 9570af 9695eu 11900af 13760eu
1700	1800		Egypt, R Cairo	15345af		
1700	1800		Eqt Guinea, Pan Am BC/R Africa	15190af		
1700	1800		Malaysia, RTM Kajang/Traxx FM	7295do		
1700	1800		Poland, Polish Radio/External Svc	9955na		
1700	1800	DRM	Russia, Voice of Russia	7370eu		
1700	1800		Russia, Voice of Russia	4975va	7285va	11985af 12040eu
1700	1800		Swaziland, TWR Africa	3200af		
1700	1800		Taiwan, R Taiwan Intl	15690af		
1700	1800		UK, BBC World Service	3255af	5845as	5975as 6190af 7565as 9410as 12095af 15400af 15420af 17640af 17795af 17830af
1700	1800		USA, Amer Forces Network/AFRTS	4319usb	5446usb 5765usb 7811usb 12133usb	12759usb 13362usb
1700	1800		USA, BBG/Voice of America	11795af	15580af	
1700	1800		USA, FBN/WTJC Newport NC	9370na		
1700	1800		USA, WBCQ Monticello ME	9330am	15420am	
1700	1800		USA, WEWN/EWTN Irondale AL	15610eu		
1700	1800		USA, WHRI Cypress Creek SC	9840na	21630af	
1700	1800		USA, WINB Red Lion PA	13570am		
1700	1800		USA, WJHR Intl Milton FL	15550usb		
1700	1800		USA, WTWW Lebanon TN	9479va		
1700	1800		USA, WWCR Nashville TN	9980af	12160af	13845eu 15825eu
1700	1800		USA, WWRB Manchester TN	9385na		
1700	1800		USA, WYFR/Family R Worldwide	7395af	17545af	
1700	1800		Zambia, Christian Voice	4965as		
1700	1800		Zambia, CVC Intl/1 Africa	13590af		
1720	1740	Sat/Sun	USA, BBG/Voice of America/Studio 7	4930af	7210af	12120af
1730	1745	h	Canada, Bible Voice Broadcasting	15215me		
1730	1745		India, All India R/Bhopal	4810do		
1730	1745		India, All India R/Delhi	5015do	7370do	9575do 9835do
1730	1745		India, All India R/Guwahati	4940do		
1730	1745		India, All India R/Hyderbad	4800do		
1730	1745		India, All India R/Jaipur	4910do		
1730	1745		India, All India R/Kolkata	4820do		
1730	1745		India, All India R/Kurseong	4895do		
1730	1745		India, All India R/Lucknow	4880do		
1730	1745		India, All India R/R Kashmir	4950do		
1730	1745		India, All India R/Shimla	4965do		
1730	1745		India, All India R/Thiruvananthapuram	5010do		
1730	1800		Australia, ABC/R Australia	6080pa		
1730	1800	Sun	Italy, IRRS SW	7290va		
1730	1800	m	South Africa, R Mirror Intl	3230af		
1730	1800		USA, BBG/Voice of America	6080af	12015va	17895af
1730	1800	mtwhf	USA, BBG/Voice of America/Studio 7	4930af	7210af	12120af
1730	1800		Vatican City State, Vatican R	11625af	13765af	15570af
1740	1745		India, All India R/Chennai	4920do		
1745	1800	Sat	Canada, Bible Voice Broadcasting	17515af		
1745	1800	DRM	India, All India R/External Svc	9950eu		
1745	1800		India, All India R/External Svc	7400af	7550eu 9415af 11580af	11670as 11935af 13695af

1751 1800 New Zealand, R New Zealand Intl 9615pa
1751 1800 DRM New Zealand, R New Zealand Intl 7440pa

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

1800 1830 w Austria, AWR Europe 15325af
1800 1830 Japan, R Japan NHK World 15720af
1800 1830 South Africa, AWR Africa 3215af 3345af
1800 1830 m South Africa, R Mirror Intl 3230af
1800 1830 Tanzania, Zanzibar BC/VO Tanzania 11735do
1800 1830 UK, BBC World Service 5850as 5975as
1800 1830 USA, BBG/Voice of America 6080af 17895af
1800 1830 Sat/Sun USA, BBG/Voice of America 4930af
1800 1830 USA, BBG/Voice of America 9850af
1800 1836 DRM New Zealand, R New Zealand Intl 7440pa
1800 1836 New Zealand, R New Zealand Intl 9615pa
1800 1857 North Korea, Voice of Korea 13760eu 15245eu
1800 1900 Anguilla, University Network 11775na
1800 1900 mtwhf Argentina, RAE 15345eu
1800 1900 Australia, ABC NT Alice Springs 2310do
1800 1900 Australia, ABC NT Katherine 2485do
1800 1900 Australia, ABC/R Australia 6080pa 9500pa 9580pa 9710pa 11880pa
1800 1900 Bahrain, R Bahrain 6010me
1800 1900 Sat Canada, Bible Voice Broadcasting 9430me
1800 1900 Sun Canada, Bible Voice Broadcasting 6130eu 15215me
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 R International 6175eu 9600eu 13760eu
1800 1900 mtwhfa Ecuador, HCJB/LV de los Andes 3995eu
1800 1900 Eqt Guinea, Pan Am BC/R Africa 15190af
1800 1900 DRM India, All India R/External Svc 9950eu
1800 1900 India, All India R/External Svc 7400af 7550as 9415af 9445af 11580af 11670eu 11935af 13695af
1800 1900 fa Italy, IRRS SW 7290va
1800 1900 Kuwait, R Kuwait 15540eu
1800 1900 Malaysia, RTM Kajang/Traxx FM 7295do
1800 1900 DRM Russia, Voice of Russia 7370eu 9880eu
1800 1900 Russia, Voice of Russia 4975me 9900va 12040eu
1800 1900 South Korea, KBS World R 7275eu
1800 1900 Swaziland, TWR Africa 3200af 9500af
1800 1900 Taiwan, R Taiwan Intl 6155eu
1800 1900 UK, BBC World Service 3255af 5875me 5950as 6190af 11810af 12095af 15400af 15420af 17795af
1800 1900 USA, Amer Forces Network/AFRTS 4319usb 5446usb 5765usb 7811usb 12133usb 12759usb 13362usb
1800 1900 USA, BBG/Voice of America 12015af 15580af
1800 1900 USA, FBN/WTJC Newport NC 9370na
1800 1900 USA, KJES Vado NM 15385na
1800 1900 USA, Overcomer Ministry 9400eu
1800 1900 USA, WBCQ Monticello ME 9330am 15420am
1800 1900 USA, WEWN/EWTN Irondale AL 15610af
1800 1900 USA, WHRI Cypress Creek SC 9840na 21630af
1800 1900 USA, WINB Red Lion PA 13570am
1800 1900 USA, WJHR Intl Milton FL 15550usb
1800 1900 USA, WTWW Lebanon TN 9479va
1800 1900 USA, WWCR Nashville TN 9980af 12160af 13845eu 15825eu
1800 1900 USA, WWRB Manchester TN 9385na
1800 1900 USA, WYFR/Family R Worldwide 5905af 7395af 9610af 13750af
1800 1900 Zambia, Christian Voice 4965af
1800 1900 Zambia, CVC Intl/1 Africa 13590af
1815 1845 Sun Canada, Bible Voice Broadcasting 6130eu 9430me
1830 1845 India, All India R/Delhi 5015do
1830 1900 f Canada, Bible Voice Broadcasting 17515af
1830 1900 Sun Italy, IRRS SW 7290va
1830 1900 mtwhf Moldova, R PMR/Pridnestrovye 9665eu
1830 1900 DRM/mtwhf Nigeria, Voice of Nigeria 15120af
1830 1900 Serbia, International R Serbia 6100eu
1830 1900 South Africa, AWR Africa 11840af
1830 1900 Turkey, Voice of Turkey 9785va
1830 1900 UK, BBC World Service 9410af
1830 1900 USA, BBG/Voice of America 4930af 6080af 9850af
1837 1900 New Zealand, R New Zealand Intl 9615pa
1837 1900 DRM New Zealand, R New Zealand Intl 9890pa

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

1900 1925 Turkey, Voice of Turkey 9785va
1900 1927 Germany, Deutsche Welle 9735af
1900 1930 f Canada, Bible Voice Broadcasting 17515af
1900 1930 Germany, Deutsche Welle 7365af 11800af
1900 1930 USA, BBG/Voice of America 9850af
1900 1930 Vietnam, VO Vietnam/Overseas Svc 7280eu 9730eu
1900 1945 DRM India, All India R/External Svc 9950eu
1900 1945 India, All India R/External Svc 7400af 7550eu 9415af 9445af 11580af 11670eu 11935af 13695af
1900 1950 DRM New Zealand, R New Zealand Intl 9890pa
1900 1950 New Zealand, R New Zealand Intl 9615pa
1900 1957 North Korea, Voice of Korea 7210af 9975va 11535va 11910af
1900 2000 Anguilla, University Network 11775na
1900 2000 Australia, ABC NT Alice Springs 2310do
1900 2000 Australia, ABC NT Katherine 2485do
1900 2000 Australia, ABC/R Australia 6080pa 9475as 9500pa 9580pa 9710pa 11660pa 11880pa
1900 2000 Bahrain, R Bahrain 6010me
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 R International 7295va 9435af 9440af
1900 2000 Cuba, R Havana Cuba 11760am
1900 2000 Egypt, R Cairo 15290af
1900 2000 Eqt Guinea, Pan Am BC/R Africa 15190af
1900 2000 Indonesia, VO Indonesia 9526va
1900 2000 Kuwait, R Kuwait 15540eu
1900 2000 Malaysia, RTM Kajang/Traxx FM 7295do
1900 2000 Micronesia, V6MP/Cross R/Pohnpei 4755as
1900 2000 DRM/mtwhf Nigeria, Voice of Nigeria 15120af
1900 2000 DRM Russia, Voice of Russia 6155eu
1900 2000 Russia, Voice of Russia 12040eu
1900 2000 mtwhf Spain, R Exterior de Espana 9665af 11620af
1900 2000 Swaziland, TWR Africa 3200af
1900 2000 Thailand, R Thailand World Svc 7205eu
1900 2000 UK, BBC World Service 3255af 5875me 5950as 6005af 6190af 9410af 11810af 12095af 15400af 17795as
1900 2000 USA, Amer Forces Network/AFRTS 4319usb 5446usb 5765usb 7811usb 12133usb 12759usb 13362usb
1900 2000 USA, BBG/Voice of America 4930af 4940af 6080af 7485me 9490me 15580af
1900 2000 USA, FBN/WTJC Newport NC 9370na
1900 2000 USA, Overcomer Ministry 9400eu
1900 2000 USA, WBCQ Monticello ME 9330am 15420am
1900 2000 USA, WEWN/EWTN Irondale AL 15610af
1900 2000 USA, WHRI Cypress Creek SC 9840na 21630af
1900 2000 USA, WINB Red Lion PA 13570am
1900 2000 USA, WJHR Intl Milton FL 15550usb
1900 2000 USA, WTWW Lebanon TN 9479va
1900 2000 USA, WWCR Nashville TN 9980af 12160af 13845eu 15825eu
1900 2000 USA, WWRB Manchester TN 9385na
1900 2000 USA, WYFR/Family R Worldwide 7395af 9775af 18980eu
1900 2000 Zambia, Christian Voice 4965af
1900 2000 Zambia, CVC Intl/1 Africa 13590af
1905 1920 Sat Mali, ORTM/R Mali 9635do
1930 1957 Germany, Deutsche Welle 7365af
1930 2000 Germany, Deutsche Welle 11800af
1930 2000 Iran, VO Islamic Rep of Iran 9540eu 9800eu 11750af 11885af
1930 2000 Sat USA, Pan Amer Broadcasting 9515af

1945	2000	DRM	Vatican City State, Vatican R	9800am		
1950	2000		Vatican City State, Vatican R	3975eu	6075eu	
			7250eu	9645eu		
1951	2000		New Zealand, R New Zealand Intl		11725pa	
1951	2000	DRM	New Zealand, R New Zealand Intl		15720pa	

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

2000	2027		Iran, VO Islamic Rep of Iran	9540eu	9800eu	
			11750af	11885af		
2000	2030	mtwhfa	Albania, R Tirana	7465eu		
2000	2030		Australia, ABC/R Australia	6080pa	9500pa	
2000	2030		Egypt, R Cairo	15290af		
2000	2030	Sat	Swaziland, TWR Africa	3200af		
2000	2030		USA, BBG/Voice of America	4930af	6080af	
2000	2030		Vatican City State, Vatican R	7365af	9755af	
			11625af			
2000	2057		Germany, Deutsche Welle	9490af		
2000	2100		Anguilla, University Network	11775na		
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, ABC/R Australia	9580pa	11650pa	
			11660pa	12080pa	15515pa	
2000	2100		Bahrain, R Bahrain	6010me		
2000	2100		Belarus, R Belarus	7255eu	11730eu	
2000	2100	DRM	Belgium, The Disco Palace	17875na		
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 R International		5960eu	
			5985af	7285eu	7295va	7415eu
			9440af	9600eu		
2000	2100	f	Clandestine, JSR/Shiokaze/Sea Breeze		5910as	
2000	2100		Eqt Guinea, Pan Am BC/R Africa		15190af	
2000	2100		Germany, Deutsche Welle	6150af	11800af	
2000	2100		Kuwait, R Kuwait	15540eu		
2000	2100		Malaysia, RTM Kajang/Traxx FM		7295do	
2000	2100		Micronesia, V6MP/Cross R/Pohnpei		4755as	
2000	2100	DRM	New Zealand, R New Zealand Intl		15720pa	
2000	2100		New Zealand, R New Zealand Intl		11725pa	
2000	2100	DRM	Russia, Voice of Russia	6155eu		
2000	2100		Russia, Voice of Russia	12040eu		
2000	2100		South Africa, CVC 1 Africa R		9505af	
			13590af			
2000	2100		UK, BBC World Service	3255af	6005af	
			6190af	9410af	9855af	11810af
			12095af	15400af		
2000	2100		USA, Amer Forces Network/AFRTS		4319usb	
			5446usb	5765usb	7811usb	12133usb
			12759usb	13362usb		
2000	2100		USA, BBG/Voice of America	4930af	7485me	
			15580af			
2000	2100	mtwhf	USA, BBG/Voice of America	9480me		
2000	2100		USA, FBN/WTJC Newport NC		9370na	
2000	2100		USA, Overcomer Ministry	9400eu		
2000	2100		USA, WBCQ Monticello ME	7490am	9330am	
			15420am			
2000	2100		USA, WEWN/EWTN Irondale AL		15610af	
2000	2100	mtwhfa	USA, WHRI Cypress Creek SC		21630af	
2000	2100		USA, WHRI Cypress Creek SC		17510va	
2000	2100		USA, WINB Red Lion PA	13570am		
2000	2100		USA, WJHR Intl Milton FL	15550usb		
2000	2100		USA, WTWW Lebanon TN	9479va		
2000	2100		USA, WWCR Nashville TN	9980af	12160af	
			13845eu	15825eu		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family R Worldwide		15195af	
2000	2100		Zambia, Christian Voice	4965af		
2000	2100		Zambia, CVC Intl/1 Africa	9505as		
2030	2045		Thailand, R Thailand World Svc		9680eu	
2030	2056	DRM	Romania, R Romania Intl	9700eu		
2030	2056		Romania, R Romania Intl	11880na	13800na	
			15220na			
2030	2100		Australia, ABC/R Australia	9500pa	11695as	
			12080pa			
2030	2100	mtwhf	Moldova, R PMR/Pridnestrovye		9665eu	
2030	2100		Turkey, Voice of Turkey	7205va		
2030	2100		USA, BBG/Voice of America	6080af	7555as	
2030	2100	Sat/Sun	USA, BBG/Voice of America	4940af		
2030	2100		Vietnam, VO Vietnam/Overseas Svc		7220me	
			7280eu	9730me	9730eu	
2045	2100		India, All India R/External Svc		7550eu	
			9445eu	9910pa	11620pa	11670eu
			11715pa			
2045	2100	DRM	India, All India R/External Svc		9950eu	

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

2100	2125		Turkey, Voice of Turkey	7205va		
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 Northern Quebec Svc		9625na	
2100	2130		Serbia, International R Serbia		6100eu	
2100	2130		South Korea, KBS World R	3955eu		
2100	2150		New Zealand, R New Zealand Intl		11725pa	
2100	2150	DRM	New Zealand, R New Zealand Intl		15720pa	
2100	2157		North Korea, Voice of Korea		13760eu	
			15245eu			
2100	2200		Angola, Angolan National R		7217af	
2100	2200		Anguilla, University Network	11775na		
2100	2200		Australia, ABC/R Australia	9500pa	11695as	
			13630pa	15515pa	11650pa	12080pa
			21740pa			
2100	2200		Bahrain, R Bahrain	6010me		
2100	2200		Belarus, R Belarus	7255eu	11730eu	
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		China, China R International		5960eu	
			7205af	7285eu	7325af	7415eu
			9600eu			
2100	2200		Eqt Guinea, Pan Am BC/R Africa		15190af	
2100	2200		Germany, Deutsche Welle	11800af	11830af	
			11865af			

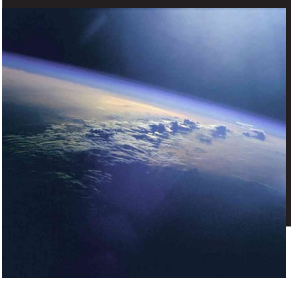
2100	2200		India, All India R/External Svc	7550eu
			9445eu 9910pa 11620pa	11670eu
			11715pa	
2100	2200	DRM	India, All India R/External Svc	9950eu
2100	2200		Malaysia, RTM Kajang/Traxx FM	7295do
2100	2200		Micronesia, V6MP/Cross R/Pohnpei	4755 as
2100	2200	DRM	Russia, Voice of Russia 6155eu	
2100	2200		South Africa, CVC 1 Africa R	9505af
			13590af	
2100	2200	Sat/Sun	Spain, R Exterior de Espana 9650eu	
2100	2200		Syria, R Damascus 9330va	
2100	2200		UK, BBC World Service 3255af	3915as
			5875as 5905af 6005af	6190af
			6195va 9410af 12095af	
2100	2200		USA, Amer Forces Network/AFRTS	4319usb
			5446usb 5765usb 7811usb	12133usb
			12759usb 13362usb	
2100	2200		USA, BBG/Voice of America 6080af	7555as
			15580af	
2100	2200		USA, FBN/WTJC Newport NC	9370na
2100	2200		USA, Overcomer Ministry 9400eu	
2100	2200		USA, WBCQ Monticello ME 7490am	9330am
2100	2200		USA, WEWN/EWTN Irondale AL	15610af
2100	2200		USA, WHRI Cypress Creek SC	17510va
2100	2200		USA, WINB Red Lion PA 9265am	
2100	2200		USA, WJHR Intl Milton FL 15550usb	
2100	2200		USA, WTWW Lebanon TN 9479va	
2100	2200		USA, WWCR Nashville TN 6875eu	9350af
			9980af 13845eu	
2100	2200		USA, WWRB Manchester TN 9385na	
2100	2200		USA, WYFR/Family R Worldwide	12070af
2100	2200		Zambia, Christian Voice 4965af	
2100	2200		Zambia, CVC Intl/1 Africa 9505as	
2115	2200		Egypt, R Cairo 6270eu	
2130	2200		Australia, ABC NT Alice Springs	4835do
2130	2200		Australia, ABC NT Katherine 5025do	
2130	2200	mtwhfa	Canada, CBC Northern Quebec Svc	9625na
2151	2200		New Zealand, R New Zealand Intl	15720pa
2151	2200	DRM	New Zealand, R New Zealand Intl	17675pa

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

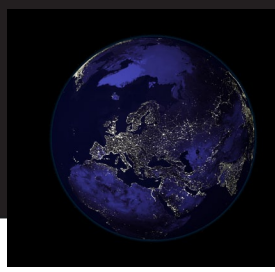
2200	2230		India, All India R/External Svc	7550eu
			9445eu 9910pa 11620pa	11670eu
			11715pa	
2200	2230	DRM	India, All India R/External Svc	9950as
2200	2245		Egypt, R Cairo 6270eu	
2200	2255		Turkey, Voice of Turkey 9830va	
2200	2256		Romania, R Romania Intl 7435eu	9540eu
			9790eu 11940eu	
2200	2300		Anguilla, University Network 6090na	
2200	2300		Australia, ABC NT Alice Springs	4835do
2200	2300		Australia, ABC NT Katherine 5025do	
2200	2300		Australia, ABC/R Australia 9855as	12080pa
			13630pa 15230pa 15240as	15415pa
			15515pa 21740pa	
2200	2300		Bahrain, R Bahrain 6010me	
2200	2300	smtwhf	Canada, CBC Northern Quebec Svc	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 R International	9590as
2200	2300		Eqt Guinea, Pan Am BC/R Africa	15190af
2200	2300		Malaysia, RTM Kajang/Traxx FM	7295do
2200	2300		Micronesia, V6MP/Cross R/Pohnpei	4755 as
2200	2300		New Zealand, R New Zealand Intl	15720pa
2200	2300	DRM	New Zealand, R New Zealand Intl	17675pa
2200	2300	Sat	Palau, T8WH/World Harvest R	9930as
2200	2300		Russia, Voice of Russia 9800va	
2200	2300		UK, BBC World Service 3915as	5875as
			5905as 6195as 7490as	9580as
			9730af 9740as 12095af	
2200	2300		USA, Amer Forces Network/AFRTS	4319usb
			5446usb 5765usb 7811usb	12133usb
			12759usb 13362usb	
2200	2300		USA, BBG/Voice of America 5755as	
2200	2300	mtwhs	USA, BBG/Voice of America 5895as	5915as
			7480as 7575as 12150as	
2200	2300		USA, FBN/WTJC Newport NC	9370na
2200	2300		USA, WBCQ Monticello ME 7490am	9330am
2200	2300		USA, WEWN/EWTN Irondale AL	15610me
2200	2300		USA, WHRI Cypress Creek SC	11775va
			13620na 17510va	
2200	2300	twhfas	USA, WINB Red Lion PA 9265am	
2200	2300		USA, WTWW Lebanon TN 9479va	
2200	2300		USA, WWCR Nashville TN 6875eu	9350af
			9980af 13845eu	
2200	2300		USA, WWRB Manchester TN 9385na	
2200	2300		USA, WYFR/Family R Worldwide	6115na
2200	2300		Zambia, Christian Voice 4965af	
2215	2230		Croatia, Voice of Croatia 9925ca	
2230	2300		Indonesia, AWR Asia/Pacific	9730as
2230	2300	mtwhf	Moldova, R PMR/Pridnestrovye	9665eu
2230	2300		USA, BBG/Voice of America 7460as	9570as
			11840as 15340as	
2230	2300		USA, WYFR/Family R Worldwide	6115af
			11580af 15255af	
2245	2300		India, All India R/External Svc	6055as
			9705as 9950as 11670as	13605as
2245	2300	DRM	India, All India R/External Svc	11645as

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

2300	0000		Anguilla, University Network 6090na	
2300	0000		Australia, ABC NT Alice Springs	4835do
2300	0000		Australia, ABC NT Katherine 5025do	
2300	0000		Australia, ABC/R Australia 9855as	12080pa
			13630pa 15230pa 15415pa	15515pa
			17795pa 19000pa 21740pa	
2300	0000		Bahrain, R Bahrain 6010me	
2300	0000	smtwhf	Canada, CBC Northern Quebec Svc	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 R International	5915as
			5990ca 6145na 7350eu	7410as
			9610as 11690as 11790as	11840na
2300	0000		Cuba, R Havana Cuba 5040va	
2300	0000		Egypt, R Cairo 6270na	
2300	0000		India, All India R/External Svc	6055as
			9705as 9950as 11670as	13605as
2300	0000	DRM	India, All India R/External Svc	11645as
2300	0000		Malaysia, RTM Kajang/Traxx FM	7295do
2300	0000		Micronesia, V6MP/Cross R/Pohnpei	4755 as
2300	0000		New Zealand, R New Zealand Intl	15720pa
2300	0000	DRM	New Zealand, R New Zealand Intl	17675pa
2300	0000		Russia, Voice of Russia 9665va	9800va
2300	0000		UK, BBC World Service 3915as	6195as
			7490as 9580as 9740as	9890as
			11850as 12010as	
2300	0000		USA, Amer Forces Network/AFRTS	4319usb
			5446usb 5765usb 7811usb	12133usb
			12759usb 13362usb	
2300	0000		USA, BBG/Voice of America 5895as	5910as
			7460as 7555as 7575as	9570as
			11840as 12150as 15340as	
2300	0000		USA, FBN/WTJC Newport NC	9370na
2300	0000		USA, WBCQ Monticello ME 7490am	9330am
2300	0000	Sat/Sun	USA, WBCQ Monticello ME 5110am	
2300	0000		USA, WEWN/EWTN Irondale AL	15610me
2300	0000		USA, WHRI Cypress Creek SC	13620na
			17510va	
2300	0000	Sun	USA, WHRI Cypress Creek SC	11775va
2300	0000	mtwhfs	USA, WHRI Cypress Creek SC	7315ca
2300	0000		USA, WINB Red Lion PA 9265am	
2300	0000		USA, WTWW Lebanon TN 9479va	
2300	0000		USA, WWCR Nashville TN 6875eu	9350af
			9980af 13845eu	
2300	0000		USA, WWRB Manchester TN 5050na	
2300	0000		USA, WYFR/Family R Worldwide	15255ca
			11580sa	
2300	0000		Zambia, Christian Voice 4965af	
2300	2330		Australia, ABC/R Australia 15240as	
2300	2330	DRM	Vatican City State, Vatican R 9755am	
2330	0000		Australia, ABC/R Australia 17750as	
2330	0000		Vietnam, VO Vietnam/Overseas Svc	9840as
			12020as	
2330	2345		India, All India R/Aligarh 9470do	



MTXtra
Shortwave Broadcast Guide



ARABIC/CHINESE

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.

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

1800	1830	USA, BBG/Afia Darfur R	9815af	11740af	13715af
1800	1830	USA, BBG/VO America/Afia Darfur R	9805af	11615af	11740af 13715af
1800	1900	Austria, AWR Europe	11660af		
1800	1900	Bahrain, R Bahrain	9745me		
1800	1900	Chad, Natl du Tchadadienne	6165do	4905al	7120al
1800	1900	Clandestine, R Nacl De La R A S D	6297af		
1800	1900	Eritrea, VO the Broad Masses/Pgm 2	5060do	6170do	7120do 9710do
1800	1900	India, All India R/External Svc	9620me	11710me	13640me
1800	1900	Iran, VO Islamic Rep of Iran	3985as	6025as	9715as 12080as
1800	1900	Kuwait, R Kuwait/General Svc	6080me	13650na	
1800	1900	Mali, ORTM/R Mali	5995do		
1800	1900	Mauritania, R Mauritanie	7245do	4845al	
1800	1900	Morocco, R Marocaine	15349af		
1800	1900	Morocco, R Mediterranee Intl/Medi 1	9575va		
1800	1900	Oman, R Sultanate of Oman	15140va		
1800	1900	Russia, Voice of Russia	7305me	9345me	12060af 12110me
1800	1900	Saudi Arabia, BSKSA/General Pgm	9555af	9870eu	
1800	1900	Saudi Arabia, BSKSA/Qur'an Pgm	11820eu	11915af	11930af
1800	1900	Spain, R Exterior de Espana	21610me		
1800	1900	Sudan, Sudan R 7200do			
1800	1900	Tunisia, RTV/R Tunisia	7225af	12005va	17735va
1800	1900	UK, BBC World Service	6195me	7375af	9915af 11680af 13660va
1800	1900	UK, FEBA Radio 9550me			
1800	1900	USA, WYFR/Family R Worldwide	11955va		
1830	1900	China, China R International	11640af		
1830	1900	Turkey, Voice of Turkey	11690va		

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

1900	1925	Turkey, Voice of Turkey	11690va		
1900	1930	Armenia, Public R of Armenia	4810me		
1900	1930	Canada, Bible Voice Broadcasting	13740af		
1900	1930	China, China R International	11640af		
1900	1930	Germany, AWR Europe	9765af		
1900	1930	Sweden, IBRA Radio	9635af		
1900	1930	UK, FEBA Radio 9550me			
1900	1930	USA, BBG/Afia Darfur R	9600af	9800af	11830af
1900	1930	USA, BBG/VO America/Afia Darfur R	9780af	9815af	11975af
1900	1945	India, All India R/External Svc	9620me	11710me	13640me
1900	2000	Bahrain, R Bahrain	9745me		
1900	2000	Chad, Natl du Tchadadienne	6165do	4905al	7120al
1900	2000	Clandestine, R Nacl De La R A S D	6297af		
1900	2000	Eritrea, VO the Broad Masses/Pgm 2	5060do	6170do	7120do 9710do
1900	2000	Germany, AWR Europe	11605af	15260af	
1900	2000	Iran, VO Islamic Rep of Iran	3985as	6025as	9715as 12080as
1900	2000	Kuwait, R Kuwait/General Svc	6080me	13650na	
1900	2000	Mali, ORTM/R Mali	5995do		
1900	2000	Mauritania, R Mauritanie	7245do	4845al	
1900	2000	Morocco, R Marocaine	15349af		
1900	2000	Morocco, R Mediterranee Intl/Medi 1	9575va		
1900	2000	Oman, R Sultanate of Oman	15140va		
1900	2000	Russia, Voice of Russia	7315me	9345me	9900me 12060af 12110me
1900	2000	Saudi Arabia, BSKSA/General Pgm	9555af	9870eu	
1900	2000	Saudi Arabia, BSKSA/Qur'an Pgm	11820eu	11915af	11930af
1900	2000 mtwhf	Spain, R Exterior de Espana	9570af		
1900	2000	Sudan, Sudan R 7200do			
1900	2000	Tunisia, RTV/R Tunisia	7225af	7345af	12005va 17735va
1900	2000	UK, BBC World Service	6195me	7375af	9915af 11680af 13660va
1900	2000	USA, WYFR/Family R Worldwide	9590va		

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

2000	2010	Tunisia, RTV/R Tunisia	17735va		
2000	2015	Germany, R Dardasha 7	5930me		
2000	2030	Iran, VO Islamic Rep of Iran	9715as		
2000	2100	Bahrain, R Bahrain	9745me		
2000	2100	Chad, Natl du Tchadadienne	6165do	4905al	7120al
2000	2100	China, China R International	6100va	6185va	7215va
2000	2100	Clandestine, R Nacl De La R A S D	6297af		
2000	2100	Egypt, R Cairo 9855pa			
2000	2100	Germany, AWR Europe	11605af		
2000	2100	Iran, VO Islamic Rep of Iran	3985as	6025as	12080as
2000	2100	Kuwait, R Kuwait/General Svc	6080me	17550na	
2000	2100	Mali, ORTM/R Mali	5995do		
2000	2100	Mauritania, R Mauritanie	7245do	4845al	
2000	2100	Morocco, R Marocaine	15349af		
2000	2100	Morocco, R Mediterranee Intl/Medi 1	9575va		
2000	2100	Oman, R Sultanate of Oman	15140va		
2000	2100	Russia, Voice of Russia	7315me	9895me	12060af 12110me
2000	2100	Saudi Arabia, BSKSA/General Pgm	9555af	9870eu	
2000	2100	Saudi Arabia, BSKSA/Qur'an Pgm	11820eu	11915af	11930af
2000	2100	South Korea, KBS World R	13585af		
2000	2100	Spain, R Exterior de Espana	9570af		
2000	2100	Sudan, Sudan R 7200do			
2000	2100 `	UK, BBC World Service	5790af	6195me	7375af 9915af 11680af 13660me
2000	2100	USA, WYFR/Family R Worldwide	6115va		
2030	2045	Germany, R Dardasha 7	9515af		
2030	2100	Cuba, R Havana Cuba	17750eu		
2040	2100	Vatican City State, Vatican R	3975eu	7250eu	9645eu

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

2100	2110	Tunisia, RTV/R Tunisia	7225af		
2100	2200	Bahrain, R Bahrain	9745me		
2100	2200	Chad, Natl du Tchadadienne	6165do	4905al	7120al
2100	2200	China, China R International	6100va	6185va	7215va

2100 2200		Clandestine, R Nacl De La R A S D	6297af
2100 2200		Egypt, R Cairo 9855pa	
2100 2200		Iran, VO Islamic Rep of Iran 3985as 12080as	6025as
2100 2200		Kuwait, R Kuwait/General Svc	17550na
2100 2200		Mali, ORTM/R Mali 5995do	
2100 2200		Mauritania, R Mauritanie 7245do	4845al
2100 2200		Morocco, R Mediterranee Intl/Medi 1	9575va
2100 2200		Oman, R Sultanate of Oman	15140va
2100 2200		Saudi Arabia, BSKSA/General Pgm 9870eu	9555af
2100 2200		Saudi Arabia, BSKSA/Qur'an Pgm 11915af 11930af	11820eu
2100 2200	Sat/Sun	Spain, R Exterior de Espana 9570af	
2100 2200		Tunisia, RTV/R Tunisia 7345af	
2100 2200		USA, WYFR/Family R Worldwide	6115va
2115 2145		Ecuador, HCJB/LV de los Andes	12025af

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

2200 2230		Chad, Natl du Tchadadienne 4905al 7120al	6165do
2200 2230		Chad, Natl du Tchadadienne 4905al 7120al	6165do
2200 2300		Bahrain, R Bahrain 9745me	
2200 2300	Sat	Chad, Natl du Tchadadienne 4905al 7120al	6165do
2200 2300		Clandestine, R Nacl De La R A S D	6297af
2200 2300		Iran, VO Islamic Rep of Iran 3985as 12080as	6025as
2200 2300		Kuwait, R Kuwait/General Svc	17550na
2200 2300		Mali, ORTM/R Mali 5995do	
2200 2300		Mauritania, R Mauritanie 7245do	4845al
2200 2300		Morocco, R Mediterranee Intl/Medi 1	9575va
2200 2300		Saudi Arabia, BSKSA/General Pgm 9870eu	9555af
2200 2300		Saudi Arabia, BSKSA/Qur'an Pgm 11915af 11930af	11820eu
2200 2300		Tunisia, RTV/R Tunisia 7345af	

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

2300 0000		Bahrain, R Bahrain 9745me	
2300 0000		Iran, VO Islamic Rep of Iran 3985as 12080as	6025as
2300 0000		Kuwait, R Kuwait/General Svc	17550na
2300 0000		Mali, ORTM/R Mali 5995do	
2300 0000		Mauritania, R Mauritanie 7245do	4845al
2300 0000		Morocco, R Mediterranee Intl/Medi 1	9575va
2300 2310		Tunisia, RTV/R Tunisia 7345af	
2330 0000		Egypt, R Cairo 13855ca 15480ca	

MT CHINESE SHORTWAVE BROADCAST GUIDE

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

0000 0027		Iran, VO Islamic Rep of Iran 13670as 15470as	13715as
0000 0030		Philippines, FEBC Philippines	9405as
0000 0100		China, China Huayi BC 6185do	
0000 0100		China, China R International 17495as	11820as
0000 0100		China, China R International 7405as 11900as 11975as 13580as 13655as	5990as 12035as
0000 0100		China, CNR/VO Shenzhou/CNR6 9170do	6165do
0000 0100		China, CNR/VO Zhonghua/CNR5 9685do 11620do 11935do	9665do
0000 0100		China, Gannan PBS 3990do	5970do
0000 0100		China, Haixa zhi Sheng/VO Strait	6115do
0000 0100		China, Haixa zhi Sheng/VO Strait 7280do	4940do
0000 0100		China, Hulun Buir PBS 3900do	
0000 0100		China, Nei Menggu PBS 7420do	9520do
0000 0100		China, Sichuan PBS2 6060do	7225do
0000 0100		China, Tibet PBS 4820do 7240do 7450do	5935do 6050do
0000 0100		China, VO Guangxi/Beibu Bay R 9820do	5050do
0000 0100		China, Xinjiang PBS 3950do 5960do 7310do	5060do
0000 0100		China, Yunnan PBS/Minority Svc	7210do
0000 0100		Clandestine, Sound of Hope R Intl 12980as 13270as 13350as 14700as 15070as 16100as 17895as	11970as 13850as 16980as
0000 0100		Indonesia, AWR Asia/Pacific 17880as	12025as
0000 0100		Philippines, FEBC Philippines	12070as
0000 0100		Taiwan, R Taiwan Intl 9660as	
0000 0100		USA, BBG/Voice of America 9545as 11925as 15170as 15385as	11830as 17765as
0030 0100		Philippines, FEBC Philippines	15455as

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

0100 0157		China, Tibet PBS 7240do	7450do
0100 0200		China, China Huayi BC 6185do	
0100 0200		China, China R International 9550as 9610as 11945as 15425eu 17495as	9460as 11980as
0100 0200		China, China R International 11650as 13580as 13665as 15160as	9560as 15140as
0100 0200		China, CNR/VO Shenzhou/CNR6 15710do	11905do
0100 0200		China, CNR/VO Zhonghua/CNR5 11620do 11935do	9685do
0100 0200		China, Haixa zhi Sheng/VO Strait	6115do
0100 0200		China, Haixa zhi Sheng/VO Strait 7280do	4940do
0100 0200		China, Hulun Buir PBS 3900do	
0100 0200		China, Nei Menggu PBS 7420do	9520do
0100 0200		China, Sichuan PBS2 6060do	7225do
0100 0200		China, Tibet PBS 4820do 5935do	6050do
0100 0200		China, Xinjiang PBS 3950do 5960do 7310do	5060do
0100 0200		China, Yunnan PBS/Minority Svc	7210do
0100 0200		Clandestine, Sound of Hope R Intl 12980as 13270as 13350as 14700as 15070as 16100as 17895as	11970as 13850as 16980as
0100 0200		Indonesia, AWR Asia/Pacific 17880as	12025as
0100 0200		Philippines, FEBC Philippines	15455as
0100 0200		Taiwan, R Taiwan Intl 9660as	
0158 0200		China, Tibet PBS 11950do	

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

0200 0210	t	China, Hulun Buir PBS 3900do	
0200 0230		Taiwan, R Taiwan Intl 15440na	
0200 0300		China, China Huayi BC 6185do	
0200 0300		China, China R International 17495as	15425as
0200 0300		China, China R International 9560as 9570na 9580na 9825sa 11650sas 11695sa 15140as 15160as	6020eu 9815as 13655as
0200 0300		China, CNR/VO Shenzhou/CNR6 15710do	11905do
0200 0300		China, CNR/VO Zhonghua/CNR5 11620do 11935do	9685do
0200 0300		China, Haixa zhi Sheng/VO Strait	6115do
0200 0300		China, Haixa zhi Sheng/VO Strait 9505do	7280do
0200 0300		China, Hulun Buir PBS 3900do	
0200 0300		China, Nei Menggu PBS 7420do	9520do
0200 0300		China, Qing Hai PBS 4750do	6145do
0200 0300		China, Sichuan PBS2 6060do	7225do
0200 0300		China, Tibet PBS 4820do 11860do 11950do	5935do 6050do
0200 0300		China, Xinjiang PBS 3950do 5960do 7310do	5060do
0200 0300		China, Yunnan PBS/Minority Svc	7210do
0200 0300		Clandestine, Sound of Hope R Intl 12980as 13270as 13350as 14700as 15070as 16100as 17895as	11970as 13850as 16980as
0200 0300		Taiwan, R Taiwan Intl 9660as	

0230	0300	China, Qing Hai PBS	4750do	6145do	9780do

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

0300	0357	North Korea, Voice of Korea			13650as
		15100as			
0300	0400	China, China Huayi BC	6185do		
0300	0400	China, China R International			6020eu
		9450as	9560as	13655as	15130as
		15160as	15230as		
0300	0400	China, CNR/VO Shenzhou/CNR6			11905do
		15710do			
0300	0400	China, CNR/VO Zhonghua/CNR5			9685do
		11620do	11935do		
0300	0400	China, Haixa zhi Sheng/VO Strait			6115do
0300	0400	China, Haixa zhi Sheng/VO Strait			7280do
		9505do			
0300	0400	China, Hulun Buir PBS	3900do		
0300	0400	China, Nei Menggu PBS	7420do	9520do	
0300	0400	China, Qing Hai PBS	4750do	6145do	
		9780do			
0300	0400	China, Sichuan PBS2	6060do	7225do	
0300	0400	China, Tibet PBS	4820do	5935do	6050do
		11860do	11950do		
0300	0400	China, Xinjiang PBS	5960do	7260do	
		9600do	11770do		
0300	0400	Clandestine, Sound of Hope R Intl			11970as
		12980as	13270as	13350as	13850as
		14700as	15070as	16100as	16980as
		17895as			
0300	0400	Taiwan, R Taiwan Intl	5985na		

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

0400	0426 DRM	Romania, R Romania Intl	21540as		
0400	0426	Romania, R Romania Intl	17780as		
0400	0430	Taiwan, R Taiwan Intl	15320as		
0400	0500	China, China Huayi BC	6185do		
0400	0500	China, China R International			9790as
		15160as	15230as		
0400	0500	China, China R International			13640as
		15130as	15170as		
0400	0500	China, CNR/VO Shenzhou/CNR6			11905do
		15710do			
0400	0500	China, CNR/VO Zhonghua/CNR5			9685do
		11620do	11935do		
0400	0500	China, Haixa zhi Sheng/VO Strait			6115do
0400	0500	China, Haixa zhi Sheng/VO Strait			7280do
		9505do			
0400	0500	China, Hulun Buir PBS	3900do		
0400	0500	China, Nei Menggu PBS	7420do	9520do	
0400	0500	China, Qing Hai PBS	4750do	6145do	
		9780do			
0400	0500	China, Sichuan PBS2	6060do	7225do	
0400	0500	China, Tibet PBS	4820do	5935do	6050do
		11860do	11950do		
0400	0500	China, Xinjiang PBS	5960do	7260do	
		9600do	11770do		
0400	0500	Clandestine, Sound of Hope R Intl			11970as
		12980as	13270as	13350as	13850as
		14700as	15070as	16100as	16980as
		17895as			
0400	0500	Taiwan, R Taiwan Intl	5960na	11640as	
		11665as	15245as		

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

0500	0557	North Korea, Voice of Korea			7220as
		9345as	9730as		
0500	0600	China, China Huayi BC	6185do		
0500	0600	China, China R International			15170as
		15230as			
0500	0600	China, China R International			13640as
		15110as	15120as	15130as	15170as
		15785as			
0500	0600	China, CNR/VO Shenzhou/CNR6			11905do
		15710do			
0500	0600	China, CNR/VO Zhonghua/CNR5			9685do
		11620do	11935do		
0500	0600	China, Haixa zhi Sheng/VO Strait			6115do
0500	0600	China, Haixa zhi Sheng/VO Strait			7280do
		9505do			
0500	0600	China, Hulun Buir PBS	3900do		
0500	0600	China, Nei Menggu PBS	7420do	9520do	
0500	0600	China, Qing Hai PBS	4750do	6145do	
		9780do			
0500	0600	China, Sichuan PBS2	6060do	7225do	
0500	0600	China, Tibet PBS	4820do	5935do	6050do
		11860do	11950do		
0500	0600	China, Xinjiang PBS	5960do	7260do	
		9600do	11770do		
0500	0600	Clandestine, Sound of Hope R Intl			11970as
		12980as	13270as	13350as	13850as
		14700as	15070as	16100as	16980as
		17895as			
0500	0600	Taiwan, R Taiwan Intl		11640as	11665as
		11885as	15290as	15245as	

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

0600	0657	North Korea, Voice of Korea			13650as
		15100as			
0600	0700	China, China Huayi BC	6185do		
0600	0700	China, China R International			15120as
		15170as	15230as	15785as	17615as
		17650eu	17740as		
0600	0700	China, CNR/VO Shenzhou/CNR6			11905do
		15710do			
0600	0700	China, CNR/VO Zhonghua/CNR5			9685do
		11620do	11935do		
0600	0700	China, Haixa zhi Sheng/VO Strait			6115do
0600	0700	China, Haixa zhi Sheng/VO Strait			7280do
		9505do			
0600	0700	China, Hulun Buir PBS	3900do		
0600	0700	China, Nei Menggu PBS	7420do	9520do	
0600	0700	China, Qing Hai PBS	4750do	6145do	
		9780do			
0600	0700	China, Sichuan PBS2	6060do	7225do	
0600	0700	China, Tibet PBS	4820do	5935do	6050do
		11860do	11950do		
0600	0700	China, Xinjiang PBS	5960do	7260do	
		9600do	11770do		
0600	0700	Clandestine, Sound of Hope R Intl			11970as
		12980as	13270as	13350as	13850as
		14700as	15070as	16100as	16980as
		17895as			
0600	0700	Philippines, FEBC Philippines			15450as
0630	0700	China, Yunnan PBS/Minority Svc			7210do

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

0700	0800	China, China Huayi BC	6185do		
0700	0800	China, China R International			11640as
		15230as			
0700	0800	China, China R International			15145as
		17560as			
0700	0800	China, China R International			11785eu
		17520as	17615as	17650as	17740as
0700	0800	China, CNR/VO Shenzhou/CNR6			11905do
		15710do			
0700	0800	China, CNR/VO Zhonghua/CNR5			9685do
		11620do	11935do		
0700	0800	China, Haixa zhi Sheng/VO Strait			6115do
0700	0800	China, Haixa zhi Sheng/VO Strait			7280do
		9505do			
0700	0800	China, Nei Menggu PBS	7420do	9520do	
0700	0800	China, Qing Hai PBS	4750do	6145do	
		9780do			
0700	0800	China, Sichuan PBS2	6060do	7225do	
0700	0800	China, Tibet PBS	4820do	5935do	6050do
		11860do	11950do		
0700	0800	China, Xinjiang PBS	5960do	7260do	
		9600do	11770do		
0700	0800	China, Yunnan PBS/Minority Svc			7210do
0700	0800	Clandestine, Sound of Hope R Intl			11970as
		12980as	13270as	13350as	13850as
		14700as	15070as	16100as	16980as
		17895as			
0700	0800	Philippines, FEBC Philippines			15450as
		15525as			

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

0800	0830	China, Yunnan PBS/Minority Svc	7210do
0800	0857	China, Tibet PBS 11860do 11950do	
0800	0857	North Korea, Voice of Korea 9345as	7220as
0800	0900	China, China Huayi BC 6185do	
0800	0900	China, China R International 11640as 11785eu 15230as 15560va 17560va 17650eu	9880as
0800	0900	China, CNR/VO Shenzhou/CNR6 15710do	11905do
0800	0900	China, CNR/VO Zhonghua/CNR5 11620do 11935do	9685do
0800	0900	China, Haixa zhi Sheng/VO Strait	6115do
0800	0900	China, Haixa zhi Sheng/VO Strait 9505do	7280do
0800	0900	China, Nei Menggu PBS 7420do	9520do
0800	0900	China, Qing Hai PBS 4750do 9780do	6145do
0800	0900	China, Sichuan PBS2 6060do	7225do
0800	0900	China, Tibet PBS 4820do	5935do 6050do
0800	0900	China, Xinjiang PBS 5960do 9600do 11770do	7260do
0800	0900	Clandestine, Sound of Hope R Intl 12980as 13270as 13350as 14700as 15070as 16100as 17895as	11970as 13850as 16980as
0800	0900	Philippines, FEBC Philippines 15525as	9430as
0800	0900 w	Taiwan, R Taiwan Intl 15290as	
0858	0900	China, Tibet PBS 7240do 7450do	

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

0900	1000	China, China Huayi BC 6185do	
0900	1000	China, China R International 11980as 15250as 15440as 17500as 17540as 17670pa	7430as 15525as
0900	1000	China, CNR/VO Shenzhou/CNR6 9170do	6165do
0900	1000	China, CNR/VO Zhonghua/CNR5 11620do	9685do
0900	1000	China, Haixa zhi Sheng/VO Strait	6115do
0900	1000	China, Haixa zhi Sheng/VO Strait 9505do	7280do
0900	1000	China, Nei Menggu PBS 7420do	9520do
0900	1000	China, Sichuan PBS2 6060do	7225do
0900	1000	China, Tibet PBS 4820do 7240do 7450do	5935do 6050do
0900	1000	China, Xinjiang PBS 5960do 9600do 11770do	7260do
0900	1000	Clandestine, Sound of Hope R Intl 12980as 13270as 13350as 14700as 15070as 16100as 17895as	11970as 18200as 16980as
0900	1000 Sat/Sun	Clandestine, Sound of Hope R Intl 11760as	9540as
0900	1000	Japan, R Japan NHK World 6090as	
0900	1000	Philippines, FEBC Philippines 9430as	9400as
0900	1000	Taiwan, R Taiwan Intl 11550as	
0900	1000 Sat/Sun	Taiwan, R Taiwan Intl 15465as	
0900	1000	USA, BBG/Voice of America 11825as 13610as 13740as 15250as 17485as 21695as	11965as 15665as
0925	1000	China, CNR/Fujian 5040do	
0930	1000	France, R France International 11875as	7325as
0930	1000	Guam, KTWR/TWR Asia 15235as	
0950	1000	China, Gannan PBS 3990do	5970do

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

1000	1030	France, R France International 11875as	7325as
1000	1030	Mongolia, Voice of Mongolia	12085as
1000	1030	Taiwan, R Taiwan Intl 11625as	15270as
1000	1035	China, CNR/Fujian 5040do	
1000	1100	China, China Huayi BC 6185do	
1000	1100	China, China R International 17670pa	15440pa
1000	1100	China, China R International 13850as 17650as	9890as
1000	1100	China, CNR/VO Shenzhou/CNR6 9170do	6165do
1000	1100	China, CNR/VO Zhonghua/CNR5 9410do	5925do
1000	1100	China, Gannan PBS 3990do	5970do
1000	1100	China, Haixa zhi Sheng/VO Strait	6115do
1000	1100	China, Haixa zhi Sheng/VO Strait 9505do	7280do
1000	1100	China, Nei Menggu PBS 7420do	9520do
1000	1100	China, Sichuan PBS2 6060do	7225do
1000	1100	China, Tibet PBS 4820do 7240do 7450do	5935do 6050do
1000	1100	China, VO Guangxi/Beibu Bay R 9820do	5050do
1000	1100	China, Xinjiang PBS 5960do 9600do 11770do	7260do
1000	1100 Sat/Sun	Clandestine, Sound of Hope R Intl 11760as	9540as
1000	1100	Clandestine, Sound of Hope R Intl 12980as 13130as 13270as 13880as 14700as 14950as 16980as	11970as 13350as 16100as
1000	1100	Guam, KTWR/TWR Asia 15235as	
1000	1100 Sun	Indonesia, AWR Asia/Pacific	12010as
1000	1100 Sun	Indonesia, AWR Asia/Pacific	17520as
1000	1100 mtwhfa	Indonesia, AWR Asia/Pacific 17520as	12010as
1000	1100	Philippines, FEBC Philippines 9430as	9400as
1000	1100	Russia, Voice of Russia 6075as	
1000	1100	Taiwan, R Taiwan Intl 15465as	
1000	1100	Taiwan, R Taiwan Intl 6150as 7385as 9780as	6085as 6105as 11665as
1000	1100	USA, BBG/Voice of America 11825as 13610as 13740as 15250as 17485as 21695as	11965as 15665as
1015	1100 mtwhf	Guam, KTWR/TWR Asia 11895as	
1030	1100	Australia, HCJB Global Australia	15400as
1055	1100	China, Yunnan PBS/Minority Svc	7210do

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

1100	1130	Australia, HCJB Global Australia	15400as
1100	1130	China, Haixa zhi Sheng/VO Strait 9505do	7280do
1100	1130	Vietnam, VO Vietnam/Overseas Svc 12000as	7220as
1100	1155	Turkey, Voice of Turkey 15240as	
1100	1157	North Korea, Voice of Korea 9345as	7220as
1100	1200	China, China Huayi BC 6185do	
1100	1200	China, China R International 9590as 9645as 13580pa	9540as
1100	1200	China, China R International 11875as	9440as
1100	1200	China, China R International 11750pa 13610as 13755as 17650eu	7435as 15440eu
1100	1200	China, CNR/VO Shenzhou/CNR6 9170do	6165do
1100	1200	China, CNR/VO Zhonghua/CNR5 9410do	5925do
1100	1200	China, Gannan PBS 3990do	5970do
1100	1200	China, Haixa zhi Sheng/VO Strait	6115do
1100	1200	China, Haixa zhi Sheng/VO Strait	9505do
1100	1200	China, Nei Menggu PBS 7420do	9520do
1100	1200	China, Sichuan PBS2 6060do	7225do
1100	1200	China, Tibet PBS 4820do 7240do 7450do	5935do 6050do
1100	1200	China, Xinjiang PBS 5960do 9600do 11770do	7260do
1100	1200	China, Yunnan PBS/Minority Svc	7210do
1100	1200	China, Yunnan PBS/VO Shangri-La	6035do
1100	1200	Clandestine, Sound of Hope R Intl 11970as 12980as 13130as 13350as 13880as 14700as 16980as	7280as 13270as 16100as

1100	1200		Guam, KTWR/TWR Asia	9910as	11895as	13765as
1100	1200		Indonesia, AWR Asia/Pacific		11775as	12080as 12105as
1100	1200		Indonesia, VO Indonesia	9526va		
1100	1200		Philippines, FEBC Philippines		9400as	9430as
1100	1200		Taiwan, R Taiwan Intl	6085as	6150as	7385as 9680as 9780as 11625as 11710as
1100	1200		USA, BBG/Voice of America	6110as	9845as	11785as 11825as 12040as 15250as
1130	1200	Sat/Sun	Australia, HCJB Global Australia		15400as	
1130	1200		China, CNR/VO Pujiang	3280do	4950do	5075do
1130	1200		Clandestine, Sound of Hope R Intl		15750as	
1130	1200		South Korea, KBS World R	6095as	9770as	
1145	1200		India, All India R/External Svc		11840as	15795as 17705as
1157	1200		China, Xinjiang PBS	7310do		

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

1200	1230	Australia, HCJB Global Australia		15400as
1200	1230	Clandestine, VO Tibet	15443as	
1200	1230	Guam, KTWR/TWR Asia	9910as	
1200	1230	Japan, R Japan NHK World	6090as	
1200	1230	South Korea, KBS World R	6095as	9770as
1200	1230	Taiwan, R Taiwan Intl	6105as	11915as
1200	1230	Vietnam, VO Vietnam/Overseas Svc	7220as	12000as

MT SHORTWAVE STATION RESOURCE GUIDE

Afghanistan, RTV Afghanistan ..... **www.rta.org.af**
Albania, R Tirana ..... **http://rtsh.sil.at/**
Angola, Angolan National R ..... **www.rna.ao/**
Anguilla, University Network ..... **www.worldwideuniversitynetwork.com/**
Argentina, RAE ..... **www.radionacional.gov.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, ABC/R Australia ..... **www.radioaustralia.net.au**
Australia, HCJB Global Australia ..... **www.hcjb.org.au**
Austria, AWR Europe **www.awr2.org**
Austria, TWR Europe ..... **www.twr.org**
Bahrain, R Bahrain ..... **www.radiobahrain.fm**
Belarus, R Belarus ..... **www.radiobelarus.tvr.by/eng**
Belgium, TDP Radio ..... **www.airtime.be/schedule.html**
Canada, Bible Voice Broadcasting ..... **www.biblevoice.org/**
Canada, CBC Northern Quebec Svc ..... **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**
China, China R International ..... **www.cri.cn**
China, Haixa zhi Sheng/VO Strait ..... **www.vos.com.cn**
Clandestine, JSR/Shiokaze/Sea Breeze ..... **www.chosa-kai.jp**
Clandestine, Sudan R Service ..... **www.sudanradio.org**
Croatia, Voice of Croatia ..... **www.hrt.hr/**
Cuba, R Havana Cuba ..... **www.radiohc.cu/**
Ecuador, HCJB/LV de los Andes ..... **www.radiohcjb.org**
Egypt, R Cairo ..... **www.ertu.org**
Eqt Guinea, Pan Am BC/R Africa ..... **www.radiopanam.com/**
Ethiopia, R Ethiopia ..... **www.erta.gov.com**
Ethiopia, R Ethiopia/Natl Pgm ..... **www.erta.gov.com**
France, R France International ..... **www.rfi.fr/**
Germany, AWR Europe **www.awr2.org/**
Germany, Deutsche Welle ..... **www.dw.de**
Germany, Mighty KBC Radio ..... **www.kbcradio.eu/**
Germany, TWR Europe ..... **www.twr.org**
Guam, KTWR/TWR Asia ..... **http://nea.ktwr.net/**
India, All India R/Aizawl ..... **www.allindiaradio.org/**
India, All India R/Aligarh ..... **www.allindiaradio.org/**
India, All India R/Bengaluru ..... **www.allindiaradio.org/**
India, All India R/Bhopal ..... **www.allindiaradio.org/**
India, All India R/Chennai ..... **www.allindiaradio.org/**
India, All India R/Delhi ..... **www.allindiaradio.org/**
India, All India R/External Svc ..... **www.allindiaradio.org/**
India, All India R/Gangtok ..... **www.allindiaradio.org/**
India, All India R/Gorakhpur ..... **www.allindiaradio.org/**
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India, All India R/Kolkata ..... **www.allindiaradio.org/**
India, All India R/Kurseong ..... **www.allindiaradio.org/**
India, All India R/Lucknow ..... **www.allindiaradio.org/**
India, All India R/Mumbai ..... **www.allindiaradio.org/**
India, All India R/Panaji (Goa) ..... **www.allindiaradio.org/**
India, All India R/Port Blair ..... **www.allindiaradio.org/**
India, All India R/R Kashmir ..... **www.allindiaradio.org/**
India, All India R/Shillong ..... **www.allindiaradio.org/**
India, All India R/Shimla ..... **www.allindiaradio.org/**
India, All India R/Thiruvananthapuram ..... **www.allindiaradio.org/**
Indonesia, AWR Asia/Pacific **www.awr2.org/**
Indonesia, VO Indonesia ..... **www.voi.co.id**
Iran, VO Islamic Rep of Iran ..... **www.irib.ir/English/**
Israel, Kol Israel ..... **www.intkolisrael.com**
Italy, IRRS SW ..... **www.nexus.org**
Japan, R Japan NHK World ..... **www.nhk.or.jp/english/**
Kuwait, R Kuwait ..... **www.media.gov.kw/**
Mali, ORTM/R Mali ..... **www.ortm.ml**
Micronesia, V6MP/Cross R/Pohnpei ..... **www.pmapacific.org/**
Moldova, R PMR/Pridnestrovye ..... **www.radiopmr.org**
Nepal, R Nepal ..... **www.radionepal.org/**
Netherlands, XVRB Radio ..... **www.twr.org**
New Zealand, R New Zealand Intl ..... **www.rnzi.com**
Nigeria, Voice of Nigeria ..... **www.voiceofnigeria.org**
North Korea, Voice of Korea ..... **www.vok.rep.kp**
Oman, R Sultanate of Oman ..... **www.oman-tv.gov.om**
Pakistan, PBC/R Pakistan ..... **www.radio.gov.pk**
Palau, T8WH/World Harvest R ..... **www.whr.org/**
Philippines, R Pilipinas Overseas ..... **www.pbs.gov.ph/**
Poland, Polish Radio/External Svc ..... **www.polskieradio.pl**
Romania, R Romania Intl ..... **www.rri.ro/**
Russia, Voice of Russia ..... **http://english.ruvr.ru/**
Saudi Arabia, BSKSA/External Svc ..... **www.saudiradio.net/**
Serbia, International R Serbia ..... **http://voiceofserbia.org**
South Africa, AWR Africa **www.awr2.org/**
South Africa, Channel Africa ..... **www.channelafrica.org**
South Africa, CVC 1 Africa R **www.1africa.tv**
South Korea, KBS World R ..... **www.worldkbs.co.kr**
Spain, R Exterior de Espana ..... **www.ree.rne.es/**
Sri Lanka, SLBC ..... **www.slbc.lk**
Swaziland, TWR Africa ..... **www.twrafrica.org/**
Syria, R Damascus ..... **www.rtv.gov.sy/**
Taiwan, R Taiwan Intl ..... **http://english.rti.org.tw/**
Thailand, R Thailand World Svc **www.hsk9.org/**
Turkey, Voice of Turkey ..... **www.trt-world.com**
Uganda, Dunamis Shortwave ..... **www.biblevoice.org/stations/east-africa**
UK, BBC World Service ..... **www.bbc.co.uk/worldservice/**
USA, Amer Forces Network/AFRTS ..... **http://myafn.dodmedia.osd.mil/**
USA, BBG/Voice of America ..... **www.voanews.com**
USA, BBG/Voice of America/Studio 7 ..... **www.voanews.com**
USA, FBN/WTJC Newport NC ..... **www.fbnradio.com/**
USA, KNLS Anchor Point AK ..... **www.knls.org/**
USA, Overcomer Ministry ..... **www.overcomerministry.org**
USA, Pan Amer Broadcasting ..... **www.radiopanam.com/**
USA, WBCQ Monticello ME ..... **www.wbcq.com/**
USA, WEWN/EWTN Irondale AL ..... **www.ewtn.com/**
USA, WHRI Cypress Creek SC ..... **www.whr.org/**
USA, WINB Red Lion PA ..... **www.winb.com**
USA, WRMI/R Prague relay ..... **www.wrmi.net/**
USA, WRMI/R Slovakia Intl relay ..... **www.wrmi.net/**
USA, WTWW Lebanon TN ..... **www.wtww.us/**
USA, WWCR Nashville TN ..... **www.wwcr.com**
USA, WWRB Manchester TN ..... **www.wwrb.org/**
USA, WYFR/Family R Worldwide ..... **www.familyradio.com/**
Vatican City State, Vatican R ..... **www.vaticanradio.org/**
Vietnam, VO Vietnam/Overseas Svc ..... **www.vov.org.vn**
Zambia, Christian Voice ..... **www.voiceafrica.net**
Zambia, CVC Intl/1 Africa **www.1africa.tv**

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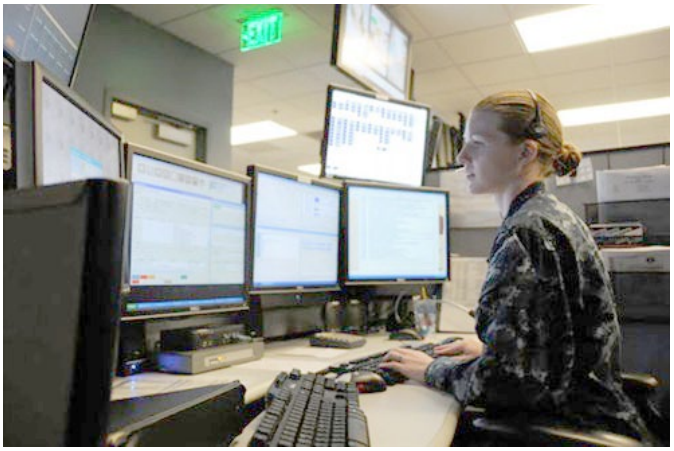
Naval Region Southwest Radio System

In last month's *MT Milcom* column we profiled the new Naval Region Dispatch Centers that have been established nationwide, specifically the Southeast Region. This month we will take a closer look at the Naval Region Southwest.

The consolidation of the Navy Region Southwest (NRSW) dispatch centers into one Regional Dispatch Center (RDC) became official on Sept. 28, 2011 during a ribbon-cutting ceremony at their new Regional Operations Center (ROC) in San Diego.



Dispatcher at the new NRSW dispatch center in San Diego (US Navy Photograph)

Eleven dispatch locations throughout NRSW were combined into a single dispatch center at ROC, effectively streamlining public safety service delivery.

The consolidation began in April 2011, with emergency dispatch services becoming more centralized as the NRSW RDC expanded operationally. The result has been complete emergency coordination responses from one central location.

"This RDC provides enhanced reporting capabilities," said Stephen Klemko, the NRSW RDC manager. "It gives our dispatchers greater situational awareness, better visuals as to where emergency assets are at, manpower savings, and reduced costs in maintaining legacy equipment."

Prior to the consolidation, emergency services were dispatched from the individual installations, often times by a single dispatcher. Now, the NRSW RDC has 12-14 dispatchers at any given time available to provide support to callers and backup to each other.

"All alarms – both fire and security – and all 911 calls that originate at the installations now come to one centralized location," said Mark Frederickson, the NRSW emergency management program director. "The technology we have here is better and it better allows our dispatchers to control events."

According to Klemko, emergency phone calls made from any base telephone in the region is automatically routed to the NRSW RDC, which then coordinates the response with no decrease in quality or speed of service.

NRSW is responsible for shore installation support of the 10 major installations and numerous smaller Naval entities located within Arizona, California, Colorado, Nevada, New Mexico and Utah.

The Navy-wide National Enterprise Land Mobile Radio (ELMR) System is a non-tactical Project 25 compliant trunked land mobile radio system that will be installed at every non-BRAC listed Navy installation throughout CONUS. ELMR will primarily be used for quick, coordinated responses to day-to-day incidents, but can also accommodate the capability and flexibility needed for emergency situations.

❖ Trunk Radio Sites in the Southwest Region

Table One is a list of known trunk radio sites operational in Navy Region Southwest based on field reports. We are looking for additional field reports for talkgroups and any site updates. You can send them to the email address in the masthead.

NAVY REGION SOUTHWEST ELMR SITES

System ID: 14c, WACN: BEE00, NAC: $140
Sites 5xx and Talkgroups: 24xxx
All frequencies are in MHz and mode is APCO P25 digital (Narrowband FM)

Bases in Region: Naval Base San Diego; Naval Base Coronado; Naval Base Point Loma; Naval Air Weapons Station China Lake; Naval Air Facility El Centro; Naval Air Station Fallon; Naval Air Station Lemoore; Naval Support Activity Monterey ; Naval Weapons Station Seal Beach; Naval Base Ventura County.

501 San Diego County (East) CA
386.1375 386.5875 386.7375 388.1375 388.3250 388.475 388.7000 388.8500 389.4375 389.7125 (Other possible frequencies in use: 386.1000 386.5500 386.7000 386.9750 388.0250 388.5000 388.5875 388.8500 389.4375)

502 San Diego CA (Balboa Park)
386.0750 386.2250 386.3750 386.5250 386.675 386.8250

503 NB Point Loma CA
385.6250 386.1750 386.2000 386.4875 386.6375 386.6500 386.8000 386.9625

504 NALF San Clemente Island CA (North)
386.7875 388.2875 388.5500 388.7375

505 NALF San Clemente Island CA (West Central)
386.7875 388.3500 388.4000 388.5500 389.4875

506 NALF San Clemente Island CA (South)
386.4375 386.7375 386.9500 388.2625

508 NWS Seal Beach CA
386.1500 386.3000 388.0875 388.1250 388.6375 388.9375

509 NB Ventura County/NAS Point Mugu CA
380.3875 380.5375 380.7125 380.8625 381.3125 381.7250 381.9500

511 NOLF San Nicolas Island CA (South)
388.2750 388.4125 388.4375 388.5625 388.5875 388.8875

522 NAS Lemoore CA
380.4500 380.5250 380.8250 380.9750 381.2375 381.6750 381.7875 381.8375

523 NWS Seal Beach Detachment Norco CA
385.3500 385.9125 386.2125 386.6625 386.9750 388.1125

524 NSA Monterey CA
380.0750 380.2750 380.4250 380.5750

525 NALF San Clemente Island CA (East Central)
388.1750 388.3375 388.4875 388.7875

528 NB San Diego CA (32nd Street Naval Station)
386.0625 386.1125 386.2625 386.3625 386.4125 386.5125 386.5625 386.7125 386.8125 386.8875 388.0625 388.3625 388.5125 388.9375

530 NOLF San Nicolas Island CA (West Central)
386.6000 386.7500 386.9125

5xx NAF El Centro CA
385.0625 385.3125 385.9000 386.1875 386.4875 386.6375

5xx NAS Fallon NV (Main Base)
386.1120 386.2750 386.4250 386.5750 386.7250 386.9375 388.0875 388.2375 388.3875 388.5375

5xx NAS Fallon NV
386.6750 386.9750 388.1500 388.3000 388.4500 388.6000

5xx NAS Fallon NV
386.3625 386.5125 386.8125 386.9625

5xx NAS Fallon NV
380.0750 380.4250 380.5750 380.8750

5xx NAS Fallon NV
380.1750 380.3750 380.5250

5xx NAS Fallon NV
380.6375 381.1125 381.8375

5xx NAS Fallon NV
385.3500 386.0625 386.2125

5xx NAS Fallon NV
381.0125 381.1750 381.7375
5xx NAWS China Lake CA
381.4250 381.6250 381.8500 385.8000 385.9625 387.3750 387.6375 389.0250 389.1750
5xx NAWS China Lake CA
380.1750 380.4375 380.6375 380.9000 381.1125 381.3375 381.7750 381.9750
5xx NAWS China Lake CA
380.5375 380.6875 380.8375 380.9125 380.9875 381.1625 381.9250
5xx NAWS China Lake CA
380.5125 380.7625 381.6875 387.2250 387.5250 387.7875 387.9500
5xx NAWS China Lake CA
380.4625 380.6625 380.9500 380.9625 381.2000

❖ Milair Nationwide Frequency Updates

Here are the latest milair frequency changes from the Federal Aviation Administration (FAA) and the Department of Defense (DoD). All frequencies are in MHz and mode is AM unless otherwise noted.

38.900 Fort Hood/Hood AAF TX (KHLR) Longhorn Tower
118.600 Springfield IL (KSPI) Approach/Departure Control (ex-126.150)
121.675 NAS/JRB Fort Worth TX (KNFW) Ground Control paired 279.575 (ex-126.400)
125.050 Cannon AFB NM (KCVS) Approach/Departure Control (Primary)
125.650 Andrews AFB MD (KADW) Departure Control paired 348.725 Potomac TRACON
126.400 NAS/JRB Fort Worth TX (KNFW) Clearance Delivery paired 254.325
127.575 Jacksonville ARTCC (ZJX) Alma GA RCAG paired 269.025 (ex-132.300)
128.200 John Murtha Johnstown PA (KJST) RAPCON West Sector paired 288.325
134.750 Hill AFB UT (KHIF) Base Operations (ex-139.300/139.900)
135.900 Charleston SC (KCHS) Departure Control paired 379.925
135.975 John Murtha Johnstown PA (KJST) RAPCON East Sector paired 244.875
138.175 Twentynine Palms MCAGCC CA (KNXP) Strategic Expeditionary Landing Field Base Operations "SELF BASE OPS"
138.325 Fort Benning/Lawson AAF GA (KLSF) Base Operations/Pilot-to-Dispatcher
139.300 Fort Sill/Henry Post AAF OK (KFSI) Pilot-to-Dispatcher (PTD is a nationwide assignment on this frequency)
140.225 Fort Rucker/Hanchey AHP AL Tower
142.550 Fort Rucker/Hanchey AHP AL Ground Control
142.850 Fort Rucker/Louisville Stagefield AHP AL East Traffic
143.000 Fort Hood/Hood AAF TX (KHLR) Longhorn Tower
148.750 Fort Rucker/Louisville Stagefield AHP AL West Traffic
225.575 Fort Rucker/Louisville Stagefield AHP AL East Traffic
227.400 Fort Benning/Lawson AAF GA (KLSF) Base Operations/Pilot-to-Dispatcher
235.625 NAS Meridian MS (KNMM) Single Frequency Approach (ex-300.400)
236.825 NAS Meridian MS (KNMM) Approach Control (ex-363.600)
237.500 Fort Hood/Hood AAF TX (KHLR) Longhorn Tower
237.600 Fort Campbell/Campbell AAF (KHOP) SHOC Pad (when tower closed)
244.875 NAS Meridian MS (KNMM) Approach Control (ex-325.200)
256.875 NAS Meridian MS (KNMM) Approach Control (ex-346.000)
265.900 NAS Meridian MS (KNMM) VT-7 Squadron Common (ex-376.700)
273.475 Vance AFB OK Approach Control (KEND) (ex-326.200)
282.525 NAS Meridian MS (KNMM) Metro (ex-312.400)
290.525 NAS Meridian MS (KNMM) ATIS (ex-273.200)
305.200 Birmingham Shuttlesworth International AL (KBHM) Clearance Delivery (ex-390.800)
309.200 Fort Rucker/Louisville Stagefield AHP AL West Traffic
318.050 Eglin AFB FL (KVPS) ACC Command Post "RAYMOND 11"
323.225 NAS Meridian MS (KNMM) Approach Control (ex-322.000)
328.025 Eglin AFB FL (KVPS) ACC Command Post "RAYMOND 11"
341.300 MCALF Bogue Field NC (KNJM) Tower (ex-256.875)
346.325 Vance AFB OK Approach Control (KEND) (ex-378.800)
348.700 NAS Meridian MS (KNMM) Approach Control (ex-374.900)
348.725 Andrews AFB MD (KADW) Andrews 1 Departure p/w 125.650 Potomac Tracon (ex-391.100)
349.400 Dyess AFB TX (KDYS) Command Post "RAYMOND 37"
351.675 NAS/JRB Fort Worth TX (KNFW) ATIS
372.200 Hill AFB UT (KHIF) Pilot-to-Dispatcher (PTD) (ex-371.950)
376.500 Fort Campbell/Campbell AAF (KHOP) SHOC Pad Air-to-Air
379.275 NAS Meridian MS (KNMM) Approach Control (ex-314.800)

❖ ARTCC Update

This month we will continue our FAA Air Route Traffic Control Center (ARTCC) tour with a look at Chicago ARTCC (Table Two). I want to remind regular readers of this column to please be patient and we will get around to the ARTCC covering your area as soon as space and current events allow. Note: All frequencies listed in table one are in MHz and mode is AM.

And that does it for this month: Until next time, 73 and good hunting.

CHICAGO ARTCC RCAG FREQUENCY LIST

RCAG Freq V/U Pair MHz	RCAG Location (ICAO Identifier)	Sector Number/Name: Notes
118.150/354.100	Ottumwa IA (OTM)	Sector 56 Ottumwa Lo
118.225/353.550	Kankakee IL (IKK)	Sector 83 Joliet Hi
118.425/327.150	Dubuque IA (DBQ)	Sector 75 Cotton Hi (ex-127.775)
118.750/353.925	Moline IL (MLI)	Sector 55 Burlington Lo (ex-351.700/377.050
119.225/307.250	Leroy IL (CE8)	Sector 58 Lincoln Lo
119.850/307.375	Fort Wayne IN (FWA)	Sector 37 Wolf Lake Lo
119.950/353.700	Pontiac IL (PNT)	Sector 49 Newtt Lo
120.125/256.800	Kankakee IL (IKK)	Sector 44 Peotone Lo
120.225/269.350	Jones MI (QJH)	Sector 85 LaGrange Super Hi
120.350/377.075	Des Plaines IA (ORD)	Sector 81 Cribb Lo (ex-317.400)
120.975/341.700	Rossville IN (QIH)	Sector 32 Logan Hi (new UHF freq may be 363.125 MHz)
121.275/351.950	Milford IL (QDV)	Sector 46 Boiler Hi
121.375/282.275	Horicon WI (QHZ)	Sector 61 Horicon Super Hi
123.750/259.100	Mazon IL (CB8)	Sector 50 Streator Lo
123.825/291.700	Milwaukee WI (MKE)	Sector 62 Harly Lo
124.550/307.125	Bradford IL (BDF)	Sector 50 Streator Lo
124.725/279.650	Rockford IL (RFD)	Sector 92 Hawks Hi
124.825/322.525	Niles IN (GIJ)	Sector 36 Fort Wayne Hi
125.050/269.375	Volk IN (VOK)	Sector 64 Lone Rock Lo
125.100/290.475	Milwaukee WI (MKE)	Sector 27 Squib Lo
125.225/322.475	Dubuque IA (DBQ)	Sector 76 Arlington Hi
125.375/370.850	Rossville IN (QIH)	Sector 34 Kokomo Lo
125.575/257.725	Washington IA (AWG)	Sector 94 IowaCitySuper Hi
125.625/281.525	Bradford IL (BDF)	Sector 93 BradfordSuper Hi
125.975/317.575	Jones MI (QJH)	Sector 23 Empire Super Hi
126.125/319.100	Grand Rapids MI (GRR)	Sector 25 Pullman Hi
126.275/360.750	Monee IL (QHF)	Sector 84 McCook Super Hi
126.325/323.050	Fort Wayne IN (FWA)	Sector 33 Burbn Super Hi
126.425/348.725	Waukegan IL (UGN)	Sector 82 Sweet Lo
Pullman MI (PMM)	Sector 82	Sweet Lo
126.475/353.625	Jones MI (QJH)	Sector 89 Gipper Super Hi
126.675/257.925	Lone Rock WI (LNR)	Sector 64 Lone Rock Lo (ex-133.300)
126.875/269.075	Horicon WI (QHZ)	Sector 60 Badger Hi
127.050/282.350	Des Moines IA (ORD)	Workload Des Monies Workload Lo
127.075/307.275	Maple Park IL (BA8)	Sector 77 Malta Lo
127.325/327.025	Milford IL (QDV)	Sector 47 ChanuteSuper Hi
127.550/307.175	Goshen IN (GSH)	Sector 80 Kelog Lo
127.625/273.600	Jones MI (QJH)	Sector 82 Keeler Hi
127.800/290.250	Crown Point IN (AR8)	Sector 35 Bearz Lo (ex-323.175)
127.950/353.775	Bloomington IL (BMI)	Sector 48 GlantSuperHi
128.175/343.725	Sullivan WI (QHG)	Sector 67 Chedr Hi
128.500/273.525	Pullman MI (PMM)	Sector 22 Sparta Lo
128.525/319.200	Washington IA (AWG)	Sector 90 Lowli Hi
128.650/351.825	Northbrook IL (OBK)	Workload Northbrook Workload Hi
128.800/314.000	Goshen IN (GSH)	Sector 31 Goshen Lo (ex-317.600)
132.100/319.250	Oshkosh WI (OSH)	Sector 65 Oshkosh Lo
132.225/323.225	Bradford IL (BDF)	Sector 52 Bradford Hi
132.275/254.350	Muskegon MI (MKG)	Sector 24 Freemont Hi
132.500/284.700	Kankakee IN (IKK)	Sector 43 Kankalee Lo
132.625/350.250	Freeport IL (FEP)	Sector 71 Waterloo Super Hi
132.800/328.400	Cedar Rapids IA (CID)	A/D Approach/Departure Services
132.950/318.800	Chicago Heights IL (CGT)	Sector 41 Boone Lo
133.200/360.800	Pullman MI (PMM)	Sector 26 KubbsLo (new UHF freq may be 317.500 or 343.675 MHz)
133.350/335.800	Marengo IL (BB8)	Sector 74 Farmm Lo (ex-268.700)
133.950/281.400	Dubuque IA (DBQ)	Sector 63 Dubuque Lo
134.025/379.150	Roberts IL (RBS)	Sector 45 Roberts Hi
134.200/291.750	Hampshire IL (QDC)	Workload Workload NW Hi (ex-348.700)
134.325/236.775	Washington IA (AWG)	Sector 91 Hanna City Super Hi
135.150/323.300	Joliet IL (JOT)	Sector 51 Plano Lo
135.550/306.975	Horicon WI (QHZ)	Sector 61 Horicon Hi
135.600/370.950	Burlington IA (BRL)	Sector 55 Burlington Lo
135.750/353.950	Danville IL (DNV)	Sector 42 Danville Lo
135.900/314.000	Goshen IN (GSH)	Sector 37 Goshen Lo
135.975/335.550	Cedar Rapids IA (CID)	Sector 95 Washington Super Hi
----------/350.350	Rossville IN (QIH)	MOA Hilltop MOA

Other possible UHF frequencies: 269.250 269.600 269.650 317.600 323.100 327.800 351.700 360.600 MHz

RCAG: Remote Communications Air/Ground Facility

BROADCAST BANDSCAN

THE WORLD OF DOMESTIC BROADCASTING

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Over-the-air TV in Canada: Going, going, gone?

If you DX TV, here's hoping you logged plenty of Canadian stations this summer – as many of the biggest signals are now gone...

The deadline for the shutdown of analog TV in Canada was last July. Transmitters in Canada's largest cities were to be converted to digital or else closed. Transmitters in rural areas don't face a digital conversion mandate; they're allowed to continue in analog indefinitely. The Canadian Broadcasting Corporation – CBC – obtained a one-year extension for some of its analog transmitters.

That extension ran out at the end of last month. The CBC has told the government its remaining analog transmitters would be shut down at that time. This includes *all* CBC analog TV transmitters, not just the ones in markets mandated to convert to digital. The transmitters which have already been converted to digital, in the largest cities, will continue to operate.

CBC's TV licences are currently up for renewal. The transmitter closure plan was released as part of the renewal application, as answers to several questions the government asked about the CBC's over-the-air plans. A few of the points raised:

- Based on the ratings, the CBC believes 98% of Canadians either subscribe to cable/satellite ("BDUs") or live within the coverage area of one of the transmitters which have already been converted to digital.
- The CBC believes the closure of their analog transmitters will have no effect on advertising revenue.
- It would cost $10,700,000 per year to maintain these transmitters.
- It would cost at least $56,000,000 to replace the obsolete equipment.
- Most of the affected transmitters are at least 25 years old. Satellite gear used to deliver programming to these transmitters has been discontinued.
- One of the satellite providers has offered free local-channel service to viewers who will lose over-the-air CBC signals.

More than two dozen powerful VHF transmitters on channels 2-6 are affected; you'll notice this during next summer's skip season. Hundreds of smaller transmitters are also involved.

❖ And in the U.S....

The FCC has been taking steps to clear out TV stations, in anticipation of converting more spectrum from television to land mobile (*i.e.*, "smartphones"). There have been several developments in the last few months:

Channel 51 is being cleared. Low-power

Bruce, KA3UIH received this Illinois station on his car radio near Washington. (Doug Smith)

TV stations have been urged to leave the channel; many have. In May, a number of applications appeared in the FCC TV database for stations with the mysterious callsign "WTB". WTB is not, in fact, a callsign, but is the abbreviation for the FCC's **W**ireless **T**elecommunications **B**ureau – the agency that regulates land-mobile radio. Each of the "WTB" applications precisely matches the technical parameters of an existing channel 51 full-power or Class A TV station. However, each of these applications specified a different channel. It certainly appears the FCC intends to order existing TV stations to leave channel 51 in favor of lower channels.

The Commission has also announced plans for a "reverse auction" of TV spectrum. Stations will be asked how much the FCC would need to pay in order for the station to surrender its channel and go off the air. The Commission would buy out the least expensive channels, sell their spectrum to land-mobile operators, and use some of the proceeds to pay the bids. (Some of the rest would go to compensate other stations for the cost of channel moves; the rest would go to the U.S. Treasury.)

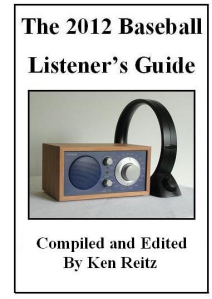
Of course, any station that sells the FCC its channel is volunteering to go out of business! The Commission figures many stations will be reluctant to do so, so they're offering another alternative: channel-sharing. The station that volunteers to sell its channel doesn't go off the air – it agrees to share a channel with another station. For example, WJKL-TV offers to sell channel 44 to the government, and then share channel 38 with WMNO-TV. In return, WMNO-TV gets half the money the FCC paid for channel 44.

The technology has existed for years. Any of you who watch over-the-air TV has noticed "subchannels," where one broadcaster transmits two or more programs simultaneously on the same channel. Here in Nashville, WKRN transmits ABC programs on channel 2.1, and a continuous weather channel on 2.2. There is nothing in the technology that requires both subchannels to be programmed by the same company. WMNO-TV could broadcast its existing religious programming on channel 39.1, while carrying WJKL-TV's programming on channel 66.1 *on the same transmitter*.

And while all of this proceeds, commentators are asking whether this removal of TV spectrum is even necessary. See the URLs in the sidebar...

❖ New Kinda-DX publication

Over the years, I've learned that many DXers didn't just decide one day they were going to listen for distant radio stations. Many of us wanted to hear *programming* that just wasn't available from our local stations. In my case, I was searching FM for the rapidly-disappearing (in the 1970s) progressive rock stations. For many a DXer, it was the search for sports that led to a new hobby.



Ken Reitz's new e-book: both a way to enjoy baseball, and a way to identify more DX. (Ken Reitz)

MT's own Ken Reitz has a new e-book out that will make sports DXing easier. *The 2012 Baseball Listener's Guide* lists the stations across North America which broadcast professional baseball. The 30 major-league teams are covered – and so are the 100+ minor-league teams. Obviously, baseball fans wishing to keep track of their favorite team's competition will be interested in this publication.

Really, even if you aren't a baseball fan, you should take a look. You're hearing the Minnesota Twins on AM 1060, but the only 1060 station in the state says they don't carry the games? The *Guide* will show which station in a rare state is carrying this game.

❖ QSL Woes

Bob Combs wrote from New Mexico with a few notes about verifications and AM DX. Bob believes a DX logging is not complete without verification from the station – and he's finding that verification increasingly difficult to obtain. Recently, his reply rate is down to about 40%. The rate is even worse for Mexican stations, which make up a large part of what he hears. Bob does report in Spanish and includes money for return postage, but still doesn't receive verifications.

He suggests a few possible reasons for the low returns:

- Secretaries not bothering to forward mail.
- Stations not caring about reports.
- Lack of engineers. (Most stations use contract engineers who serve several stations.)
- Streaming broadcasts online. (Hearing a station's programming over a great distance is no longer unusual.)

I suspect a combination of all four is involved. More recently, with massive ownership consolidation, many stations do have a fulltime engineer. They may serve all of the company's stations in a given market – but likely have no duties elsewhere. Whatever you may think of these large group owners, they usually get engineering right. They also usually control the stations with the best signals – the ones you probably already verified years ago...

Some New Mexico stations do QSL! (Doug Smith)

For Bob, follow-up emails have been quite successful. Bob emailed reports to ten stations that didn't respond to requests 12 years ago. *All ten* replied – two even sending verifications via postal mail.

To this end, Bob suggests a column giving station email addresses that normal websurfers can't find. I'm not any better at finding these than anyone else! – but if anyone out there has any suggestions, any addresses they've found to work, I'll be glad to publish them in this column. Please be sure the station is OK with such addresses being published.

❖ Another News/Talk Station on FM

For years, it's been the rule in radio: news/talk formats on AM, music on FM. The mold was broken here in Nashville twenty years ago when news/talk 99.7 FM (W)WTN came on the air. It was followed a few years later by all-sports WGFX 104.5. Today, Nashville has a news/talk station and two all-sports operations on FM, and is by no means unusual.

Larry, W9QR writes with news of an FM relay of a well-known news/talk station in Indiana. Classic rock station WFWI-FM flipped, on April 1st, to a simulcast of WOWO-1190 Fort Wayne. Years ago, WOWO was briefly sold to the owners of a daytime-only station on the same frequency in New York City. The new owners reduced WOWO's nighttime power and changed the directional pattern to allow their NYC station to operate at night. They then resold the Indiana station.

The nighttime WOWO signal null towards New York results in difficult reception for listeners north of Fort Wayne. 92.3 FM fills in that coverage (it probably also allows reception in office buildings and other noisy locations within the city itself).

Larry notes good reception of WOWO's original AM signal in December near Columbia, South Carolina. March reception in Tennessee, on the other hand, wasn't so good. Here in the Nashville area, I'm in the "major lobe" of WOWO's nighttime signal; reception is just as good here as it was before the power cut.

❖ Get 'em while they're Hot!

I've probably bored all of you with my continuous suggestions to check out 690 and 940 while the Montreal powerhouses are off the air. As of my deadline (beginning of June), these frequencies are still silent. Bruce KA3UIH made good use of this DX opportunity. While reading Ken Reitz's column in the March issue of *MT*, in his car (parked!) near Washington, he took a listen on 940 – and logged WMIX Mount Vernon, Illinois. WMIX is routine reception at my location. In Washington, on the other hand, it's a pretty good catch. Congrats!

On a similar subject... If it isn't already too late, Eastern DXers should also spend some time with 1550 kHz. Earlier this year, the CBC silenced their powerful station on this frequency in Windsor, Ontario; the programming moved to 97.5 FM. They now propose to reactivate the 1550 frequency – this time in French. The towers for the existing French-language station in Windsor, on 540 kHz, are in bad shape. It appears the CBC feels it would be more economical to reactivate the 1550 kHz station, rather than repairing the 540 system.

❖ Frequency Trumps Power?

Bob Hawkins wrote from southern Indiana, about 200 miles north of Nashville. He's spent some time DXing 540 kHz. In the past, he used to get a suburban Milwaukee station on this frequency (WAUK, Jackson, ESPN Radio). Bob's more recent efforts on the frequency are yielding my local, WKFN Clarksville, Tennessee. Even during the day, WKFN reaches Bob's location; indeed, it's stronger than 50,000-watt WLAC!

WKFN did recently increase daytime power from 1,000 watts to 4,000. That's still a far cry short of WLAC's 50,000. However, WKFN has an additional advantage: its low dial position. During the day, when AM signals are traveling along the earth's surface, lower frequencies cover further. The propagation curves the FCC uses to determine AM station coverage shows that for the same radiated power, a station operating on 550 kHz will deliver *ten times the signal* at 60 miles as a station operating on 1600. WKFN's 4,000 watts on 540 is like 40,000 watts on WLAC's 1510 channel.

Did you experience any last-minute Canadian TV DX this spring? Please write, at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to *dougsmith@monitoringtimes.com.* Good DX!

Until next time...

BANDCAN STATION REPORT

NEW STATIONS

Permits granted for new stations:

Tyonek, Alaska	1360	(new) 20,000/20,000 ND
Keaau, Hawaii	1260	(new) 5,000/1,000 ND
Reno, Nevada	1010	(new) 50,000/2,000 DA-2

Applications for new stations dismissed/denied:

Calgary, Alberta	1670	(new) 5,000/1,000
Shasta Lake City, Calif.	1550	(new)
Eagle, Idaho	1010	(new)
Ottawa, Ontario	1630	(new)

Applications for new stations:

Juneau, Alaska	1400	25,000/1,000 ND
Red Bluff, California	1580	3,000/1,000 DA-N
Blue Diamond, Nevada	1020	5,000/250 DA-2
Red Oak, N. Carolina	1190	4,200/1,000 DA-N
Lebanon, Oregon	1100	3,900/1,500 DA-2
Black Hawk, S. Dakota	860	50,000/350 DA-2
Draper, Utah	780	1,000/250 DA-2
Springville, Utah	1580	10,000/570 ND

CHANGES

Windsor, Ontario DA-1	1550	CBEF from 540; 10,000

DELETIONS

Stations deleted:

Calera, Alabama	1370	WBYE
Camden, Alabama	1450	WCOX
Talladega, Alabama	1230	WPPT
Thomasville, Georgia	840	WHGH
Toccoa, Georgia	1420	WLET
Eddyville, Kentucky	900	WWLK
Fulton, Kentucky	1270	WFUL
South Haven, Michigan	940	WCSY
Oak Ridge, Tennessee	1290	WATO
Somerville, Tennessee	1410	WSTN

ND: non-directional
ND-D: non-directional, only operates daytime
DA-N: directional at night only
DA-D: directional during daytime only
DA-2: directional all hours, two different patterns
DA-3: directional day, night and critical hours, three different patterns

URLS IN THIS MONTH'S COLUMN:

http://americanbandscan.blogspot.com - My AM DX blog
http://gigaom.com/broadband/is-the-spectrum-crisis-a-myth/ - Articles suggesting there is no need to transfer TV spectrum to land-mobile
www.dslreports.com/shownews/Its-Time-to-Stop-Buying-the-Capacity-Crisis-Myth-118099
http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-12-45A1.pdf - FCC proposal to allow "channel-sharing"
www.fcc.gov/topic/incentive-auctions - FCC page on "reverse auctions" of TV spectrum
www.amazon.com/2012-Baseball-Listeners-Guide-ebook/dp/B007W4GD1C/ref=sr_1_1?ie=UTF8&qid=1338391748&sr=8-1 - Ken Reitz's Baseball Listener's Guide

BOATS, PLANES, AND TRAINS

PLANES

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Aircraft and Altitude

In the three-dimensional environment of aircraft flight, altitude is a crucial element. Aircraft must fly over mountains and not try to fly through them. The altitude of airport runways can be specified in thousands of feet. It makes for better landings when the pilot knows his cockpit altitude readout is the same as the published runway altitude. Air Traffic Controllers and pilots frequently have radio exchanges that include altitude information. Let's take a look!

❖ AGL / MSL

The altitude of an aircraft can be expressed in feet "Above Ground Level" (AGL). If a plane were flying level over irregular terrain, the altitude AGL would be constantly changing so that form of altitude measurement is only practical for some things. Examples: some Military Training Routes (MTRs) have route segments defined, in part, by altitudes AGL; some helicopter maneuvering may be described in AGL; under certain meteorological conditions, holding patterns for arriving aircraft may have some AGL altitude restrictions; and some geographic features on Sectional and on VFR Terminal Area aeronautical charts are noted in AGL.

For Air Traffic Control (ATC) purposes, it isn't practical to use AGL for most instances of referring to altitude, and that's where altitude with reference to "Mean Sea Level" (MSL) comes in. It is easy to conceptualize flying above the ocean and one's altitude would be in feet above the water. MSL is also used over land extensively as if the land were removed and replaced by ocean.

As an example of runway altitude expressed in MSL, go to www.airnav.com/airport/KSLC for Salt Lake City International Airport, and not far down you will see "Elevation: 4227 ft." An aircraft on this runway would have an altitude of zero feet AGL.

US Airways Flight 269, call sign Cactus 269, destined for Sacramento International Airport, has just been handed off to NorCal Approach Control from the Oakland Air Route Traffic Control Center (ARTCC). In the following typical exchange, all altitudes are expressed in MSL:

Aircraft: *NorCal Approach, Cactus Two Six Nine, sixty-five hundred for four thousand.*

Controller: *Cactus Two Six Nine, NorCal Approach, descend and maintain three thousand.*

Aircraft: *Three thousand, Cactus Two Six Nine.*

❖ Aircraft Altimeters

Barometric altimeters, the most common, work by accurately sensing atmospheric pressure and the higher the altitude, the lower the pressure. One complication is that atmospheric pressure varies some throughout the day in a single area and from area to area.

Stand-alone cockpit altimeters like the one pictured have a manual adjustment knob. Pilots must adjust their altimeters from information gained via the radio. The altimeter setting is conveyed by a four-digit number. If a controller says, *Current altimeter three zero zero five*, it means that the barometric pressure is 30.05 inches of mercury. The pilot then turns the altimeter adjustment knob until it reads 30.05 in the little window. On the pictured altimeter, a crosshatched area appears when displaying an altitude below 10,000 feet MSL. Above 10,000 feet, a disk rotates to cover the crosshatch markings and to reveal an indicator for tens of thousands of feet.

This altimeter reads 6,500 feet MSL. The altimeter setting / barometric pressure is set for 29.92. Courtesy FAA.

Electronic cockpit displays are quite popular. They integrate the altitude readout into the display. You can check out one example here: www.dynonavionics.com/docs/D180_intro.html. The vertical green strip with the altitude setting of "29.94" or "29.92" under it is the altimeter. Be sure to click on those images to open nice large images.

❖ Acquiring the Setting

Altimeter setting information is available from several different types of frequencies. Air Traffic Controllers in different areas of responsibility – like Clearance Delivery, Ground Control, Tower, Approach and Departure Control – offer or are prepared to offer altimeter setting information, each on their own frequencies.

Automatic Terminal Information Service (ATIS), a pre-recorded, repeating, periodically updated broadcast, is available at many airports with control towers. One of the several items of information offered in an ATIS broadcast is the altimeter setting.

Each update of the broadcast is identified by a phonetic alphabet letter. Succeeding, updated broadcasts progress to the next letter. If "Information Foxtrot" is current, "Information Gulf" will be next. Also, when the pre-recorded message is updated, it is common for some area controllers to announce it as in this case, NorCal Approach: *Attention all aircraft, Information Gulf current, Sacramento International Airport, Wind calm, Visibility one zero, Altimeter two niner eight seven, Runway One Six Right is in use, One Six Left is closed.*

Barometric pressure is also included in the Automated Weather Observing System (AWOS) and Automated Surface Observing System (ASOS) voice broadcasts. These two automatically update the weather information.

ATIS, AWOS, and ASOS frequencies may be found in the 118-136 MHz band. To find the frequencies, you can tune the band or go to www.airnav.com/airports/ and look at airports in your listening radius. Once at a given airport listing, scroll down to "Airport Communications."

❖ Feet and Flight Level

If you have listened to aircraft communications even a little, you probably have heard altitude called out in feet and by Flight Level. It is both interesting and important to understand the difference.

Altitudes below 18,000 feet are given in thousands of feet and use the local altimeter settings as described. Altitudes above 18,000 feet (in the U.S.) are given as Flight Levels (FL) and are based on a fixed altimeter setting of 29.92. Closer to the ground, it is essential to have an altimeter calibrated to current atmospheric pressure so it accurately coincides with elevations for runways, mountains, and other geographic features. Above 18,000 feet, geographic features are of less concern but

other aircraft are – as well as the convenience.

The convenience is that on long flights, there are no altimeter adjustments to be made above 18,000 feet as aircraft pass through areas of differing atmospheric pressure. Since all aircraft are using the same altimeter setting, all aircraft at Flight Level Three Four Zero (FL340), for example, are at the same altitude. That is to say, no matter where they are on flights above 18,000 feet, all their altimeters will be coordinated with each other. If FL340 isn't exactly 34,000 feet MSL it doesn't matter.

There are times, due to the current barometric pressure in a given area, when FL180 cannot be assigned by controllers. If FL180 falls below 18,000 feet MSL, there could be problems. When the barometric pressure is 29.92 or higher, FL180 is usable. When the barometric pressure is 29.91 to 28.92, FL190 is the lowest usable Flight Level. For pressures of 28.91 to 27.92, FL200 is the lowest usable.

Following is Southwest 966 making the altitude transition from feet MSL to Flight Level by crossing the 18,000 foot altitude on its way from Sacramento International (KSMF) to Seattle-Tacoma International (KSEA).

Aircraft: *Good afternoon Oakland, Southwest Nine Sixty-Six, Seventeen and a half for Flight Level two three zero*.

Controller: *Southwest Nine Sixty-Six, good afternoon, climb and maintain Flight Level three six zero*.

Aircraft: *All the way to three six zero, Southwest Nine Sixty-Six*.

Translation: "Oakland" is Oakland Center (ARTCC). "Seventeen and a half" is 17,500 feet MSL.

❖ Class A Airspace

From 18,000 feet MSL up to and including FL600 is defined as "Class A" airspace. It is controlled airspace, meaning that the pilot must be in contact with Air Traffic Controllers. Most airliners flying any distance fly in the FL300-FL400 altitude range. Class A altitudes are often called "en route altitudes" or "cruising altitudes." All flights must be by Instrument Flight Rules (IFR) and that requires a functioning transponder – more on transponders later.

Just a point of interest, there is no Air Traffic Control above FL600 where it is mostly the world of U-2 spy planes. Controller: *PINON Seven One, climb to Flight Level Six Zero Zero or above and report reaching VFR on top*. "PINON" is a U-2 call sign, pronounced pin-yun or like piñon in Spanish. "VFR" means Visual Flight Rules.

❖ Altitude Exchanges

Aircraft will often request a different altitude for weather, turbulence, or fuel economy.

Aircraft: *Allegiant Two Zero Three, we would like to request three four zero*. Controller: *Allegiant Two Zero Three, climb and maintain three four zero*. **Aircraft**: *Three four zero, Allegiant Two Zero Three*. "Three four zero" is FL340.

This next aircraft has just been handed off to a new Oakland Center sector controller. The controller acknowledges him but does not assign a new altitude. The receiving controller often assigns a different altitude from what was assigned by the previous controller. It depends on other air traffic, weather, etc.

Aircraft: *Center, Gulfstream Eight Nine November Charlie, Flight Level four three zero*.

Controller: *Gulfstream Eight Nine November Charlie, Oakland Center, good afternoon*.

Also note that corporate / BizJet (business jet) and other such aircraft often can and do fly a little higher than do airliners. For great photos of BizJets, go to **www.google.com/imghp** and enter – business jets.

On approach to Sacramento International:

Aircraft: *Approach, SkyWest Forty-Four Forty-Eight is eight six* (eight thousand six hundred feet), *descending to four thousand, Airport in sight*.

Controller: *SkyWest Forty-Four Forty-Eight, NorCal Approach, descend and maintain three thousand*.

Aircraft: *Three thousand, Forty-Four Forty-Eight*.

Departing from Sacramento International and just handed off from the Tower to Departure Control:

Aircraft: *Horizon Five Twenty Six, one thousand four hundred, climbing to two thousand*.

Controller: *NorCal Departure, radar contact, climb and maintain six thousand*.

Aircraft: *Six thousand, Horizon Five Twenty Six*.

There are lots of numbers and terms in pilot-controller communications and it can take careful listening. One aid in learning is to record pilot-controller exchanges and play them back several times in order to write down every number and word. The *Pilot/Controller Glossary (P/CG)* can be helpful: **www.faa.gov/air_traffic/publications/atpubs/PCG/index.htm**. If questions remain, consider joining http://groups.yahoo.com/group/AirComSouthwest/ and post your questions.

❖ Transponder and Mode C

ATC surveillance radar does not have the ability to acquire altitude information from aircraft, so how do controllers know each plane's altitude? Generally, positioned above the often large rotating ground-based radar antenna is another antenna rotating with it. It can be short and wide or also fairly large. It is called "Secondary Radar" but is not actually radar and is part of the Air Traffic Control Radar Beacon System (ATCRBS).

This system sends out interrogating pulses in the same direction as the "Primary Radar" antenna. Most aircraft have a piece of electronic equipment called a transponder. It is a specialized receiver-transmitter. When each aircraft's transponder receives these interrogating pulses, it responds by sending an information packet, which includes a controller-assigned four digit "Squawk Code." This is used by the ATC computer and combined with the primary radar return. It ends up as an enhanced "target" on the controller's radar display and accompanied by a "data block," similar to those you see for aircraft at FlightAware.com.

From time to time, you may hear a controller refer to "Mode C." This is the altitude reporting part of the transponder return. It sends altitude information in one hundred foot increments.

Transponder Mode C is preset to the standard pressure altitude of 29.92 and is not affected by the manual adjustments that the pilot makes to the cockpit altimeter. The ATC equipment on the ground corrects for differences between 29.92 and the current local barometric pressure for altitudes below 18,000 feet. Thus, the manually set cockpit altitude readout and the Mode C readout on the controller's screen are the same when all is set and working properly.

If there is a problem, Mode C can send an incorrect altitude reading or none at all. When the controller wants to see if the aircraft altimeter is the same as his readout on the screen, he may say "verify altitude" or "say altitude." He might even say, "Not receiving your Mode C." A pilot may have concerns, too, and say, "What altitude are you showing us at?"

❖ FlightAware

FlightAware at http://flightaware.com/ is a great resource to scanner listeners. If the site is unfamiliar to you, take the time to explore it and when on the home page, click on "About FlightAware" for information.

Flight tracking information typically runs behind by maybe seven minutes. In the FAA's words, "Subscribers that are Class Two Users are not authorized to receive near real time flight tracking and position messages. Class Two Users are only authorized to receive the full ASDI and NASSI data set that has been time-delayed at least 5 minutes."

Individual aircraft tracks include a data block. What information is conveyed by a FlightAware's data block?

This is an example of a data block accompanying an airliner flight track. Courtesy of FlightAware (flightaware.com).

"SKW5341" is the brief form of the flight number. In this case, SkyWest Airlines Flight 5341. This is also shown near the top right on the page when tracking a single plane. "CRJ2" is the aircraft model. "330" is the altitude and translates to 33,000 feet by adding two zeros. "440" is the speed in knots (nautical miles per hour). "KSMF" (Sacramento International) is the airport where the flight originated and "KDEN" (Denver International) is the destination airport.

Got to fly, see you next time!

GLOBALNET

Exploring the World of Internet Radio and Television

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It's Convention Time!

Every four years, political junkies go into full-on "geek" mode and absorb every minute of the presidential campaign coverage they can. It begins with primaries, but doesn't really reach a fever pitch until the conventions hit near the end of the summer.

This year, the Republicans will open the festivities with their convention in Tampa, Florida August 27-30. The Democrats will follow the next week, in Charlotte, North Carolina from September 4-8.

With Charlotte just up the road from my homestead here in South Carolina, I am fully expecting our local news media to go bananas with coverage of that convention. For those of you a little more removed from the scene of the action, fear not. There is plenty of coverage to be found through streaming sources, including communications from live-on-the-scene – a definite "no-spin zone."

❖ Tampa, Florida

In addition to the possibility of an occasional hurricane and a football team that has traditionally been a "cellar dweller", late August this year will host delegates from this year's Republican National Convention.

Outside of traditional broadcast media, there isn't a large amount of listening to be found here, but there is enough to make for some interesting monitoring during the conventions.

First, a look at some of the larger broadcasters in town. Remember, there is more to Tampa than just the City of Tampa. There is also St. Petersburg and Clearwater as well.

News/Talk stations are a great place to start in trying to find the latest news during convention time. To get a sense of the latest news, try WWBA-820 AM, WGUL-860 AM, WFLA-970 AM, WHNZ-1250 AM, WTAN-1340 AM and WLKF-1430 AM.

In addition to the broadcasters, there are a number of scanner feeds available online, many of which are outside of the City of Tampa proper. Should emergency responders be needed, Hillsborough County (Tampa) Fire and Rescue can be found online. Police streams can be found for City of Clearwater and Pinellas (St. Petersburg) County Sheriff communications. There are additional streams available for some of the surrounding communities.

For air traffic coming in and out of Tampa's International Airport (KTPA) or Clearwater/St. Petersburg International Airport (KPIE), LiveATC has streams available.

It might not be a bad idea to do a quick Google search as well to see if any new streams, especially scanner streams, pop up during convention time. There might be radio enthusiasts in the Tampa area that want to provide a window for the rest of the world to hear a slice of the action, if only during this prime-listening time.

❖ Charlotte, North Carolina

Just up Interstate 85 from my abode, Charlotte will probably be the spotlight location, especially for listening to communications, since the President himself will be in town.

Starting with the broadcasters, Charlotte is a big radio town. There are radio stations a-plenty here, and just about everyone will be covering the convention in some form or fashion. The "big gun" in town is WBT-1110 AM. Other talk/news outlets to try as a first 'best-bet' for coverage include WBCN-1660 AM, WGNC-1450 AM, WSPC-1010 AM, WZKY-1580 AM and WSTP-1490 AM. With all of the commercial stations in town, don't forget public broadcasters such as WFDD-88.5 FM as well for coverage.

The Charlotte-Mecklenburg Police Department's Matthews Police Dispatch is online. This should be some interesting listening, especially when it comes to crowd and traffic control, and general security around the event. Also keep an ear on Gaston County Police, Fire and EMS. The city of Charlotte proper is in Mecklenburg County, but neighboring Gaston County will undoubtedly be providing assistance.

It might not be a bad idea to keep an ear on the Charlotte and Mecklenburg County Fire Department streams as well. There could be interesting listening here, too.

Charlotte-Douglas International is the main airport in town, and LiveATC has them covered. Most air traffic should be coming through there, but it might not be a bad idea to keep your ears on Greenville-Spartanburg International as well. It is the closest international airport and may be a convenient "low-profile" option for some "high-profile" travelers.

Just like with Tampa-St. Pete, it probably isn't a bad idea to do a quick Google search to see if any new scanner streams pop up around convention time in the Charlotte area. Look for online receivers and online scanners as well, as they can provide you with opportunities to tune in specific frequencies that might not be available through the traditional RadioReference list.

Don't expect to hear Secret Service transmissions, or Air Force One communications through these streams, obviously. However, the on-the-ground communications that surround these types of events can often be just as entertaining, if not more so. Political conventions often bring out scores of protestors and demonstrations. Keeping these under control falls under the responsibility of the local city and county police departments. They also assist with escorting the motorcades while moving VIPs.

If you are diligent, you should be able to find some pretty interesting listening. It also wouldn't be a bad idea to join some of the online communities, such as Yahoo's LiveScannerAudio group, as during high-profile events like these they will often share any hot streams they are finding.

❖ Amazon comes to Xbox 360

As a Kindle Fire owner, I have been tempted to sign up for Amazon's Prime service, which would allow me to stream video directly on my Fire, as well as other devices with the Amazon Instant Video app installed.

What has so far kept me from doing this, is the fact that my main television is in the living room and the Apple TV device I have connected to it does not have an Amazon Instant Video app installed. I do have it on the TV in the bedroom through my Roku LT, but my TV isn't in HD. Oh, but my reservations for signing up may finally subside.

Microsoft has now announced the release of an app for the Xbox 360 that will allow for streaming of Amazon Instant Video on their gaming console. This app will be Kinect-powered, which means it will allow for limited control through voice and motion.

The Amazon Prime service runs $79 per year and includes free two-day shipping on most items purchased from Amazon, free Instant

Video streaming, and free "borrowing" of thousands of books on Kindle e-readers (including the Fire).

You can get a free month-long trial of the Amazon Prime service by signing up through the Amazon Web site (link in GlobalNet links below).

For those of you who are perhaps already on Netflix, or are just generally on the fence about this whole streaming video thing, try out the free trial and see what you think of the selection of available titles. Right now, they don't have as many titles as Netflix, but they are adding more all of the time and it seems like (to me, at least) they have more popular titles than Netflix.

I'm still waiting to see if my prediction holds true, that Amazon will eventually purchase Netflix and offer a "super-streaming" service that includes video, books and music. With the aggressiveness we have seen so far from Amazon in putting their streaming app on various devices, and the aggressive price point of their Kindle Fire device, it sure feels like they are trying to get Amazon Prime in as many hands as they can to directly compete with Netflix.

Combine that with Netflix's much publicized troubles in 2011 and early 2012, and I just can't help but picture Amazon licking their chops and waiting for the right moment to make their move.

❖ Verizon FiOS ups the ante on Internet speeds

When I was in college, my dorm room came with a T1 internet connection that gave me 1.5 Mbps download and upload speeds. I remember at the time thinking how blazingly fast that was, because all I was used to at the time was a dial-up 56K connection.

Currently at my home, I am running AT&T's U-Verse with a 12 Mbps download/1.5 Mbps upload connection. This is more than adequate for me to be able to stream Netflix, Pandora and my assortment of WiFi radios.

However, when I heard that Verizon FiOS is launching new tiers of internet service with speeds up to 300 Mbps download/65 Mbps upload, I couldn't help but do a relatively dramatic double-take.

The low-end of their internet speed offerings comes in at 15 Mbps down/5 Mbps up. The trouble with FiOS is finding an area that offers it. I have had U-Verse (which, like FiOS, operates through a fiber-optic connection for at least part of the run) for a couple of years now, yet FiOS is nowhere to be seen in my area.

As of press time, there were no price-points aligned with these new packages. But, as I am currently paying roughly $50 per month for my measly 12 Mbps, I can only imagine the 300 Mbps connection would be entirely beyond any realistic budget for me.

Still, if you can afford it (and if you can get it), there are few options available to most residential customers that come close to these speeds. I can't for the life of me, though, imagine any residential user using that much bandwidth to make these kinds of speeds necessary. Verizon must have an idea of who their target for these speeds would be.

According to the release information, the upper-end of their speed offerings are for households of five or more Internet-connected users, streaming high-definition video on a number of different devices.

That is, indeed, a huge chunk of bandwidth.

❖ Everybody's a Streaming Expert

I have talked in past columns about the explosion of internet radio and streaming video popularity, heightened by smartphones such as the iPhone and Android product line. I recently was able to get a glimpse of just how far this knowledge has begun to penetrate.

Actually, it was a combination of two events that happened nearly at the same time that made me realize how big all of this is getting – especially Internet radio.

For starters, I was at my local Target store and for the first time, I saw WiFI radios for sale that weren't online or in a large electronic chain like Best Buy. They were some pretty off-brand models and I didn't see any that I would recommend using for any serious listening, but it was still really interesting to see them in a Target store. When you see technology filter into the Target and Wal-Marts of the world, you know you have definitely entered mainstream awareness.

The other event came with a recent conversation with some friends of mine. They work for a company that is owned by a larger corporation. The IT department of the larger corporation places pretty tight restrictions on the Web sites that employees may visit from their work computers. Many popular sites are blocked, especially bandwidth hogs like Pandora.

I was talking about using Pandora while sitting at home relaxing (or even when typing this column), and they said that Pandora was one of those sites blocked by their IT department. Then, they went on about how they were still able to access Jango.

❖ Jango?

Yup, your Internet radio columnist missed the boat on this one, apparently. Jango is a Pandora alternative. It hasn't yet been flagged as a 'problem site' by the IT department at this company, so employees are still able to stream music to their heart's content. They also discussed playing streaming video on their computers, but I never was able to pry from them which site they were using.

So, not only am I able to present to all of you a new Internet-radio site to check out with me, but I also have people who two years ago would have looked at Internet radio as one of those high-tech things that they didn't understand. Now, they are so ingrained with using internet radio, that they are willing to seek out alternative methods of tuning in when their main source was taken away from them. In the meantime, they were able to teach this old dog a new trick or two.

Two years ago, when I told people I wrote a column about Internet radio, I had to explain to them what that meant. Now, they are knowledgeable about the technology and the players in the industry.

It is just mind-blowing to think how far we have come in such a short amount of time.

Until next time, 73!

GLOBALNET LINKS

TuneIn – Streaming Links in Tampa/St. Petersburg/Clearwater - http://tunein.com/search/?id=r100021&so=0
RadioReference – Tampa/St. Petersburg Live Audio - www.radioreference.com/apps/audio/?mid=34
KTPA (Tampa International) Streaming feeds - www.liveatc.net/search/?icao=KTPA
KPIE (St. Petersburg-Clearwater International) - www.liveatc.net/search/?icao=KPIE
TuneIn – Streaming Links in Charlotte - http://tunein.com/search/?query=charlotte%2C+nc
RadioReference – Charlotte Metro Live Audio - www.radioreference.com/apps/audio/?mid=67
KCLT (Charlotte/Douglas International) - www.liveatc.net/search/?icao=kclt
GOP Convention 2012 - www.gopconvention2012.com/
Dem Convention 2012 - www.demconvention.com/
Microsoft adds Kinect-powered Amazon Streaming to Xbox 360 - www.itworld.com/personal-tech/279079/microsoft-adds-kinect-powered-amazon-streaming-xbox-360
Amazon Prime - www.amazon.com/gp/prime
Verizon FiOS will debut a 300 Mbps internet tier next month - www.technobuffalo.com/home-entertainment/streaming-media/verizon-fios-will-debut-a-300-mbps-internet-tier-next-month/

BELOW 500 kHz

DXING THE BASEMENT BAND

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Allure of Longwave

Welcome to another edition of *Below 500 kHz*. I'm often asked why I focus my work on the longwave band, and if I ever get tired of sifting through beacons. I know that I'm not alone in my pursuit, and this seems to be a good time to explore *why* we do what we do!

First off, I'd like to say that longwave is *not* all I do, and that chasing beacons is not all I do when I am on longwave. I can be found exploring just about any band or mode below 148 MHz, and I even have a special affinity for a VHF band: 6 meters. However, longwave does hold an intrigue that is hard to find elsewhere in the radio spectrum, and I do spend much of my time there.

This month, we'll review what draws many of us to longwave – in part to share the mystique to newcomers, but also to "jumpstart" veteran listeners on this amazing part of the spectrum. Here are the best reasons I can think of to include longwave in your listening menu…

❖ New Ham Band Coming

Sometime in 2013, we expect formal approval of a U.S. ham band from 472-479 kHz, resulting from recent WRC-12 proceedings. This band was a long time in coming, and now is an excellent time to learn more about longwave propagation and behavior. When approval is granted, you'll be in a better position to take advantage of the new signals on the band, whether you are a ham or a DX-chasing listener.

❖ Variety of Signals

I've said it before and I'll say it again: *Where else in the radio spectrum can you hear so many different types of signals in the space of just 500 kHz?* On longwave, you can expect to hear Natural Radio, Military signals, Time Stations, Broadcasters, Beacons, and Experimenters – all in this relatively narrow slice of spectrum. You simply cannot become bored!

❖ Beacons: The Ideal DX Target

If you were to design the perfect DX station to listen for, what features would it have? How about these for starters: 24-hour year-round operation, near omni-directional transmission pattern, constant and repetitive IDs (in CW mode, to help cut through noise), and published location/operator data. Guess what? Longwave beacons have *all* of these traits, making them a perfect DXing target.

❖ Propagation Stability

Take a listen sometime below 100 kHz, and what do you hear? For the most part, this is the land of military RTTY, time stations, and other utilities that use longwave for its reliability around the clock. How else would I hear Jim Creek, WA (NLK/24.8 kHz) in broad daylight near Rochester, NY, *and* hear the same station at night with virtually the same signal strength? When the signal positively *must* get through, day or night, longwave rules. Even higher up the band, stable propagation is a hallmark of longwave operation, although skip does begin to play a significant role above 100 kHz.

❖ Not Everyone Can Tune It

Getting on longwave used to be quite a challenge, because not many receivers available to U.S. listeners covered the band. Until the mid-1980s, you generally had two choices: Buy surplus military gear, or build up an outboard receive converter that would "move" the longwave band to a range your receiver could tune. Today, things are easier with the advent of wide-range receivers covering down to at least 100 kHz. Still, longwave capability is by no means universal, and a suitable antenna is required if you expect to hear much.

❖ Historical Significance

Some of the earliest work in radio communications took place on longwave. In fact, at one time it was believed that the longer the wavelength the longer the communication range. The shortwaves soon took over for most long haul work, but the unique behavior of longwave still makes it ideal for radio navigation, military and other specialized users. In fact, it is being "rediscovered" today as a fertile ground for low power experimentation and homebrew construction.

❖ Underdog Status

To borrow a theme from a well-known country song, some of us were "longwave" before longwave was cool. As one example, I recall former *MT* columnist Uncle Skip telling me of a chance encounter he had with an old timer who was chasing beacons on LF long before it was a popular pursuit.

As I recall the story, Skip had stopped to check out some discarded electronic "junque" at the curb in front of this fellow's house. As he sifted through the goodies, he could hear the repetitive sounds of Morse Code coming from inside the home. He introduced himself to the occupant and was invited inside to see the shack. There, he noticed lists and lists of beacons this fellow had heard. Apparently, he pursued the activity with little or no knowledge that others chased beacons on a regular basis. He was just doing it to satisfy his own curiosity about these stations.

That's the kind of spirit I see even today in longwave, regardless of the particular area of interest. The "basement band" may not be for everyone, but it has a fiercely loyal following among those looking to explore the unusual and the intriguing!

❖ Forgiving Circuitry

It is well known that things get trickier, from a design standpoint, the higher you go in frequency. In microwave, for example, even the length of a trace on a circuit board can drastically affect the operation of a circuit. No such formalities exist in longwave radio. Component leads can be *feet* long and still work just fine. Audio transistors are sometimes used for RF applications, and breadboard or perfboard construction is perfectly acceptable. Does surface mount construction have you down? Plug in your soldering iron and try longwave!

❖ Mailbag & Loggings

I was pleased to hear recently from Larry Shaunce, WDØAKX (MN), who writes: "Saw your mention of the Sony 2010 as being a trusty radio and I have to agree with you – it is one great radio. Very reliable and the performance is just hard to beat. I must admit, I have not tried any of the more modern portable radios, but I use my 2010 on a daily basis and it has passed the test of time and still works like new. If anyone is looking for a used radio and can find one of these at a reasonable cost, don't pass it up!

"I use it when I am out of the shack in other rooms or outside under the shade tree on a sunny Sunday afternoon. It also sits by the bed at night for some late night tuning before I get to sleep, and the timer on it works great for this use, as I can fall asleep listening to something and it will shut down automatically after 1 hour, usually about right for it to soothe me to sleep."

Hello Larry, and thanks for writing to *Below 500 kHz*. About the only trouble I've ever had with my Sony 2010 was with the battery contacts coming loose and giving me an error code on

Station sign and beacon ZWG/287 kHz, near Winnipeg, MB *(Photos courtesy of Daniel Gillet, MB)*

the front panel display. After a few times of this happening, I cured it by soldering soft, flexible wires between the battery contacts and the circuit board. I left the leads long enough to permit removal of the cover for service without too much hassle.

I also installed a large value capacitor across the battery tray to permit changing the cells without losing the memory settings of the radio. I expect to be using my 2010 for many years to come! As I stated recently, the Eton E1XM was a promising set early on, but its quality issues finally meant that I would return to the trusty 2010. Others may have a different experience, and I know of several satisfied E1 users today.

Our loggings this month are from **Mario Filippi**, N2HUN (NJ) and **Van Wilshire**, N1VW (IN). Mario uses a Ten Tec RX-320D receiver and a 43-foot vertical antenna, while Van uses a Yaesu FRG-100 receiver with a 40-foot dipole running N-S, and up 25 feet.

Van points out that he was using paper logs for a while, but then discovered Alex Wiecek's WWSU 6.3.7 NDB-logging program, which makes logging even easier. Each logging in Table 1 is identified by the initials and location (state) of the contributor.

TABLE 1. SELECTED BEACON LOGS

kHz	ID	City	By
198	DIW	Dixon NC	V.W. (IN)
209	IB	Atikokan ON	V.W. (IN)
212	MPZ	Mt. Pleasant IA	V.W. (IN)
220	BX	Blanc Sablon QC	V.W. (IN)
243	YVB	Bonaventure QC	V.W. (IN)
244	TH	Thompson MN	V.W. (IN)
248	FRT	Spartanburg SC	V.W. (IN)
261	ELQ	Emporia VA	V.W. (IN)
273	ZV	Sept-Iles QC	V.W. (IN)
273	ZV	Sept-Iles, QC	M.F. (NJ)
278	NM	Matagami, QC	M.F. (NJ)
317	VC	LaRonge SK	V.W. (IN)
332	YFM	La Grande, QC	M.F. (NJ)
340	YY	Mont-Joli, QC	M.F. (NJ)
349	GW	Greenwood MS	V.W. (IN)
351	MSQ	Culpepper, VA	M.F. (NJ)
351	YKQ	Ft. Rupert, QC	M.F. (NJ)
353	MG	Montgomery, NY	M.F. (NJ)
365	HQG	Hugoton KS	V.W. (IN)
365	YMW	Maniwaki, QC	M.F. (NJ)
367	FVX	Farmville, VA	M.F. (NJ)
370	GR	Magdalen Isl., QC	M.F. (NJ)
370	MQI	Manteo, NC	M.F. (NJ)
373	AEA	South Hill, VA	M.F. (NJ)
376	ZIN	Great Inagua Is. BAH	V.W. (IN)
382	LQ	Boston, MA	M.F. (NJ)
388	RNW	Chocowinity, NC	M.F. (NJ)
389	EN	Kenosha WI	V.W. (IN)
390	JT	Stephenville, NL	M.F. (NJ)
391	DDP	San Juan PR	V.W. (IN)
392	ML	Monroe LA	V.W. (IN)
396	GOI	Ft Knox KY	V.W. (IN)
407	OX	Ocean City, MD	M.F. (NJ)
417	HHG	Huntington, IN	M.F. (NJ)
417	IY	Charles City IA	V.W. (IN)
420	TU	Tupelo MS	V.W. (IN)
426	IZS	Montezuma GA	V.W. (IN)
450	PPA	Puerto Plata, Dom.	V.W. (IN)
516	YWA	Petawawa, ON	M.F. (NJ)
521	GM	Greenville SC	V.W. (IN)
526	ZLS	Stella Maris, BAH	M.F. (NJ)

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

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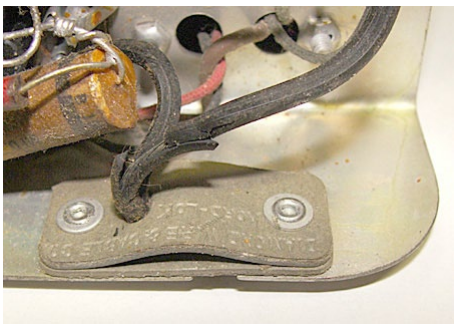
More on the Midget Arvin and Sets You Don't Want to Plug In!

In last month's column, I mentioned how my wish for a project radio small enough to fit on my currently cluttered benchtop seemed to have been almost providentially granted. While attending the Antique Wireless Association spring meet, which is always held in conjunction with the AWA May board meeting, I came across the perfect set: one of those midget metal-cased Arvins. However, the very diminutiveness that seemed to be such an asset had the effect of stopping me in my tracks a little earlier in this work session than I had anticipated. But I'm getting ahead of my story.

I began this month's work session with the prospect of spending a few quiet hours recapping the little Arvin. As regular readers know, I start most radio restorations with replacement of all paper and electrolytic capacitors. Turning the set upside down, I took a good look at its underside for the first time. What I saw caused me to quickly abandon my plans for a wholesale recapping.

The wiring is so tight in this little chassis that it must have been installed in layers. I thought I might do more harm than good as I disturbed various connections to wire in the new capacitors. It would be easy to create short circuits as I moved parts around. So I decided to use a servicing technique that would have been normal for the era when the set was current: turn it on, look for trouble, and correct any faults that occur as they come up.



Rivets on the unusual cord restraint had to be drilled out so it could be removed (see text).

❖ Needed: A Line Cord

But before I could power up this radio, I would have to provide it with a line cord. The original was clipped off where it entered the chassis. Looking at the deteriorating remnants of the cord left inside the chassis, I could see why. Like most rubber zip cord of the time, this one must have become a safety hazard with the usual flaking insulation and exposed wire.

Making way for the new line cord turned out to be a bit of a project. The remnants of the old cord were held in a tight grip by a restraint system I had never seen before. The cord was sandwiched between a couple of small pieces of insulating board that were riveted to each other and the chassis apron. The rivets had to be drilled out so that the restraint system could be removed. Having done that, I replaced it with a rubber grommet, ran the new cord through, and prevented it from pulling out with a knot on the inside of the chassis.

❖ Checking the Tubes

Once the new cord was hooked up, I removed the radio's four tubes and checked them against the chassis layout shown in Rider's to make sure that the correct tube had been installed in each socket. All the tubes checked out fine on my Navy TV-7, though I wouldn't have been **surprised** to find one with an open heater – which is one of the most common faults in an a.c.-d.c. receiver.

With the tubes out of their sockets, I cleared out most of the dust from the chassis and various crevices using nothing more than a damp cloth. Though there was plenty of dust, there was little or no pitting – a sign that this radio had been stored inside, not in a garage or shed where there was no environmental control. Before each tube was permanently seated in its socket, I sprayed its pins with contact cleaner and ran it in and out of the socket a few times.

❖ The Smoke Test

Now I was ready to try the radio – an operation that seemed very strange to me with the original capacitors still in place. I plugged it in through a little autotransformer I have that has four voltage steps – at about 40, 60, 80 and 120 volts. The autotransformer was powered, in turn, through an isolation transformer. The latter wasn't technically necessary, since this radio has a "floating ground" (see last month's column). That should protect the user from a hot chassis situation, but its protection could be compromised by a leaky bypass capacitor.

Before turning up the voltage, I set up a multimeter to monitor the power supply's d.c. output by connecting it from the 35Z5 cathode to the floating ground. A lack of d.c. voltage or a sudden voltage falloff would be an indication of a possible short and a signal to turn off the radio immediately.

Turning the set on, I increased the autotransformer voltage slowly, leaving it set at each switch position for several minutes. There was no smoke, but as I reached the 80-volt position I began to notice a loud, raspy a.c. hum that was unaffected by the position of the volume control. This is the classic indication of one or more open filter capacitors.

❖ The Capacitor Problem

The Arvin is equipped with a three-section electrolytic capacitor. Two of these (40 uf and 20 uf at 150 volts) are filter capacitors and the third (20 uf at 25 volt) is the cathode bypass for the 50L6 power amplifier. My next move would be to change out this capacitor, but here's where I ran into trouble. None of the multi-section caps in my stock could possibly fit in the tiny space available. And even the most compact unit available new was an inch too long.

The Arvin's cramped chassis makes capacitor replacement an adventure.

It looks as if the only course open to me is to order three individual caps of the correct sizes and somehow shoehorn them into the small space available. Modern low-voltage electrolytics tend to be quite small, so I'm hoping I can make this scheme work out. Next month's column should tell the tale.

❖ Don't Plug These Sets In!

This topic was inspired by a query that recently came across the desk of our publisher, Bob Grove. I knew some of the answer and, in researching the rest, I came across some very interesting material.

Here's the issue: almost every serious radio collector will eventually come across a routine-looking radio, usually a table model in a wood cabinet, that is designed to run on some value of d.c. – generally 110 volts, 6 volts or 32 volts. Quite often, the radio will be internally fried because somebody in the past has mistaken it for a routine a.c. model and plugged it into the a.c. line.

An uninformed person might have attached an a.c. plug to the power cord of a radio that is clearly equipped with a vibrator power supply. Or the set, for reasons to be discussed, may legitimately be equipped with an a.c.-compatible plug that was not intended to be plugged into an a.c. outlet. Let's take a look at some of these d.c. sets so we can understand and appreciate the purpose for which they were designd.

❖ 110-Volt D.C. Radios

This is a very rare class of antique radio, with few examples surviving today. Probably the best example is the Philco Model 46, which is in the same style cabinet as the very well known Philcos 70 and 90. The 110-volt d.c. radio is a legacy of Thomas Edison's early electrification of our major Eastern Seaboard cities in the late 19th century. 110 volts d.c. is what his dynamos supplied, and so 110 volts d.c. is what all lighting, appliances and motors used in the system had to be designed to operate on.

Even though the much more efficient a.c. distribution system invented by Nikola Tesla had become dominant by the early 20th century, the large installed base of d.c. appliances kept d.c. power in the mains in some areas of certain cities for decades. A *New York Times* article of November 14, 2007, titled "Off Goes the Power Current Started by Thomas Edison," describes the cutoff of the last d.c. power being distributed in New York City.

The extreme longevity of these pockets of d.c. service explains why radios like the Philco 46 were still being made in the early 1930s. The 46 had no rectifier circuit – only a hash filter at the power input – and so plugging it into a.c. would result, at the least, in non-operation. However, inexpensive a.c.-d.c. radios began to appear on the market just a little later in the decade. These little sets would operate happily on either type of current, requiring only reversal of the plug to correct failure to operate on d.c.

❖ Six-Volt Farm Radios

Before the era of rural electrification began in the mid 1930s, life on most of America's farms was, in many ways, still very similar to what it had been for the prior 200 years. Though the actual work of farming had become easier for those who could afford tractors and other machinery, the lack of electric power meant lantern or lamp light after dark and backbreaking work for the housewife with no labor saving appliances.

But during the earliest days of radio broadcasting, the farmer was at no particular disadvantage compared to his city cousins. The city listener might be connected to a power line, but it did him no good when it came to radio listening. He still needed to rely on an array of bulky and expensive batteries to operate his set.

By the late 1920s, the latest radios could be plugged into the wall – **IF** you happened to be a city dweller. Farm folks still needed their A, B and C batteries and the rat's nest of connecting cables. Rural electrification was still over five years away.

But some relief was at hand with the appearance on the market of radios which, like

A Wincharger could be had at a deep discount if a radio were purchased at the same time.

auto sets, operated from a 6-volt car battery that provided all necessary voltages. Borrowing from auto radio technology, these sets incorporated a vibrator power supply. Their advertising made the important point "Only two wires to connect!"

But the mere acquisition of a six-volt radio and an extra car battery did not, of itself, make for convenient radio listening. The battery was going to need regular recharging, and transporting that heavy messy thing to a service station in town was not the most attractive of options. Enter the Wincharger, a wind-driven generator which, as its ads proclaimed, supplied "firepower" from the air. [*For a full account of these radios see "Old School Wind-Powered Farm Radios" pages 16-19 MT April, 2011 -- Editor*]

The Wincharger sold for about $20.00, complete with its own steel tower. And this price was often deeply discounted for customers who purchased a radio at the same time. The little wind generator did a creditable job of keeping the one battery charged but, for those who wanted a charging system with a little more reliability, another ten or twelve dollars would buy a gas-powered generator.

❖ The 32-Volt System

A single car battery might supply enough power for a radio and perhaps one or two lights, but the family that required power to operate several household appliances and tools and wished to wire their entire home, and perhaps an outbuilding or two, would probably choose a 32-volt system. Power for the system was stored in a group of heavy glass-cased batteries arranged on a rack in the basement.

Not only did such a system have the ability to supply much more power, but the power could be distributed over smaller wires, and for greater distances, without appreciable losses. The batteries usually were kept charged by a gasoline-driven generator that would automatically start up and top off the batteries every time a light or appliance was turned on. However, some systems used large wind driven generators instead.

Now, here's how many rare 32-volt radios and other appliances were accidentally destroyed. When wiring up a house for a 32-volt system, the usual practice was to use the plugs, sockets, and other wiring devices suitable for a 110-volt installation. This was done in anticipation of the rural electrification that had begun transforming farm life by the mid 1930s. When the power line came to the neighborhood, all the installer had to do was disconnect the feed from the 32-volt system and connect the 110-volt cable in its place.

Of course, all 32-volt lamps, appliances and tools had to be trashed or put in the attic – to be replaced by their 110-volt counterparts. Much later a collector might come across a long-ago-discarded 32-volt radio with its 110-volt plug still in place and...well you can imagine the rest.

D.C. Farm radios looked much like 110-volt a.c. plug-in types – sometimes leading to accidental destruction!

Some 32-volt radios had vibrator power supplies to provide the necessary high voltage and these are easy to spot. More subtle are those that use 32-volts throughout and have no special power supply. If you suspect you are dealing with a 32-volt set, one sign to look for is the absence of a rectifier tube and power transformer. Another is the presence of multiple audio output tubes. Sometimes as many as four were used to provide adequate volume at the low plate voltage.

See you next time when we will try to shoehorn some replacement electrolytics into the tiny Arvin chassis.

ANTENNA TOPICS

BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Dan Farber, AC0LW
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Antenna, Feedline and Ground
Linking Our Radios to the Cosmos

Welcome back, my friends. This month, I want to look at the three actors in the title in a more interactive way – a way that recognizes the trio as an organic whole rather than separate entities. It seems that for many of us the interconnection between our radios and the ether is one of the trickiest parts of the hobby to understand and to get right. Grouping the antenna, feedline and ground into a single entity may help us to see more clearly how they interact and help us assemble better and more efficient antenna systems. That means more quality time on the air – and I'm sure we could all get behind that!

❖ Grounding

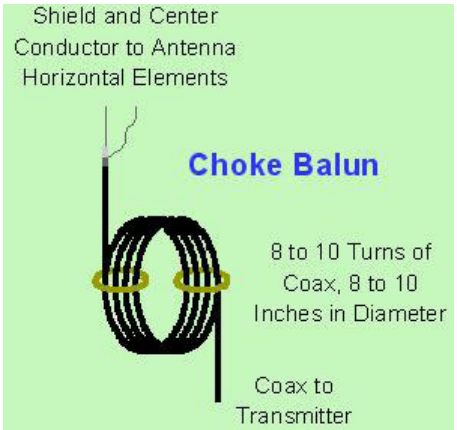
Let's start by trying to clarify some the terminology. For example, *ground.* Turns out that "ground" can mean RF ground, AC ground, DC ground, safety ground … Which one are we concerned with here?

Well, it turns out that antenna systems have two completely different issues called ground. They must be protected from lightning by a *safety* ground, often involving lightning arrestors; and to work efficiently they may need to have *RF* grounding ... depending. Is it a "balanced" antenna?

❖ Balanced vs Unbalanced

That brings up our next semantic bugbear, *balanced.* What do we mean by "balanced"? The term is used for antennas and for feedlines, but as we'll see it's quite common to connect an *unbalanced* feedline to a *balanced* antenna. Confused yet?

It's always helped me to visualize balanced and unbalanced from the perspective of AC circuits. Think of the 240 Volt power that comes into your home's electrical panel. There are two "hot" conductors and a "ground" (neutral) conductor. By connecting only to the two "hots," we can power 240V items like dryers and stoves. By connecting to a "hot" and the "ground," we obtain 120V for everything else. "Balanced," then, equals "two hots," independent of ground. "Unbalanced" is "a hot and a ground." We can think of antennas and feedlines in this same way. Balanced means "two hots." Unbalanced is "a hot and a ground."



One of the common ways to "balun" from coax to a dipole.

Another popular balun configuration for the coax-fed dipole.

It's easy to see this concept among antennas and feedlines. Dipoles – and all their descendants, like beams – clearly have two equally sized elements that are independent of ground: a "balanced" arrangement. Conversely, vertical antennas have a single active element – the "hot" – and, ideally, an extensive system of radials: the "ground."

❖ Feedlines

Similarly, transmission lines are pretty clear-cut on this issue: Coaxial cable has that well-insulated center conductor, the "hot," surrounded by a braided jacket, the "ground" – while ladder line or twin-lead or open-wire feeders have two equal and unshielded conductors: "two hots." As long as we keep in mind throughout that "ground" in this context means *RF ground,* we can understand the basic concept that a *balanced antenna,* for the purpose of this discussion, really means *largely independent of RF ground,* while *unbalanced antenna* means *highly dependent on RF ground.*

What do I mean by independent of RF ground? I'm thinking of the hundreds of contacts I made from a third-floor station, using a 90 foot dipole fed with ladder line. A true wire run to an earth or water-pipe ground would have been over 25 feet long, so I didn't have an RF ground. However, the dipole, undeterred, proceeded to work the nation and the world on all the HF bands, with absolutely no RFI or other interference issues of any kind.

However, when I would feed the rain gutter with a single wire as a random antenna – which is about as "unbalanced" a load as a tuner ever has to look at – stray RF sprayed everywhere, burning my fingers on the key paddles, garbling TV reception on every floor of the house, sometimes scrambling PCs and the telephone service, and once even re-programming the kitchen microwave, two floors below. I hadn't gotten smart enough yet to tumble to the radial counterpoise wire or artificial RF ground ideas, or I could have tamed this beast.

One lesson sunk in very clearly, though: RF ground is a *much* less crucial topic for a balanced antenna; but an unbalanced one absolutely must have robust RF grounding.

We begin to see what I had intimated at the beginning, that antenna, feedline and ground cannot be meaningfully separated, but are an organic entity, and each case is potentially unique.

❖ The Balanced Dipole

Let's try looking at it another way: consider the ubiquitous dipole. Is it some specific resonant length? If so, do you wish to limit its usefulness to the one band where it's resonant? If you can answer yes to both questions, then coaxial feed for this dipole becomes meaningful. In any other case, though, you'll probably do much better to feed the dipole with a balanced line like window line or Twin-lead from your tuner's *balanced* output and enjoy the single dipole's use on any number of bands.

Even with coaxial feed, the now single-band dipole still properly needs a balun of some sort at the antenna end to work efficiently. Notice, though, that it is the *balanced* aspect of the antenna that rules the day here – a good RF ground is not nearly as important, in either case, as is the notion of *balanced feed.* The real secret of coax's success is that its characteristic impedance is so close to that of the dipole at resonance.

❖ The Unbalanced Vertical

Now turn aside to a completely different world – the vertical antenna. *Dude! Somebody stuck one end of a dipole straight into the ground!* Well, that's basically it, but for some reason the solid earth isn't so good as a radiator. Oh yeah, that's right: It's busy being *ground.*

Here's the ultimate exposition of "a hot and a ground" – the vertical. As any of you who

A somewhat modest system of ground radials for a vertical.

A more robust radial arrangement at the base of a vertical.

have built or installed one knows, ground for a vertical is one of the more arcane sciences of our hobby. Most of it, of course, is driven by forced improvisation – few of us have the real estate to lay out the radial wires that an AM station's antenna requires. Ingenious schemes of ground rods, metal screen, and radial wire have been developed and used by many a radio hobbyist.

I love the ad copy for one of the popular 43-foot verticals; the small print says "requires at least one radial ground wire. More radials will give better results." Gee, ya think? It's hard to overbuild a ground system for a vertical, and numerous radials seem to be one of the better solutions for folks on a normal city lot.

It is the *unbalanced* aspect of the antenna that trumps all else – now RF ground is the dominant issue. Coaxial cable, again, has a rated impedance that's pretty close to a properly laid-out vertical antenna, so it's obviously the default feeder for this situation.

Can you feed a vertical with window line? Hmmm! Now, there's a trick I haven't tried yet – I suspect you'd need some sort of balun at the antenna end – don't see much in the literature about this one. Anyhow, you can see that there's no getting away from the importance of the ground and the unbalanced configuration.

And so it goes. It becomes clear that for each antenna configuration there is one definite arrangement of feedline and ground that will maximize its performance. The three cannot be meaningfully separated – they are a single entity that should be considered as a whole system, instead of grappling with three separate and seemingly different topics. They are, after all, separate aspects of the same concept – the link between our radios and "out there." The better we understand this link, the more fun we can have on the air!

That's all for this month, friends. Tune me in here in the September issue, and we'll peer ever deeper into the wondrous jungle of antennas. Until then, happy operating!

SKY SURFING

RADIO FROM THE OUTER REACHES

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A Flock of Other Amateur Radio Satellites

Up to now, I've been sharing information about the mainstays of our Amateur Radio satellite fleet and how you can receive their signals or, if properly licensed, actually work through those that have transponders.

In this installment, I'll discuss a number of other amateur satellites that have launched in the last few years and then bring you up-to-date on some of the latest happenings in the amateur satellite world.

❖ An Aging Fleet

In my work as the past president and current treasurer of AMSAT-North America, I'm frequently asked, "With all the on-orbit failures of AMSAT's satellites lately, what satellites are left for me to work?"

Clearly, we have recently lost our most popular so-called "EZ-sats" (AO-51) to battery failure. Some others (like SumbandilaSat (SO-67) and Hope OSCAR 68 (HO-68), which showed great promise soon after their launch, are now in beacon mode (if that) most of the time. In addition, satellites like AO-7 (which is now nearing its *fortieth* anniversary in orbit) is only functional while in sunlight, and VO-52's Indian ground handlers recently had to switch the satellite to one of its backup analog transponders as the primary transponder experienced an on-orbit failure.

Even the Mode V/U (Mode J) transponder aboard JAMSAT's venerable Fuji OSCAR 29 (FO-29) had to be turned off by its handlers for many months because its orbit progressed into long periods of darkness.

But, despite all these failures, the good news is that there are still several fully functioning Amateur Radio satellites available to listen to (or work through) most of the time. Satellites like AO-27 and SO-50 now carry the bulk of FM traffic and FO-29's analog transponder has now come back to life as strong as ever. What's more, there's an emerging class of satellites now in orbit that are fun to listen to even if they don't have transponders aboard. Most are in a satellite class we call "CubeSats."

❖ The CubeSats

In a previous column, I briefly described this whole new class of satellites, based on a design that now appears poised to become the future of the Amateur Satellite Service. Measuring only 4 inches on a side, these tiny satellites (sometimes also called "nanosatellites") are now being built, launched and/or controlled in ever increasing numbers by numerous organizations (primarily educational institutions) around the world.

While some of these organizations have links to amateur radio, most do not. The bulk of these satellites have digital downlinks. A few take pictures. But most are placed in orbit for the express purpose of conducting various scientific experiments. And while some of these experiments are of interest to amateur radio operators, most are not. Unfortunately, when their original scientific experiments are complete, many of them die on orbit or revert to beacon mode…if they even last *that* long.

However, despite their shortcomings, CubeSats are the future of this part of the hobby. They are reasonably inexpensive to build and still quite affordable (less than $100K) to launch. However, they are not without their own built-in problems.

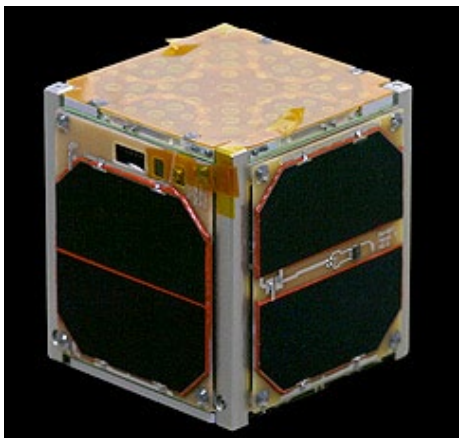
For example, because these satellites are *so* small, they tend to run "cold" on orbit, as they cannot absorb enough heat when in daylight to keep their internal parts warm enough during eclipse to function properly. Batteries, in particular, usually will not accept a full charge if their internal temperature falls below freezing. This issue is further complicated by the fact that the cross sectional area of these satellites does not allow for large enough solar panels to generate enough extra onboard power that could be used for internal heating. As a result, these satellites often run in a negative power mode that eventually "does them in," sometimes soon after launch.

But, as I've also said, even though most of these satellites do not contain transponders, they are still fun to listen for. So, let's shine the spotlight on a few of these CubeSats that were still operational at press time (late June 2012). Unfortunately, some (or all) of these satellites could very well be partially or completely defunct by the time you read this, so "your mileage may vary."

❖ PW-Sat

PW-Sat is the first Polish satellite. Its construction was an initiative of the students of Warsaw University of Technology (in Polish - *The Politechnika Warszawska*, therefore the "PW" in the satellite's name) working within the Students' Space Association and Student Space Engineering Scientific Group.

PW-Sat was successfully launched from Koruou, French Guyana on February 13, 2012. The satellite is a 1U Cubesat (approximately

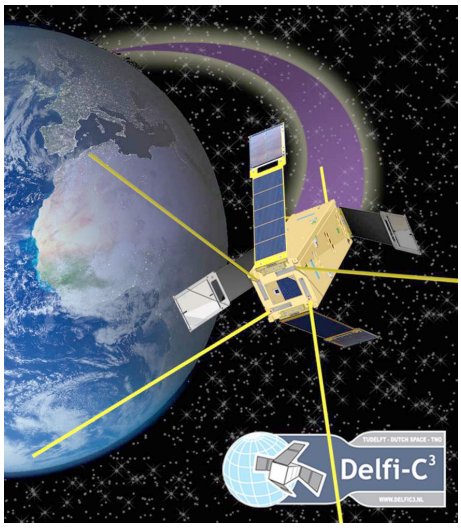


The flight model of PW-Sat. (Courtesy: Warsaw University of Technology)

4 inches square) and its stated mission is to (eventually) test de-orbiting techniques at the end of its on-orbit life. At press time its Mode U/V (Mode J) transponder was still operational. More information (in Polish) about the project can be found at: **www.pw-sat.pl**.

❖ DO-64 (Delfi-C3)

Delfi-C3 is the first nanosatellite built as a student project at the Delft University of Technology in the Netherlands. The satellite is based on the CubeSat concept in a "3U" design….that is, three single (so-called "1U") CubeSat frames stacked on top of one another.



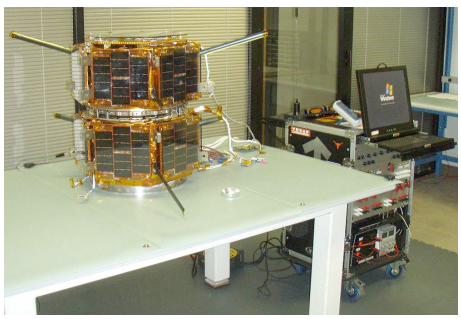
An artist's concept of how the Delfi-C3 satellite might appear in orbit. (Courtesy: Delft University)

A number of novel technologies are being tested on board the satellite including a thin film solar cell experiment and an autonomous wireless sun sensor experiment.

Delfi-C-3 was successfully launched on April 28th, 2008 at 03:54 UTC on a PSLV launch vehicle from the Satish Dhawan Space Center in India. As of this writing, Delfi-3C was still operational with a telemetry (science) beacon downlink centered on 145.870 MHz. However, its linear uplink and downlink analog transponders, although activated soon after launch, were not operational. The latest status of the satellite can be found on the Delfi-C3 Web site at: **www.delfic3.nl.**

❖ FO-69 and FO-70 (Fastrac-1 and 2)

Fastrac-1 and 2 are a pair of student-built nanosatellites from the University of Texas at Austin (USA) built to investigate relative navigation, attitude determination with GPS, and a micro-discharge plasma thruster. After their primary science missions are completed (and assuming they survive that long!) one or both satellites may be opened for general amateur Radio use as digipeaters using 1200 and 9600 Baud packet radio.



Fastrac 1 and 2 undergoing final electronic testing prior to launch (Courtesy: University of Texas at Austin)

Fastrac-1 and 2 were successfully launched by a Minotaur launch vehicle from the Kodiak Launch Complex in Alaska on November 20, 2010 into a 650 km circular orbit. At press time, the digital transponders aboard FO-69 and FO-70 were not operating, but their 2m and 70cm beacons were being transmitted.

❖ (AO-70) (AubieSat-1)

AubieSat-1 (AS-1) is an undergraduate-built CubeSat satellite developed by Auburn University in Alabama (USA). It was successfully launched into a somewhat elliptical 816 X 458 km Orbit from Vandenberg AFB, California on October 28, 2011.

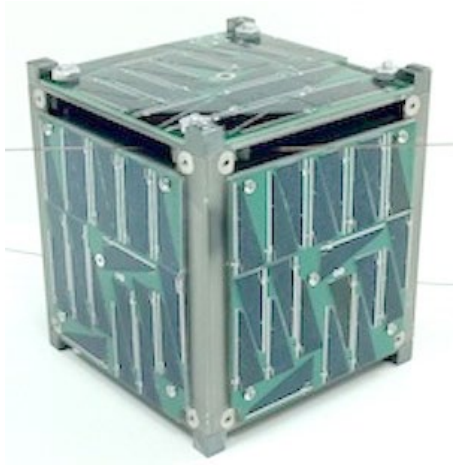
Fastrak 1 and 2 were successfully launched by a Minotaur launch vehicle from the Kodiak Launch Complex in Alaska on November 20, 2010. They became FO-69 and FO-70 when they were activated on orbit. (Courtesy: University of Texas at Austin)

AubieSat-1 transmits with a power of about 800 milliwatts on a downlink frequency of 437.475 MHz. The beacon signal, along with telemetry, is sent using continuous wave (CW) Morse code at about 20 words per minute. More information on the status of AO-70 can be found at: **www.space.auburn.edu.**

These are just a few of the current "flock" of small satellites that are now in orbit and available for you to hear (or, if properly licensed, to actually talk through). However, there are many more satellites that have been recently launched than I have room to list here. An excellent chronological outline of all of our amateur satellites (listed by launch date along with their current operational status) can always be found on the AMSAT Web site at**: www.amsat.org/amsat-new/satellites/history.php.**

❖ Project FOX Update

In my February *MT* column, I introduced you to AMSAT-North America's next big project…a Cubesat design we call "FOX." Then, in my May column, I reported that the first satellite in this series (FOX-1) had recently been selected by NASA for one of their reduced cost ElaNa launches (Educational Launch of Nanosatellites program) in the 2013-2014 time frame.



The flight model of AubieSat (AO-71). (Courtesy: Auburn University)

Since that announcement, FOX experimenters completed an extensive Preliminary Design Review (PDR) of the entire project. During the PDR, all mechanical, RF, control, power, and related designs and issues were extensively discussed. The current status of the project was also evaluated, and the need for further development for various systems and subsystems was refined. AMSAT's Vice President for Engineering Tony Monteiro, AA2TX, characterized the review as, "Very productive."

AMSAT is now working with NASA on a detailed collaborative agreement for the launch of the satellite. It is also important to note that FOX-1 was selected to participate in the NASA ELaNa effort based on its merit in support of NASA's strategic and educational goals. Clearly, this recognition places AMSAT in a very good position to garner future launches for its satellites under the ElaNA program.

AMSAT's Fox-1 project timeline is based on an anticipated launch for the satellite in the second half of 2013. However, NASA will determine on which specific flight each of the Project ELaNa CubeSats is carried to orbit. So, the launch timeline for FOX-1 could very well slip…or be accelerated… depending on NASA's other launch needs. In the interim, the latest on FOX-1's status can be found on the FOX-1 Web page at: **www.amsat.org/amsat-new/fox/.**

❖ Looking Ahead

That's all for this time. Clearly, it's a very exciting time for amateur radio in space. In future columns, I'll bring you up-to-date on the progress of the FOX-1 effort as well as the status of some of our other amateur satellites still in orbit. I'll also highlight some exciting amateur satellite projects that are now on AMSAT's drawing boards. See you then!

SELECTED FREQUENCY AND MODE DATA

SATELLITE	Uplink (MHz)	Downlink (MHz)	Mode
PW-Sat	435.020	145.900	FM / DSB
DO-64 (Delfi-C3)		145.870	CW Telemetry Beacon
Fastrac-1 (FO-69)	145.980 145.825	437.435	9600 and 1200 Baud AX.25 Packet
Fastrac-2 (FO-70)	435.025 437.435	145. 825	9600 and 1200 Baud AX.25 Packet
AubieSat-1 (AO-71)		437.475	1200 Baud AX.25 CW Beacon (20 WPM)

A Camping DXpedition - Part 2

Photos and Story by David Payne Sr.

If you look at radio project magazines from the 1920s, you'll see that people took their radios everywhere. For any outdoors activity you could possible imagine, people figured out a way to take these early radios with them. Among the most memorable to me was a project for installing a crystal radio on a bicycle – one wonders how it could be ridden with that bulky, homemade radio on the handlebars – and another for enjoying radio in a small sailboat. The sailboat mast served as means to erect a vertical antenna, while a ground wire trailed underwater behind the boat.

There's no reason we can't do that today. In fact, it's far easier for us. We have radios capable of amplifying sound, so you don't need to drag along a bulky set of high-impedance headphones. Our radios are also capable of amplifying signal, negating the need for stringing up a great deal of wire – although you surely can if you want to.

You don't necessarily have to go on an overnight trek to enjoy your radio out-of-doors, nor do you have to use a cumbersome antenna to enjoy the experience. Even a simple trip to a park with a portable radio can get you away from RFI and offer a vastly improved listening experience.

When I was a young man, I worked for a city park which was located atop a very high hill. I traveled from park shelter to park shelter throughout the day, stopping at each for an hour or two to pick up trash, clean the restrooms and hose off the concrete surfaces. And, I listened to shortwave while I worked.

My setup was very basic – and it had to be because I couldn't be erecting and taking down nice, big antennas several times a days on the city clock. I had a Radio Shack DX-360 portable. It was the perfect radio for the task, only 10-inches long with 9-band coverage. For an antenna, I had a piece of small-gauge wire about 20 feet long with an insulator and rope on one end and an alligator clip on the other. I simply set the radio on a picnic table, attached the alligator clip to the antenna, and tied the other antenna end to one of the support posts at whichever shelter I happened to be working.

Even though it was in the middle of the day – as well as the middle of the summer – I enjoyed great reception. Radio Netherlands, in fact, sounded as strong as a local AM station and it was while working there that I heard my name on radio for the first time – a letter read on-air by Radio Netherlands.

❖ Choosing your antenna

In most camping experiences, you'll be liberated from the antenna constraints of home. Unless there is some special rule prohibiting it, you can temporarily install basically any antenna design you want. If you bring plenty of rope, insulators, wire, and a couple of copper rods, you can erect any antenna imaginable. Last month, I discussed a fan longwire I had built for camping. There are, however, many other options.

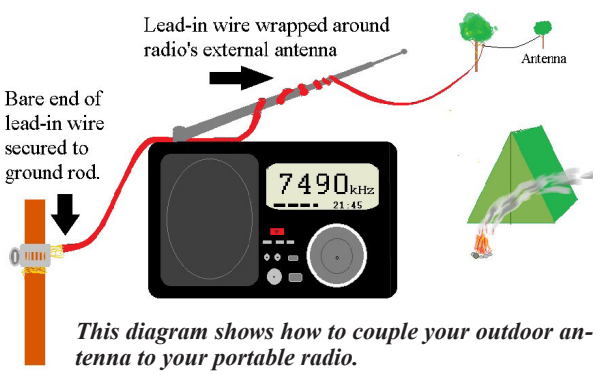
The camping antenna that is most exciting to me is the Beverage antenna. A typical Beverage is a single wire one or two wavelengths long. A resistor connected to a ground rod terminates the end of the antenna pointed at the target area.

This is a very simplified version of it, but the Beverage works like this: on a typical end-fed longwire, signals coming from behind the feedpoint first travel all the way down to the other end of the antenna. Once it reaches the other end, it's reflected back. The beverage is directional, because most of the signal coming from the rear is sent to ground instead of being reflected back.

In the AM band, a one-wavelength Beverage could be more than 1,000 feet, but for a shortwave band, such as 31 meters, your one-wavelength antenna would be around 100 feet.

To construct this antenna, you'll need one end terminated at an insulator – with a feed line for your radio coming off of it – and the other end terminated with a clamp that you can attach to a ground rod. Between the end of the antenna and the ground clamp, solder in a 470-ohm resistor – you could try using different resistor values to see what works for your soil.

When you add the resistor, your soldering joint may not be able to hold the weight of antenna, so you'll need to relieve some of that stress. One way is to make a small loop of wire at the resistor's location and hold it together with a zip tie so that when the antenna's own weight pulls upon it, the resistor is safely tucked away in the loop. As long as the loop doesn't slip, there will be little tension force on your resistor's solder joints.



This diagram shows how to couple your outdoor antenna to your portable radio.

Before you go, attach the clamp to the ground rod and check to make sure there is conductivity between the antenna and ground rod. If nothing else works, one temporary – and easy – grounding solution I've found is simply wrapping a long section of bare wire around the copper rod and holding it securely with a common hose clamp.

One benefit of this antenna is that it's not something you'll need to hoist into the trees. In fact, it should be only a few feet above the ground to work properly. However, it can be a very serious trip hazard if installed too low, so it would be more suited for installing in remote areas. Even so, I would try to keep it at least 8 feet from the ground at its lowest points. Even if you know it's there, it can be very easy to stumble into during darkness.

Make sure it's pointed where you need it! The Beverage is a highly-directional antenna, but because of its length – and you will surely have to work it around obstacles in a forested area – it will be cumbersome to adjust. So make sure it's pointed in the right location. Use a compass to get your bearings, which you should obtain from an azimuthal map centered on your location.

If your location doesn't have room for a long antenna, you can still get plenty of wire in the air by going horizontal *and* vertical with a delta or quad loop configuration. Since your radio will be receive-only, you have a great deal more freedom in how your antenna is configured.

It would be nice to have an impedance-matching transformer and 50-ohm coax line to couple your radio to this antenna, but that's not always an option with portable radios. If you have external antenna and ground jacks, you can still use coax – and have one end of your loop going to the coax shielding and the other to the center conductor. This should still work nicely even if you don't have a variable capacitor or two to tune your loop.

If your radio doesn't have those jacks, you can still connect it by wrapping insulated feed wire around the telescopic antenna of your radio and terminating that feed wire to a second ground.

❖ Snaking your antenna around obstacles

Sure, the closest distance between two points is a straight line, but if you are camping in a forested area, you probably won't find many straight-line opportunities. This is a major reason why I like insulated wire for these antennas. You can run them over brush, on top of rocks – anywhere – just be mindful of the tripping hazard. You certainly don't want anyone passing through to trip and get hurt on your antenna.

You can also use additional ropes run over tree branches to pull your antenna from the sides to help get around obstacles, such as other trees in your way, if a perfect straight line isn't available. Keep in mind, the more complex your antenna plans are, the longer it will take to install and remove your antenna. It would, after all, be nice to have some time to listen to your radio.

❖ Setting up your radio and ground

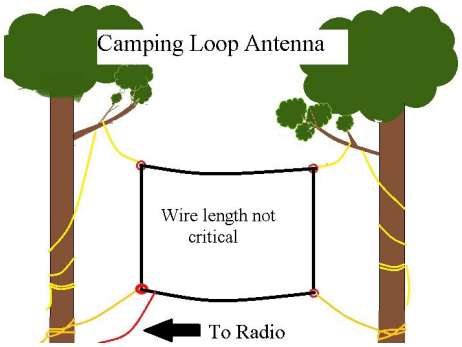
Regardless of what antenna you create, you'll need to get that signal to your radio. If you're taking a portable – and these two articles have assume that you were – that has external antenna and ground jacks, that's wonderful. Keep in mind that those portables were designed to use very small, inefficient antennas, not these large, resonant, super-awesome antennas we're talking about here, and the front-end mixer of your radio will likely see some severe signal overload. You can install a resistor on the feed line between the antenna and the radio. I have no idea what resistor to suggest, as the needed value will vary, but you could install a potentiometer to adjust resistance.

You could also eliminate the mechanical connection by running piece of insulated wire from the antenna jack and wrapping it around the feed line (which would be connected to ground). This is technically very similar to what seems to me the easiest method of joining the antenna to the radio, simply wrapping insulated feed line – which should go directly to ground – around the radio's telescopic antenna.

Every antenna *always* needs a good ground. For a temperate climate, I would recommend a piece of copper rod about three feet long that you can drive into the ground. I think anything longer is a bit cumbersome for a temporary setup. You could devote a great deal of time learning about the resistance values of various soils, but the damper the soil the better. Check your ground with the positive lead of your meter – which you should definitely bring along – to make sure current is flowing to ground. If current isn't flowing freely – or at all – you can try pouring some water on the soil around your ground rod and check again. If the soil is very dry, you may also need to add water later.

❖ Modifying your AM radio for external antenna

As mentioned earlier in the Beverage section, this may present a perfect opportunity for erecting extremely long – although temporary – antennas, and that's great news if you enjoy medium-wave DX. This would be especially true for AM DXing.



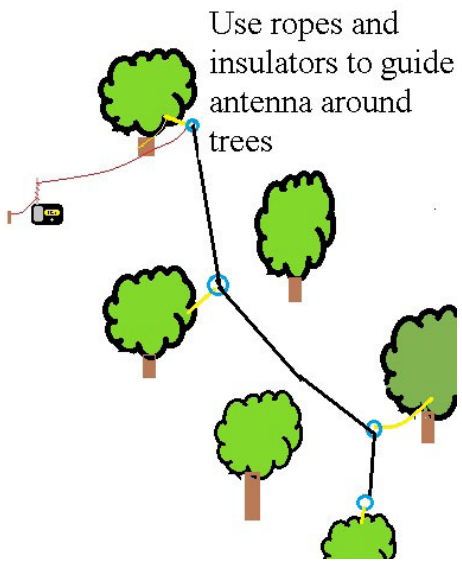
You can use two trees to create a loop antenna like this one.

One time-tested way of improving AM reception is simply by placing a radio with an internal ferrite AM antenna within the magnetic field of another antenna. Yes, that can improve reception, but you don't have to settle for that. You have the power to bring your own magnetic field inside the radio.

You can make this modification on virtually any AM radio (if you plan to modify a nice radio, you may want to practice this modification on a cheap one). I have a newer wood-case Crosley radio, to which I've attached a tunable loop antenna with great results. All you need is access to the internal ferrite antenna inside and a little bit of very, very small gauge wire. You can make this modification as fancy or as basic as you want. You may want to drill a small hole in the radio cabinet and install a proper jack for your external antenna, but I've got two such modified radios that just have wires sticking out and they work fine.

I've had good results with just wrapping a few turns of 22-gauge enamel-coated magnet wire around the ferrite antenna itself. Obviously, you'll want to be careful you don't short out anything inside as you do this. Magnet wire works well for this because it's so thin that it's easy to work it around the ferrite antenna without removing the internal antenna from the radio.

One end of the magnet wire (remember, you have to scrape off the enamel to make a connection) should be soldered to the antenna itself and the other end should be soldered to ground. It doesn't matter which end goes where, just as long as one goes to the antenna and one to ground.

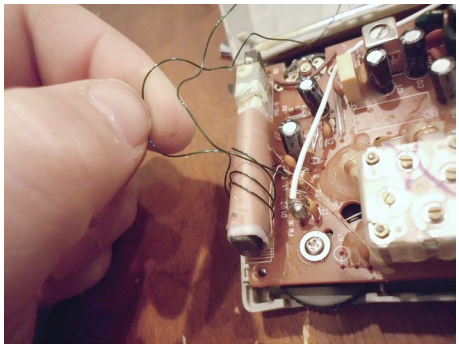


If you are unable to run a straight length of wire, you can use extra ropes and insulators to pull the antenna around obstacles.

You can overload your medium-wave radio just like your shortwave radio. If you are using a MW resonant antenna, you may want to consider installing a potentiometer or some other sort of resistor between the antenna and the radio.

Speaking of 22-gauge enamel-coated magnet wire, I replaced the wire from my window-loop antenna (as discussed in the Stealth SWL column a few issues back) with magnet wire. Now, I've got about 200 hundred feet of wire in the window and it's harder to see than ever. As a receiving antenna, it's worked great.

Contact David Payne Sr. via e-mail at *dave@elkriverharmonicas.com*.



You can hook up an external antenna to your AM radio by simply wrapping a few turns of enamel-coated magnet wire around the internal ferrite antenna. Connect one end of this wire to your antenna and the other to ground.

Bonito 1102S RadioJet Shortwave Receiver

By Bob Grove, W8JHD

Bonito has released a new shortwave receiver – the RadioJet 1102S – that combines an innovative design with the advantages of modern computer technology.

The tiny size of this electronic package belies its potential. With a frequency range of 40 kHz to 30 MHz, a sensitivity of 0.03 microvolts (-137 dBm), and an intermodulation figure (IP3) of +29 dB, this computer-hosted analog receiver has a lot going for it.

Receivable modes and decoders include LSB, USB, CW, AM, FM, and stereo DRM. Fine tuning adjustability is 1 Hz. A combination of noise reduction and squelch massage reception without the irritation of background interference.

A spectrum display reveals all signals in real time on a swath up to 24 kHz wide, maintaining linearity for 16 kHz (some roll-off is seen from 16-24 kHz). The baseline screen presentation is quite smooth with its 48 kHz sampling rate.

Since this is an up-conversion receiver with some analog circuitry, occasional "birdies" (oscillator/mixer image products) will appear as phantom signals in the receiver's tuning range. These are easy to identify on the spectrum display since their spikes will move in the opposite direction of legitimate signals.

The system is designed to work best with a PC running Windows 7 or XP, interconnected by a USB 2.0 cable. As with any other computer-dependent application, the faster the computer, the better the program will run.

Since the 1102S is powered through the USB connection, no power supply is required. A BNC connector is provided for the antenna port. Surge-protection diodes are installed on both inputs. A CD is included to off-load the software from the computer.

After the installation, which requires registration information, a small window pops up showing successful activation, followed by the operating control window with the spectrum display.

The display may be contoured to fit four different screen formats – net book, small monitor, notebook, and standard desktop PC.

As illustrated by the accompanying photos, the screen is a busy place with an extremely flexible selection of control functions, including your choice of six different pallets of color (with additional custom selections as well).

What's in the Box?

The following items are included as part of the 1102S package.

- 1 x Bonito RadioJet 1102S
- 1 x Bonito RadioJet Software in selected Version
- Short instructions
- Online Manual

Integrated Frequency List

For shortwave listeners, the 1102S is an SWL's dream. After your general preferences are set up and you don't really care to see tech specs any longer, just click the arrow next to the truncated frequency list and it expands to nearly a full page. Stations currently scheduled for your time are highlighted in red; just double-click and you're there.

While Digital Radio Mondiale (DRM) is a cost option for many receivers, it's included in the 1102S decoder package. Double clicking on the red-highlighted listing for the current time, within three seconds the DRM signal synchronizes, presenting high-fidelity, noise-free reception – if the broadcast is currently using DRM.

The large frequency list is useful to the shortwave broadcast listener and the utilities hunter. It shows such details as frequency, mode, name, time schedule, language, location, call sign, and use. On the spectrum display, the user may choose to present visual station identifiers right on their frequency locations. The list is Internet-updated free of charge on a regular basis.

At the top of the listings is a chart providing additional station information not found in the listing lines.

Hams will appreciate the instant spectrum switching through the HF bands, 160-10 meters as well as the emerging135 kHz LF band, with automatic mode changing to the dominant voice sideband (LSB, USB) for each band as applicable.

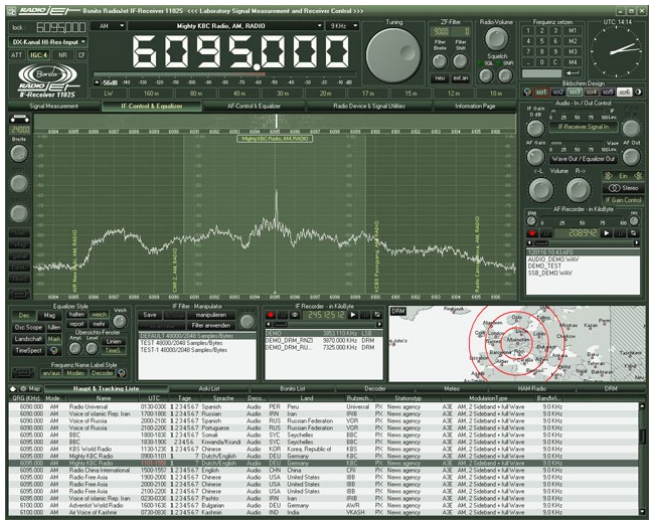
Although the list is admittedly Europe-oriented (the 1102S is made in Germany), you can custom-edit it with your own revisions and entries.

A global map may be brought up showing the locations of stations worldwide. As each frequency/station highlighted is double-clicked on the list, the corresponding map location highlights in red. A single click allows precise readout of latitude and longitude anywhere the cursor is placed. Zoom allows extreme magnification for accuracy.

Memory

Using your computer, you can record the entire 24 kHz spectrum like the spooks do ("pre-detection recording") and listen to it later as if it were in real time, invoking all the functions of the receiver to process the signal for whatever time length was recorded.

Additionally, you can associate custom filter settings with specific frequencies in the list. Thus, when you click on that listing later, the special settings will apply.



Single-Signal Slicing

Your computer mouse cursor can manipulate selectivity, IF shift, passband tuning, notch, and many other signal-processing functions. The mouse can be used to draw a series of notches with 2 Hz resolution to suppress unwanted interfering signals within the passband of the desired signal.

IF filtering bandwidth is continually adjustable from 100 Hz to 24 kHz, and can be shifted +/- 5 kHz either side of center frequency. An additional 16 kHz crystal roofing filter assists in selectivity.

C. Crane Twin Coil Ferrite™ AM Antenna

By Bob Grove, W8JHD

Circuit Architecture And Technical Specifications

All specifications are subject to change without notice.

Software for Windows 7, Vista, and XP
PC-Connection and Driver installation: USB 2.0
Input Sound Samples: 48000 at 2x16 bit resolution
Output Sound Samples: 24000 at 2x16 bit resolution
Left Channel: DX-Channel +30 dB for real 48 dB in high resolution
Right Channel: RX-Channel real -137 dBm (0.03μV) in 16-bit resolution
Automatic channel selection: RX/DX real 144dB in 24-Bit Resolution
A/D Converter: 2 x 16 Bit cascaded to 24-Bit high resolution
Mixer Dynamic Range: -16 to +45 dB
Technical Demodulation method: Real sampling (No I/Q-Complex)
Demodulation Modes: LSB, USB, CW, AM, FM, Stereo-DRM
IF-Filter: Variable 100-24000 Hz at +/- 5 KHz Shift
IF-Equalizer: Manually (mouse) adjusted filter for Notch and Bandpass
IF-Recorder: Record and Playback 24 KHz / 48000 Samples
IF-Spectrum Analyzer: 24 KHz / 160 dB with 3D-LandScape and Time Spectrum
Power consumption: 220 mA max., USB-Powered
Size/weight: 4"W x 1-1/4"H x 3-1/2"D, 7 oz.
Reception Method: Active Mixer 45.012 MHz + VFO; no AGC
Frequency range: 9 KHz – 30 MHz in 1 Hz Steps
IF-Band width: 24 KHz
IF-Filter: 15 KHz (- 3dB) crystal filter
Image rejection: >90dB / 1.IF (LO + 45MHz) >70dB / 2.IF (In-Band -24KHz)
Dynamic range: ~96.32 dB real = () =~136.22 dB by "Squaring the circle"
Noise floor (0.15-30MHz/2.3KHz BW): -137dBm (.03μV) -122 dBm (.18μV)
Linear processing level (0.15-30MHz/2.3KHz BW): -40 dBm -15 dBm
Intercept Point (IP3): (7.00 & 7.20MHz) +14 dBm +29dBm

In order to maintain measurement linearity, the receiver does not have automatic gain control (AGC), so to prevent front-end overload, a step-adjustable preamplifier/attenuator can adjust signal gain from -16 to +45 dB. Selection of the signal-level-dependent attenuator can automatically switch the process on or off.

A 144 dB scaled signal is channelized to prevent an adjacent 40 dB-stronger signal from suppressing the weaker signal, enhancing DX reception. Depending on the pre-amplification chosen, the 1102S has 96-136 dB dynamic range.

❖ The Bottom Line

Getting used to the myriad controls, some with unfamiliar legends, will take some time, but properly adjusted, this receiver offers outstanding performance. Down-loadable updates for this new product are available free of charge from the manufacturer on a regular basis.

The Bonito RadioJet 1102S is available for $699.95 plus shipping from Grove Enterprises.

Options and accessories available at additional cost:

Decoding software (for RTTY, CW, PSK, SSTV, FAX and time signals)
Transmitter control and encoder software (for modes listed above)
Combination transceiver control and encoder/decoder (for modes listed above)
Project 7 RadioCom receiver/transmitter
Weather receiving software (NAVTEX, RTTY, Synopsis)
USB connected tuning wheel
16 or 32 ft. USB extension cords
Mounting bracket

Even though some listening hobbyists would say that AM radio is an anachronism, there are still enough folks listening to the 530-1700 kHz broadcast band to justify new product development.

The traditional approach to enhancing medium frequency reception without using an outdoor aerial is by using a loop antenna. These can be large or small, and either an open winding of wire or a smaller ferrite rod loop. Some are amplified (active) and some are not (passive).

One of the most successful loops was the Select-a-Tenna. Roughly a foot in diameter, it could be plugged into the external antenna socket of a radio, or simply placed in close proximity to the radio in order to "focus" the desired signal to the radio's internal antenna. Although an excellent product, it is no longer manufactured.

So what makes the C. Crane AM antenna different? It is amplified and has several separate components. Its antenna may be mounted inside or outdoors (which may require ordering an extension cable in 25 or 50 foot lengths).

The amplified tuner may be powered by the AC wall adapter (included) or a nine volt battery (not included). It will work with radios with or without an external antenna jack.

❖ Radios without an External Antenna Jack

Since portable radios have internal AM antennas, the C. Crane loop must be inductively coupled to the internal antenna. This is done by pressing a ferrite coupling device to the cabinet of the radio close to the internal antenna.

The tuner control is set conveniently near the radio so that it can be adjusted by the listener. The antenna element is placed anywhere in a six foot radius that it picks up signals best with minimum environmental electrical noise.

❖ Radios with an External Antenna Jack

If your radio receiver is equipped with an RCA phono jack to accommodate an external antenna, or separate antenna and ground terminals as found on most home entertainment stereo receivers, cabling and an adapter are provided to make that interconnection. No provision is made for radios with a 1/8 inch phone jack or SO-239 antenna connections. These adapters would have to be provided by the user.

❖ Setting it up

After the separate modules are interconnected (you can't mismatch connections) a weak signal is selected on the radio – the more barely readable, the better. With the ferrite probe set on the portable radio top, the tuner is then switched on.

Slowly rotating the large concentric knob, an increase in signal should be heard at one setting; the inner, smaller tuning knob is then adjusted for fine tuning.

The ferrite probe is move around the radio to find the "sweet spot" of strongest signal coupling, and then the antenna element is positioned the greatest increase in incoming signal strength.

❖ Let's try it out

I decided to try a worst-case scenario. Using an over-the-counter AM pocket radio with the ferrite probe against the top of the case, I randomly selected stations that were barely above the background hiss.

In each case the C. Crane loop brought the signal up to 100 percent intelligibility. It must be pointed out that tuning is quite sharp, and although there is backlash in the main tuning dial, it is easily resolved by adjusting the fine tuning knob.

Success is dependent upon location and orientation of the main antenna element. If it's close to interference-generating appliances or wiring, then it's going to amplify that noise. But with the antenna free and clear of noxious noise producers, and its position favoring desired incoming signals, the ferrite loop antenna will provide substantial signal improvement over the radio's internal antenna.

Twin Coil Ferrite AM Antenna, $99.95 from Grove Enterprises and some *MT* advertisers and from C. Crane, 1001 Main St., Fortuna, CA. Website: **www.ccrane.com**, Email *rreynoza@ccrane.com*; Phone (707) 725-9000.

What's NEW

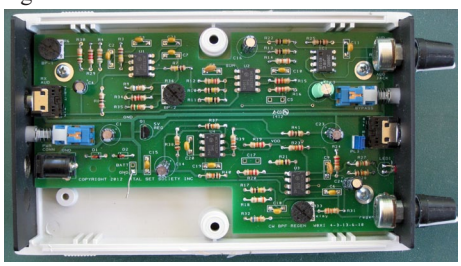
Tell them you saw it in Monitoring Times

Larry Van Horn, New Products Editor

New Kit and Book Released by the Xtal Set Society

The Xtal Set Society (**www.midnightscience.com**) has a new kit available – the CW Regen Filter Kit, Alias: "The Scrubber."

This kit was inspired by the inhibiting galactic noise encountered when listening to HF CW. Many proficient CW operators turn the AF gain full on and manage the audio signal and noise with internal rig filters and the RF gain knob. Even with these techniques, band-limited cosmic static is present along with man-made noise. There isn't much one can do to copy CW notes that are simply too weak; but, one can scrub away a portion of the static that makes its way into our consciousness with an audio regenerative filter.



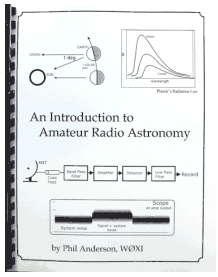
For example, when tuned to a quiet spot on 30-meters with the regen filter engaged, the regen's output shows a reduction in noise compared to the signal at the phone jack of the receiver. In bypass mode one simply listens to what the rig has to offer. In scrubber mode, the multiple-feed-back filters and regen work together to remove a majority of the remaining white noise. The processed signal sounds clean with a slight echo-chamber quality. For most this is an improvement and may reduce stress and improve copy. For more details, see the Society's website.

For experienced kit makers, assembly and alignment is about two hours. You'll need a meter or scope to align the filters and the audio delay line. In addition, you'll supply the connectors and cabling for your specific radio and the following tools and supplies: pliers, cutters, knife or wire stripper, soldering iron and solder, masking tape and your enthusiasm! The filter can be supplied with a well regulated and grounded 13.8 VDC supply or one or two 9-volt batteries. A well grounded station is necessary when external high gain audio-based accessories are added to prevent or substantially reduce any "ground loop" interference.

You can purchase the kit in three ways: PCB and 18-page manual only – Cat# XSCWPCB, $29.95; full kit with parts, but without case – Cat# XSCWNC, $49.95; or full kit with case – Cat# XSCW, $69.95. The populated PCB fits in a plastic case that is 3.7 inches wide. 1.45 inches height, and 6.1 inches in length.

Phil Anderson, WØXI, at the Xtal Set Society has also released a new book – *An Introduction to Amateur Radio Astronomy*.

The basics of crystal sets and radio telescopes have much in common. Phil has written a series of beginner articles on radio astronomy, that culminated in a presentation at Ozarkcon 2012 (4SQRP), last April 14th, in Branson, Missouri.



The articles in this new book include: An Introduction to Radio Astronomy summarizing Grote Reber's work, Earth and Sky Coordinate Systems, Basics For Our First Radio Telescope, Noise and A Tuned Radio Frequency Telescope, The Square Law Detector, The DC-Amplifier, and Summing Up.

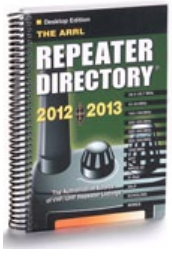
This 50 page print book is CAT# XSRA and sells for $9.95.

Orders for both the items above may be placed by phone (405-517-7347) or via their website at **www.midnightscience.com/html**, The Xtal Set Society, Inc., PO BOX 3636, Lawrence, KS, 66046

The ARRL Repeater Directory® – 2012/2013 Edition

The best directory of frequencies for amateur radio repeaters around the country is now better than ever. It now includes D-Star and APCO-25, references for operating practices, emergency message handling, tips for handling interference and more. It also includes guidelines for severe weather reporting to SKYWARN nets and the National Weather Service.

In print there are two different editions including a pocket-sized edition, perfect for mobile operations (3.75 by 5.25 inches), and a 640 page desktop edition (6 by 9 inches and spiral bound). Both editions have 21800 plus listings for VHF/UHF repeaters across the US and Canada and have the following features:



- Repeater operating practices, repeater lingo and hints for newly licensed hams.
- Frequency coordinator contact information.
- VHF/UHF Band Plans and 2-meter channel-spacing map
- Amateur Television (ATV), D-Star and APCO 25 repeaters
- CTCSS tones and Digital Coded Squelch (DCS)
- IRLP, WIRES-II, and EchoLink® (Internet linked) nodes
- Repeater listings for 29.5-29.7; 51-54; 144-148; 222-225; 420-450; 902-928; and 1240 MHz and above.
- Emergency message handling procedures (ARRL Radiogram, Numbered Radiograms, and ICS0213 General Message Form)
- Tips for handling interference
- Transceiver memory log
- Handy indexing tabs on the cover to aid finding the listings you're looking for.
- Easy-to-read listings.
- Key to repeater notes located right up front.
- Icons make it easy to identify "Open" or limited access repeater systems.

The third format for this annual publication is available – CD-ROM. The TravelPlus CD-ROM with a bonus Repeater Directory, Version 16.0, is a power packed CD for hams who use electronic publications.

With TravelPlus for Repeaters™, you have the power of The ARRL Repeater Directory on your computer. With TravelPlus for Repeaters as your traveling companion, you'll never be alone on the road. Locate ham radio repeaters along US and Canadian travel routes using this map-based software package.

This feature-packed CD-ROM includes the following features:

- Map your travel route and tune in. Supports GPS with separate external hardware (cable and adapter purchased separately and not supplied with TravelPlus).
- View and print maps and repeater lists.
- Access The ARRL Repeater DataBase, global Internet linked nodes, AM/FM radio, broadcast television, and NOAA weather stations, USA and Canadian licenses, and ham radio points of interest.
- Export data. Transfer to Palm or Pocket PC, radio programming software, and more.

This CD requires Microsoft Windows™ XP, Vista or Windows 7, and a Pentium or comparable processor (recommended for 32-bit systems only), and a CD-ROM. 16 MB of RAM (32 MB or more recommended). Hard disk with at least 50 MB free (run from CD-ROM) or 260 MB free (run from hard drive). 640 x 480, High Color (16 bit) graphics supported.

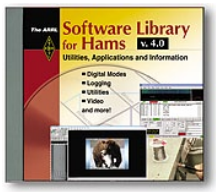
The 768 page pocket-sized book (ARRL #5347) costs $12.95, and the Desktop edition (ARRL #5485) sells for $17.95 plus shipping. The TravelPlus for Repeaters CD-ROM. (ARRL #4678) retails for $39.95 plus shipping.

If you have previously purchased a TravelPlus CD, there is a discount available. Just cut out the Proof of Purchase from the booklet included with your previous edition CD, and return it with your order for this new 2012-2013 edition by mail to the ARRL only. Please specify ARRL Order #4678U, and include $19.95 plus $2.75 shipping with your order.

The ARRL Software Library for Hams

If you are interested in ham radio software for your computer and do not have time to surf the net looking for it, then check out the ARRL

Software Library for Hams. This library is available in two versions – on CD and via Internet download. This library gives you quick access to ham utilities, applications and information. In several categories:



- Videos
- Image Editor
- DX Cluster client software (CC USER)
- Software Defined Radio
- HF digital software for PSK31, MFSK16, MT63, RTTY and JT65
- WSJT software for meteor scatter and moonbounce and more!

The content on versions is divided into folders which contain software for a variety of ham radio applications. You'll find handy software tools for decoding CW, creating custom DSP audio filters, and more. Bonus files include ARRL screensavers, audio samples and PowerPoint presentations.

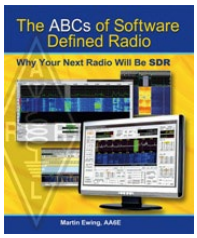
Minimum System Requirements: A 1 GHz Pentium with 1 GB of RAM and Microsoft® Windows® XP or Windows Vista/7. A sound card is required to listen to sound samples or use the sound-card-based digital communication software. Includes the free Microsoft® PowerPoint® viewer.

Both products (CD ARRL #4364 and Download (ARRL #4364D) sell for $19.95.

The ABCs of Software Defined Radio

Amateur Radio operators and radio listening enthusiast are finding themselves incorporating Software Defined Radio – the latest big step in radio communications – into their operational activities.

From low-end QRP rigs to this month's *First Look* review of the Bonito RadioJet 1102S receiver to the most powerful radios (i.e., WinRadio and FlexRadio Systems®), they're all using SDR technology.



The ABC's of Software Defined Radio, written by Martin Ewing, AA6E, is an introductory guide to SDR and Digital Signal Processing (DSP) technologies. Written in a friendly style, it offers a straightforward look inside SDR and provides a foundation for those who want to understand the subject on a more fundamental level. As you read, you'll discover the basic principles of SDR, advantages to SDR technology, and ways to utilize it in radio listening operations … all with a minimum of mathematics!

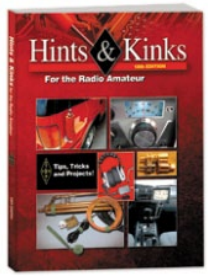
Contents of this book include:

- It's a New World!
- The Meaning of "Digital"
- Real-World Software Defined Radio
- Computers and Software for SDR
- Using SDR
- Coming to a Shack Near You and much more

This 64 page soft cover book (ARRL #6320) sells for $22.95.

Hints and Kinks for the Radio Amateur

QST's monthly *Hints & Kinks* column is one of the most popular sections of the magazine – and it's easy to see why. If you're in the mood for an evening or weekend project, you'll find it in *Hints & Kinks*. If you're looking for a solution to a problem, chances are you'll find it there as well.



The 18th edition of *Hints and Kinks for the Radio Amateur* gathers the best projects and problem-solving tips spanning eight years from 2004 through 2011. It's more than 170 pages of practical information you can use every day.

Some of the contents include:

- Equipment Tips and Mods
- Batteries and Other Power Sources
- Mobile and Portable Stations
- Software and Computers
- Troubleshooting/Test Gear
- Restoration
- Construction/Maintenance
- Antenna Systems
- Operating
- Around the Shack
- Interference (RFI/EMI)

The soft-cover 192-page book (ARRL #5200) sells for $19.95. These fine ARRL amateur publications mentioned above are all available from the ARRL website (**www.arrl.org**), via their toll free order line at 1-888-277-5289 9 (8 a.m. to 5 p.m. Monday through Friday, except holidays), or snail mail to ARRL, 225 Main Street, Newington, CT 06111-1494. You should also check your local amateur radio dealer or selected *Monitoring Times* advertisers for these and other ARRL publications.

DX Engineering Tilt Base

The new DX Engineering Tilt Base mounting plate enables you to raise or lower a vertical antenna in seconds while leaving the base securely attached to the mounting post. With the Tilt Base, one person can easily service an antenna – no more climbing ladders, or removing brackets from a support post.

Precision cut from 3/16 inch 304 Stainless Steel, this mounting plate is virtually indestructible. This tilt base conveniently mounts to the same pipe that you use for the antenna and radial plate.

Repair, tune, or lay your antenna down before bad weather hits with a DX Engineering Tilt Base. Models include:

- DXE-TB-3P for Hustler BTV
- DXE-TB-4P for Tilt Base Kit for ground mounted 1/4 wave vertical antennas, including most Butternut, GAP, Hy-Gain & DXE Verticals. (Model Restrictions apply)
- DXE-TB-6P for Hy-Gain 14AVQ, 18AVQII

Not sure whether your 1/4 wave vertical is compatible with the Tilt Base? Contact DX Engineering's technical support for advice.

The Tilt Base mounting plates sell from $62.50 to $87.50 (V-clamps for pipe mounting not included). Optional wing nut knobs available for tool-less quick release, $7.95/ pair. For more information or to order, visit **www.dxengineering.com**.

Pacific Radio Listener Guides

The Radio Heritage Foundation has released their latest version of the PAL Radio Guides covering all AM [mediumwave] radio stations across the Asia and Pacific region, and it's now available from **www.radioheritage.com**.

The PAL Radio Guides list all known AM and SW radio stations operating in the region with detailed station data such as operating times, languages, location, and much more across many thousands of individual stations.

The very latest medium wave [AM] version can be downloaded for free from the Radio Heritage Foundation website (above).

The PAL Radio Guides are compiled in Seattle, Washington, by their editor-in-chief Bruce Portzer from monitoring reports, official sources and feedback from listeners across the region.

Now you can search the two guides online by options such as location and frequency or download copies for your own personal use from the website. Access is free for non-commercial use.

Also available for free are these radio station guides:

- Australia Radio Guide covering AM, FM and Digital stations
- Pacific Travellers Guides including AM and FM stations in Melanesia, Micronesia and Polynesia
- New Zealand Low Power FM Radio Guide

Feedback, corrections and updates from users are always welcome and will be incorporated in future versions. Simply email your comments to *info@radioheritage.net*. Radio Heritage Foundation is a registered non-profit connecting popular culture, nostalgia and radio heritage. The foundation does accept online donation via PAYPAL to help keep their guides free.

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.

to the editors

editor@monitoringtimes.com

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

Happy monitoring!

Rachel Baughn, Editor

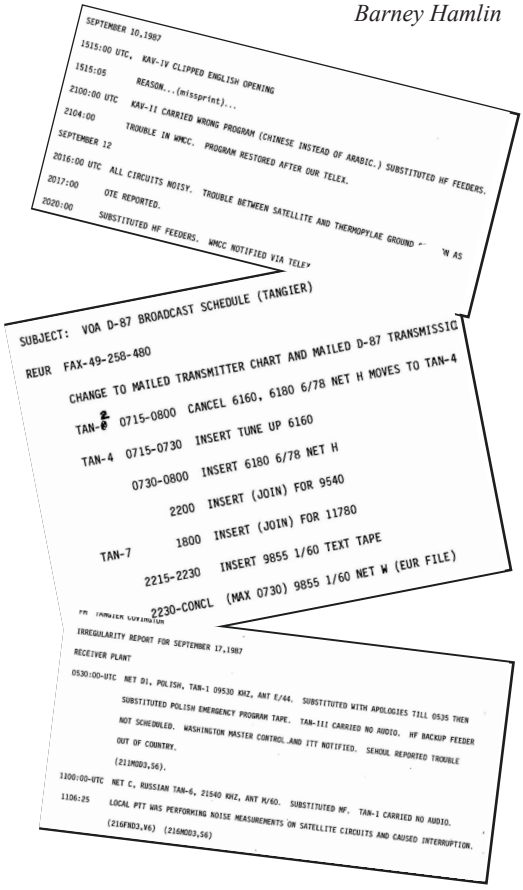
RTTY Memories of VOA

I thoroughly enjoyed the article on the VOA Greenville transmitter site in the April edition of *Monitoring Times*. I remember years ago when VOA was much more prominent and active. In 1987 I came across an interesting narrow shift RTTY signal. It took a moment to tune it in on my Infotech M600A (purchased from Grove Enterprises several years earlier). It turned out to be a frequency used by VOA Greenville and several relay sites in Europe and the Mediterranean. Most were messages sent from Greenville to these sites but some were being sent to Greenville. They consisted of program schedules, transmission problems, parts requests, etc.

I have included a few transcribed messages. Some as you can see concern the satellite feeds from Greenville to these relay sites. This was found on 15.717 MHz early in the mornings (Central Time - I lived in San Antonio, TX at the time.) Not exactly a strong signal, no telling how many times I had missed it in the past. I was using a Radio Shack DX-302, the M600A with a custom HF vertical.

Although I enjoy all of the digital modes and using an SDR today, I certainly had a lot of fun finding unusual signals like that with what would certainly be considered inferior equipment back then.

Barney Hamlin



SEPTEMBER 10,1987

1515:00 UTC, KAV-IV CLIPPED ENGLISH OPENING

1515:05 REASON...(missprint)...

2100:00 UTC KAV-II CARRIED WRONG PROGRAM (CHINESE INSTEAD OF ARABIC.) SUBSTITUTED HF FEEDERS.

2104:00 TROUBLE IN WMCC. PROGRAM RESTORED AFTER OUR TELEX.

SEPTEMBER 12

2016:00 UTC ALL CIRCUITS NOISY. TROUBLE BETWEEN SATELLITE AND THERMOPYLAE GROUND ... W AS

2017:00 OTE REPORTED.

2020:00 SUBSTITUTED HF FEEDERS. WMCC NOTIFIED VIA TELEX

SUBJECT: VOA D-87 BROADCAST SCHEDULE (TANGIER)

REUR FAX-49-258-480

CHANGE TO MAILED TRANSMITTER CHART AND MAILED D-87 TRANSMISSIC

TAN-2 0715-0800 CANCEL 6160, 6180 6/78 NET H MOVES TO TAN-4

TAN-4 0715-0730 INSERT TUNE UP 6160

0730-0800 INSERT 6180 6/78 NET H

2200 INSERT (JOIN) FOR 9540

TAN-7 1800 INSERT (JOIN) FOR 11780

2215-2230 INSERT 9855 1/60 TEXT TAPE

2230-CONCL (MAX 0730) 9855 1/60 NET W (EUR FILE)

IRREGULARITY REPORT FOR SEPTEMBER 17,1987

RECEIVER PLANT

0530:00-UTC NET D1, POLISH, TAN-1 09530 KHZ, ANT E/44. SUBSTITUTED WITH APOLOGIES TILL 0535 THEN SUBSTITUTED POLISH EMERGENCY PROGRAM TAPE. TAN-III CARRIED NO AUDIO. HF BACKUP FEEDER NOT SCHEDULED. WASHINGTON MASTER CONTROL AND ITT NOTIFIED. SEHOUL REPORTED TROUBLE OUT OF COUNTRY.

(21MOD3,S6).

1100:00-UTC NET C, RUSSIAN TAN-6, 21540 KHZ, ANT M/60. SUBSTITUTED HF. TAN-1 CARRIED NO AUDIO.

1106:25 LOCAL PTT WAS PERFORMING NOISE MEASUREMENTS ON SATELLITE CIRCUITS AND CAUSED INTERRUPTION.

(21GFND3,V6) (21GMOD3,S6)

Railroads and Districts

Ernest, my name is Ken Weindl and I live in Nebraska since January this year. I work for BNSF as an Electronic Technician, working with all the radios, telephones, the internal network, and the computers here. I am also an Amateur Extra Class ham radio operator, callsign N2VHZ.

Let me say that I used to subscribe to *MT* for many years but allowed the subscription lapse since I went overseas (Germany) to work for the Army as a civilian…I allowed my subscription to lapse because the magazine would not arrive in a timely manner via the Army Post Office (APO) and sometimes it would be as much as 2 months late!!!

Well anyway, since my wife and I have a permanent address now here in Nebraska, I decided to start the subscription up again. I was quite surprised to read in my first new issue the article about "Crawford Hill" and I am very familiar with that area, being that we maintain all of that (from South Dakota to Wyoming to Colorado to Broken Bow, Nebraska) communications equipment.

I copied the article and handed it out to my fellow Techs here at BNSF and they enjoyed it as much as I did!

Thank you and keep up the good work,
Kenneth Weindl

I have a question about monitoring railroad radio. I follow your columns in *Monitoring Times* and I have your book *The Basic Railfan Book* but I cannot find the answer to my question.

Do railroads use districts for radio communication control of railroad traffic similar to air traffic control centers?

While monitoring railroad radio in Massachusetts and Maine I hear base stations identifying themselves as District 1, District 2, etc. If such a system is used, is there a list of their locations and frequencies and what areas they cover?

John Rooney

I'll try to answer your question as best as I can, without knowing specific details about the railroads where you are located.

Larger railroads divide up their dispatching centers into dispatcher districts. These dispatcher districts / consoles may be identified by a name, letter combination, or number.

These districts overlap at their borders. So dispatchers will identify themselves with their district identifier and trains calling in will also often identify which dispatcher they want to talk to.

However, typically, all dispatchers are located at a common dispatching center and talk to trains through remote base stations that are connected to the center by landline, fiber optic cable, microwave, etc.

For example, where I live in NC, all the district dispatchers for NS are located in Greenville, SC.

You should be able to find something on the Internet by searching the name(s) of the railroad(s) in your area and "radio frequencies." I don't think there is any single national source of dispatcher districts, as these are up to the railroads and can be changed as needed. Adjoining districts may or may not use the same AAR channels.

For example, a railroad may use three different dispatchers to handle three different districts on busy days. However, during a slow holiday weekend, when few trains are operating, a single dispatcher may answer all calls from all three of those districts.

Much also depends on the type of train control system in use. If the line has CTC signals, a single dispatcher can handle a much larger territory than if a line uses track warrants which have to be issued by radio.

I hope that helps, Ernest Robl

RCA Model 86T-1

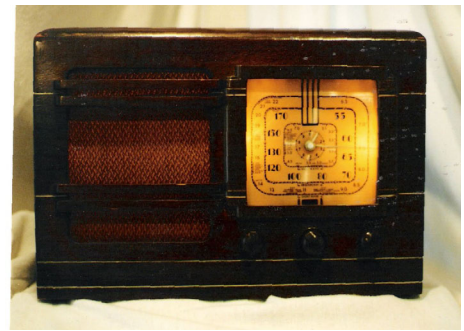
Hello, Ken,

Thanks for your many interesting articles in *Monitoring Times*. I am subscribed to the *MTXpress* edition, and it is great not to have worry about when the postman is going to get here.

In the April edition, on page 18, under the title of *Scanner Squeeze*, you had a picture of an old RCA radio. I think this may have been the second-hand radio that got me started in shortwave listening back in the early '60's. I didn't write it down, but I always suspected that it was an RCA. If it wasn't this one, it was a very similar one because the lettering is the same.

Maybe you have the model number, or a picture of the entire radio you could send me.

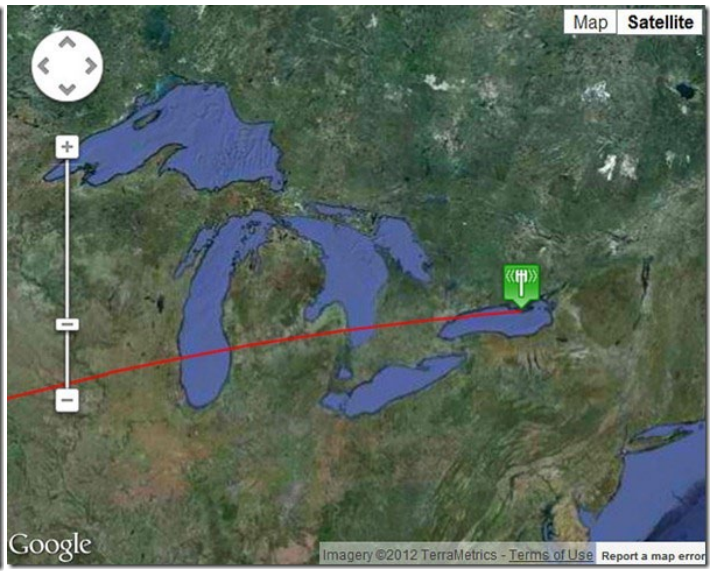
Any help would be appreciated, Gil Torbeck



Hi Gil,

Thanks for your comments! Well, it took me a while to track it down, but I did find a photo I took almost twenty years ago and it's attached. It's a 1936 RCA Model 86T-1, according to the label inside. Maybe this is the one you remembered.

It's funny to think that this radio in 1966 would have only been 30 years old but a galaxy away from small, solid-state, multi-band portables of the day. Today, a 30 year-old radio wouldn't look that much different from the



new ones on sale right now. Thanks again for your comments and I'm glad you're enjoying *MTXpress*.

Best regards, Ken Reitz KS4ZR

Aero Listening from Wyoming

Hey Iden, Thanks for such an informative column (May 2012 "Aviation Related Frequencies.") I have another frequency for you – 15.034 MHz.

It's a Canadian VOLMET frequency that I hear in a lot from South Wyoming. Last time it was signing as "Trenton Military."

I already have the Atlantic freq. of 13.270 MHz. I'll program the 13.282 in and see what I can hear.

Thanks, Robbie in south Wyoming

Oh yes, I have heard Trenton Military VOLMET many times. Many aero listeners rarely mention VOLMET broadcasts, but I think they are fun for DXing. Some provide useful weather info for particular areas of interest.

I just dialed up 15.034 at 2:15 p.m.PDT / 2115Z. I am receiving it fair and with no S-meter reading at all. The I.D I am hearing right now is "Trenton Military."

I just did a search and found this: **www.canairradio.com/canforce.html** Not sure how up to date it is – but it may be. At night I expect that I would receive some of the other frequencies.

From here, **http://qualsh.com/index.php?_page=hflogs&_mode=station&_task=&id=91f18fac-e5f0-11e0-8074-fd27c772e526&page=3** zoomed in and out is Trenton Military VOLMET.

Iden Rogers

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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

ANTENNA TOPICS
www.wa5vjb.com - by Kent Britain

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

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Line Ads $1 per word

I currently subscribe to 5 magazines, all of which I receive in PDF format. One of the first I subscribed to was Monitoring Times, owned by (fellow ham) Bob Grove. In addition to offering a reduced subscription rate, those who chose the electronic PDF version contribute to eco-friendly publishing.

- Bob K.

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The Amateur Radio Service offers a unique mix of public service, technology and experimenting with electronics – all with an emphasis on fun. Some hams use their skills to provide communications during emergencies and disasters when all else fails. Others enjoy talking to people across the country and around the globe, participating in local contests and building experiments. Whatever YOUR interest, ARRL – the national association for Amateur Radio – has all the resources you need to **get started, get involved** and **get on the air**.

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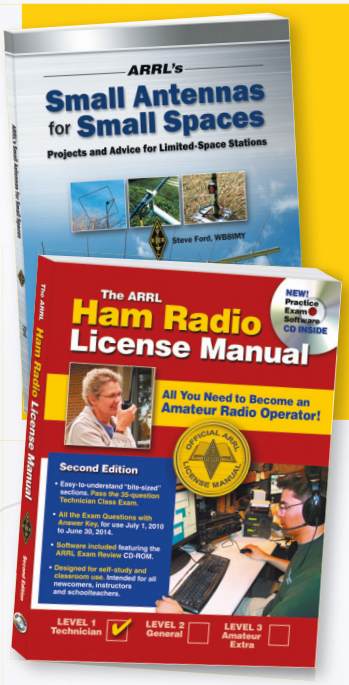

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THE Magazine for every radio enthusiast is now fully digital!

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Portable Ham Station in a Briefcase

By Bob Patterson KSDZE
(Photos by author unless otherwise noted)

The Case for Briefcases

Choosing the Right Radio


The Other Stuff

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I have been a long time subscriber--off and on--since the early eighties when your format was newsprint. Through the years your staff and contributing writers have done a great job in producing some very informative articles. -Mark C.

Have downloaded my first copy of MTXpress. The clarity of the pages is breathtaking; very easy to read. This is a brilliant idea: Wish I had known about it earlier. - Barry, UK

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