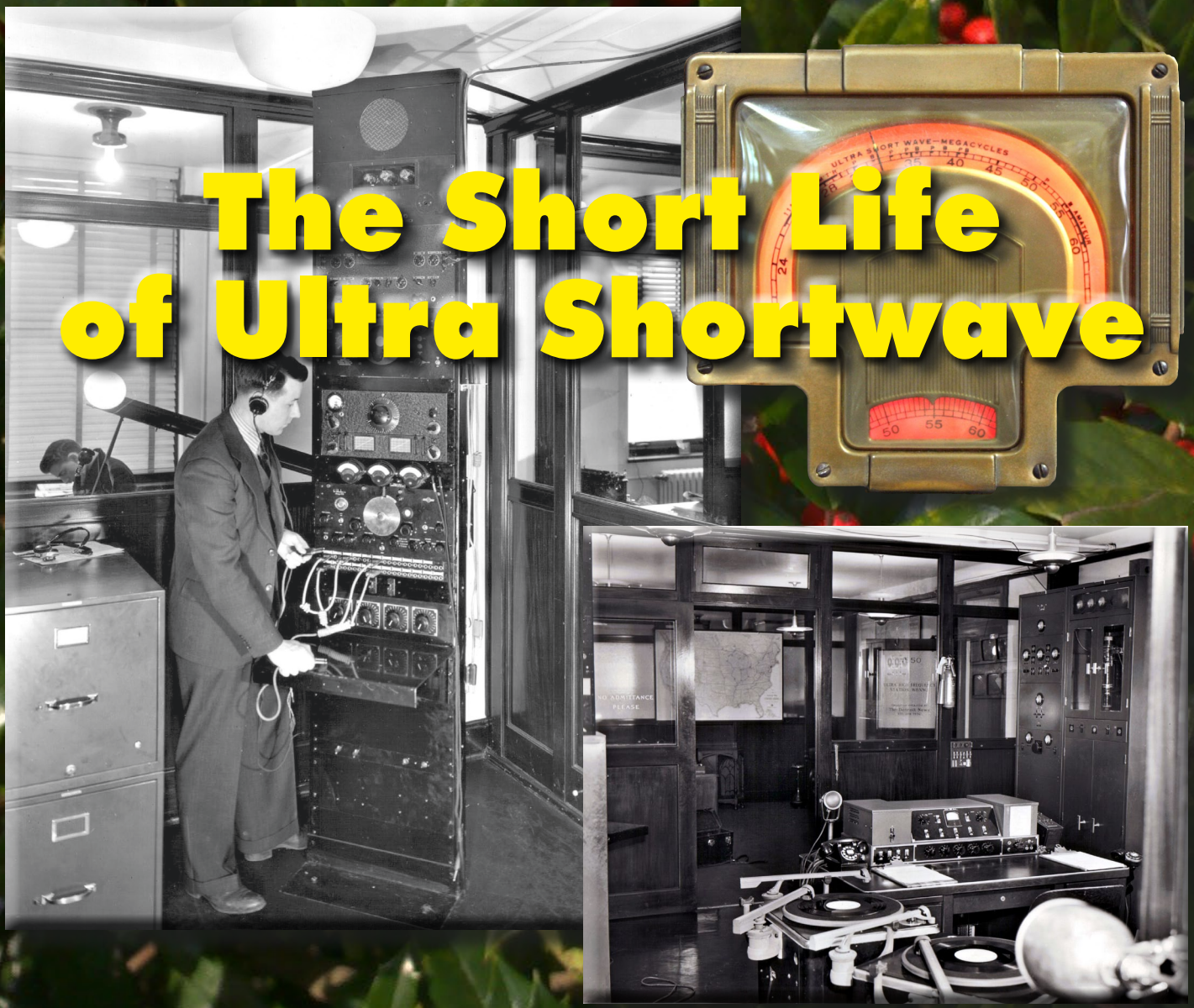
Scanning - Shortwave - Ham Radio - Equipment
Internet Streaming - Computers - Antique Radio

Monitoring® Times

A Publication of Grove Enterprises

Volume 29, No. 12
December 2010

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



The Short Life of Ultra Shortwave

In this issue:

- My Fight for Free Speech Radio: WBCQ's Allan Weiner
- A Real Radio Classic: The Scott Allwave-23
- Nouveau Retro: PURE Evoke Flow Internet Radio

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Monitoring Times

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Ultra Shortwave: The Apex Hi-Fi Stations of the 1930s..... 8

By John Schneider, W9FGH

Today it's easy to dismiss the audio fidelity of amplitude modulated radio stations. After all, virtually all AM stations operating on medium wave frequencies offer mostly talk radio. No need for high fidelity there. And it's mostly the same for shortwave. What little music is played hardly compares with the sound we hear on modern FM radio or compact discs.

But, things were different in the 1930s. Before the advent of FM broadcasting, radio engineers competed to bring high fidelity to the air waves using AM. For a brief and brilliant period, low power experimental stations, operating in the upper reaches of the shortwave bands, dubbed Ultra Shortwave, brought high fidelity programming to local as well as global listeners.

Amateur broadcast historian and certified broadcast engineer, John Schneider W9FGH tells the amazing story of the Apex radio stations of the 1930s, a forgotten side of shortwave broadcasting that preceded FM radio.

On Our Cover

First photo: W8XWJ Shortwave receiving and monitoring station from 1-24-1936 which features a National HRO receiver, SX-10 Ultra Skyrider receiver, audio mixer and switch panel. The operator is not identified. (From the Detroit News Archive).

Full color dial is from the author's 1938 RCA model 15-K1

Second photo: W8XWJ from 7-7-1940 with RCA turntables in foreground, Western Electric audio console, and Western Electric 500 watt ultra shortwave transmitter. (From the Detroit News Archives)

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R E V I E W S

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

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

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

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

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COMMUNICATIONS

by Ken Reitz

AMATEUR RADIO/SHORTWAVE

DRM Finds Inroads

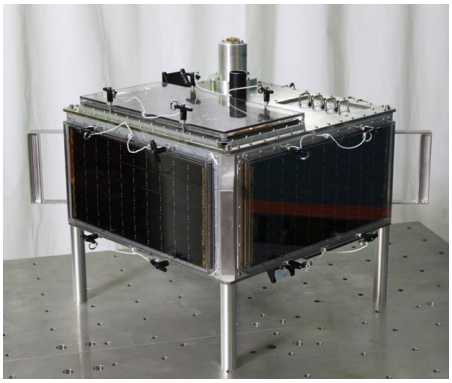
Digital Radio Mondiale (DRM), the European-based digital radio scheme (and HD-Radio's greatest threat) continues to make inroads throughout Europe and Asia. DRM trials are planned for Sri Lanka and Italy while Russia continues to deploy DRM locally as well as on its shortwave transmitters. Presentations at a Canadian conference of engineers attracted a lot of attention in September.

DX Hounds get New Entities

According to a bulletin from the ARRL, the dissolution of the Netherlands Antilles this past October has resulted in a rearrangement of the islands' DXCC entities. They are now: Curacao (PJ2), Bonaire (PJ4), St. Eustatius (PJ5), Saba (PJ6), and Sint Maarten (PJ7). The new prefixes took effect at 0400 October 10 which is when the pile-ups started.

ARISSAT-1 Set to Fly

Following on the success of the original SuitSat, a surplus Russian space suit outfitted with solar panels and a transponder deployed "over the side" of the International Space Station in February 2006, a new "suit-sat" is set to fly this coming February. The difference is that this will actually be a satellite that will be a long term teaching aid for schools and amateurs; it will also offer two-way FM and BPSK digital communications. More information about the progress of ARISSAT-1 can be found here: **http://arissat1.org**



ARISSAT-1 (Courtesy: NASA)

AM/FM/TV BROADCASTING

FCC to Ask OTA-TV for Spectrum

An article in the Washington *Post* October 20, quoted FCC Chairman Julius Genachowski as saying he plans to encourage Over-the-Air (OTA) broadcasters to give up unused spectrum for auction so that wireless carriers can accommodate the rapidly overcrowding territory in which smart phones are currently confined. But, according to the article, industry analysts call the proposal "incremental" and say it would not help in extremely congested areas such as New York City. The proposal would be to allow local channels to agree to share digital spectrum, relinquishing the unused space for government auction.

Clock Running out on LPTV

TV band DXers will possibly have only a one more year to put analog Low Power TV (LPTV) stations in their logs as the FCC seeks comments on a cut-off date which will occur sometime during 2012. But, the real significance of this whole issue relates to the FM broadcast industry. At present there are several LPTV stations, mostly in urban areas, actually operating as FM stations with their audio showing up on 87.7 MHz at the bottom of the FM band. Once these stations are required to transition to digital TV they will no longer compete on the FM band.

BTC Wants FM to be Competitive

With the rapid advance of mobile Internet technology bringing 3G and 4G mobile applications to the dashboard of America's cars, FM radio is playing a desperate game of catch-up. The Broadcast Traffic Consortium (BTC) hopes to make FM more competitive by expanding its services to more markets.

Currently, according to an article in *Radio World On-line*, only 130 stations in 82 markets transmit traffic and similar data via HD-Radio's digital capability. BTC wants to broaden their reach to 115 markets and expand the offerings to include sports, movie listing and travel content. BTC has agreements to deliver traffic and weather information as well as gas prices, current to within a few hours, to existing HD-Radio stations.

But, delivery of such data on HD-Radio signals is an extra expense for radio stations already struggling with expenses. And, while such data delivery can be offset by selling ads, it unclear how consumers will react to one more layer of advertising in commercial radio content. Meanwhile HD-Radio stations continue to be under-powered, keeping its the supposedly competitive technology limited to urban areas which already have better access to high-speed mobile platforms.

Flo-TV Tanks

The direct-to-consumer mobile video service from AT&T and Verizon Wireless – known as Flo-TV and powered by Qualcomm, which apparently had money to burn – launched a little over a year ago. According to *Multichannel News,* Qualcomm burned through $800 million from March 2008 to the third quarter 2010, acquiring "a dedicated 6 MHz spectrum slice in the 700 MHz band" from the FCC in early auctions. Lackluster subscriber numbers for the $15 per month, limited channel cable-TV style service have the company re-thinking their business plan, including the possibility of working with an undisclosed third party, who presumably has a better idea.

PBS Ends Analog Satellite Feed

PBS announced that it has discontinued its analog, in-the-clear, C-band satellite feed of the PBS National Program Service, which was found on transponder 16 of AMC-1 (103ºW). But, because it was mandated to do so by Congress, PBS has made available two Free-to-Air (FTA) digital feeds to replace the analog feed. The feeds, one standard definition and one high definition feed, have been available since May of 2010.

The digital feeds are found on AMC-3 (103ºW) C-band transponder 20 (4091 MHz with a symbol rate of 14.029), vertical polarity in MPEG2 format. Any MPEG2 FTA satellite receiver will be able to receive the SD version of this feed, but an HD-capable MPEG2 FTA receiver will be required to receive the HD feed. The audio is standard MPEG2 digital on the SD feed, but Dolby AC3 on the HD feed.

Despite its promise to "actively promote" the new digital satellite feed, it seemed quite a secret even to avid C-band satellite TV viewers. With less than a month to go before pulling the plug on the analog feed, the main PBS web site was still steering viewers to the old analog feed as the only option for those not signed up on cable-TV, satellite-TV, or living within easy DTV reception range of a PBS TV affiliate.

PUBLIC SERVICE

Cal. Police Radio Pirate Busted

According to a story in the *San Mateo County Times*, area police were bedeviled by a phony police dispatcher who, since this past summer, broke into their frequency for a few minutes, and sometimes as much as half an hour, taunting them, playing audio clips and, in one instance, apparently reporting a false crime. A clever bit of detective work uncovered the culprit who was charged with three misdemeanors.

SATELLITE

Earth-based Radio Garbles Sat Data

An article in *SpaceFlightNow.com* reports that data from a European Space Agency (ESA) satellite known as SMOS (Soil Moisture and Ocean Salinity) which is used to measure those

attributes, is being ruined by Earth-related radio transmissions. According to the article, the source of heaviest QRM is around Madrid, Athens and Beijing. ESA reports that it believes the signals are possibly illegal transmissions within the SMOS frequency band.

Tax on Sat-TV in Ohio Top Court

An article in the *Columbus Dispatch* reports that a 5.5% sales tax on satellite TV, which costs the average viewer an estimated $80 per year that cable-TV viewers don't have to pay, found its way to the Ohio State Supreme Court in mid-October. Both DirecTV and DISH Network argued against the tax, while lawyers for the state claimed the tax approximates the franchise fees paid by cable-TV companies. But, DirecTV and DISH pointed out that most of their customers are in rural areas not served by cable-TV companies. No word on when a decision can be expected.

Careening "Zombiesat" Still a Threat

It was the kind of scary space story 24/7 news channels adore: A cable-TV satellite, Galaxy 15, apparently lobotomized by an April solar flare became unresponsive to ground commands and, instead, began an aimless trek through the Clarke Belt, threatening to destroy other cable-TV satellites. Now, at the end of the year it's still there, lurching around, still transmitting full power from its C-band transponders. And that's the difficulty; when it gets near other C-band satellites its signals could interfere with responsible satellites answering their ground commands as they're supposed to.

But, engineers at Intelsat, according to *SpaceflightNow.com* have actually become expert at working with other satellite operators and, so far, there's been no actual damage done. They even believe, if they ever get control of the satellite, they may get a few more useful years out of the bird.

Sirius/XM Defies Skeptics

Racking up more than 334,000 net new subscribers in quarter three of this year, satellite radio monopoly Sirus/XM has raised its subscriber base to nearly 20 million, a company record. Meanwhile, Bloomberg *Businessweek* reports that the FCC is inching its way toward rules that the company must follow in choosing programmers for 12 minority channels required more than two years ago as a stipulation for the merger/monopoly. The service has 136 channels. Investors have been bullish on the stock, which trades on the NASDAQ market, pumping up the price to more than double in the last twelve months.

INTERNET BROADCASTING

Sony-Google Internet TV Launch

In mid-October Sony announced the introduction of Sony Internet TV, powered by Google TV, claiming to be the world's first television to "combine the big-screen impact of HD television and full Internet search." According to a company press release, the TV is built on the Android platform, runs Google's Chrome web browser, and includes an Intel Atom processor."

But, wait, there's more! The TV features what Sony calls "Dual View," letting users "watch television while tweeting about what they're watching, checking their fantasy football scores, or finding related content on the web." A large RF-enabled keyboard/remote control incorporates an optical mouse for navigating content, typing search terms and controlling the TV's user interface.

Naturally, the TV is configured to let an Android phone control TV functions as well. A 46 inch full HD 1080p display Sony Internet TV (NSX-46GT1) retails for $1,399.99. A similarly equipped 40 inch version comes in at just under $1,000. As this is written these TVs are being pre-ordered via **www.SonyStyle.com** and **www.BestBuy.com**.

FCC wants "Super Wi-Fi" Technology

As mentioned above, the FCC is hoping OTA TV stations will cooperate with its plan to free up some space for new mobile digital technologies. One such use of the so-called "white space," the space freed up by OTA TV, would be to offer "super wi-fi" – greatly expanded wi-fi hotspots that could cover whole neighborhoods, not just stores.

FCC ENFORCEMENT

Breaker 1-9 for Cuts and Washes

It was easy pickin's for FCC field agents as they rolled into West Memphis, Arkansas earlier this fall. First they heard somebody at Phillip's Hair Technicians advertizing what it termed "hair salon services" on CB channel 19. The company was issued a Notice of Violation (NOV). Also tagged with an NOV in West Memphis was Crossroads Truck Wash for advertising its truck wash services on channel 19. And, finally, more misery in West Memphis: Ch 5 C.B. Shop was tagged for operating a Galaxy DX 2519 export ten meter radio with an output of 80 watts. A Notice of Unlicensed Operation (NOUO) was issued with a reminder that only FCC certified CB sets with an output of 4 watts are allowed on the band.

More AM Shenanigans

Last month I mentioned an FCC bust of a ring of AM pirates in Portland, Oregon who were apparently playing pass-the-transmitter on 1710 kHz. This month, agents operating out of Lakewood, Colorado busted two in Sioux Falls, South Dakota for unlicensed operation on 1610 and 1640 kHz.

The two had pretty good signals emanating from their respective residences: 6,800 microvolts/meter at 126 meters and 14,000 microvolts/meter at 50 meters. Maximum output allowed for a Part 15 Device operating in that part of the AM band is 14.9/microvolts/meter at 30 meters. In addition, agents found both operators were radiating spurious signals on 3220, 3280, 4320, and 4920 kHz, potentially interfering with aircraft and aviation ground facilities.

FCC: Register your EPIRB!

An NOV was sent by the Miami, Florida field office of the FCC to a West Palm Beach man for activating a non-registered Emergency Position Indicating Radio Beacon (EPIRB) during a non-emergency. The offender was told how and where to register his EPIRB and warned that the full resources of the Air Force Rescue Coordination Center (AFRCC) had to be deployed because his beacon was not registered. When authorities were able to track down the beacon, they found there was no emergency. Now the hapless "sailor" will have to explain to the FCC just exactly what happened. The AFRCC reports that over 90% of all activations are false alarms.

So You Wanna Be a Rock'n'roll Star?

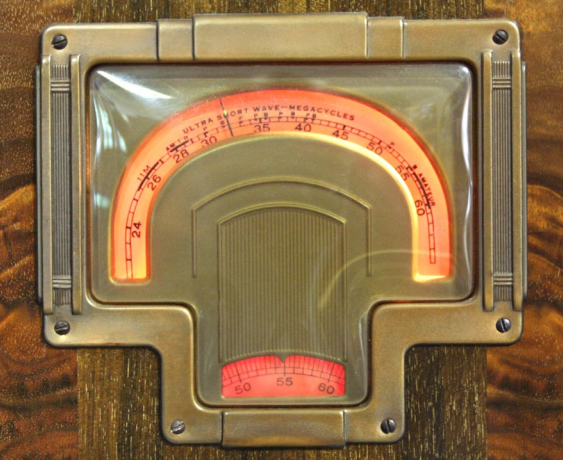
A Shure wireless microphone and T1G Wireless Guitar Transmitter operating on 169.45 MHz were apparently interfering with federal government activity on the frequency in Miami. It didn't take long for FCC track down the interference to a couple in nearby Lighthouse Point. An NOUO was handed out along with the admonishment that the equipment could be seized if it happened again. No word on whether or not the feds would take the guitar.

D.C. 17.5 kHz Xmtr QRT

It was the brilliant answer to an age old question: How do you disperse groups of loitering teenagers when they gather at places they love to gather? The place was, in fact, Gallery Place Metro station in Washington, D.C., site of some nastiness this past summer as a result of teens hanging out with nothing better to do.

Taking advantage of youthful full-spectrum hearing, the city employed an audio transmitter, dubbed "The Mosquito" by its manufacturer, Moving Sound Technologies. The device pumps out one note at 17.5 kHz, according to the Washington *Post*, "the high end of the hearing range for 13-25 year-olds." But, there was a problem. A 28 year-old who should have been out of hearing range of the device heard it and was annoyed, not only because the device was doing its job, but because he was a director of the National Youth Rights Associations. An age-discrimination investigation ensued and the plug was pulled on The Mosquito.

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



Dial of 1938 RCA model 15K-1 console radio, showing the "magic brain" dial tuned to the "Ultra Short Wave" band. This radio is from the author's collection. (Photo by the author.)

Ultra Shortwave
America's Apex Broadcast Stations of the 1930s

By John Schneider, W9FGH

As radio broadcasting matured and gained importance to Americans in the 1930s, the public became increasingly dissatisfied with the limitations of standard AM broadcasting. The principal complaints were interference, static and audio quality. The best technical minds of industry immediately set out on a quest for solutions to these issues.

In the United States, the Federal Radio Commission (FRC), later to become the Federal Communications Commission, began to consider several technical alternatives to solve these issues in 1932. Their first step was to expand the upper end of the AM band from 1500-1600 kHz. The second move was to authorize radio broadcasting on upper short wave frequencies by authorizing what it called "Apex" stations. The third and most elegant solution was ultimately the invention of Frequency Modulation (FM) by Major Edwin Armstrong and others. FM eventually became the FCC's preferred solution, and it supplanted the previous attempts to create high fidelity, "staticless" radio.

In 1927, the FRC had decided not to expand the AM broadcast band from 1500-2000 kHz, but to hold these frequencies in reserve for experimental work in broadcasting. In 1932 it created three frequencies to be used by experimental wideband "high fidelity" AM stations – 1530, 1550 and 1570 kHz. Because of the wider spacing between these three channels compared to the standard broadcast (AM) band, stations on those frequencies were able to operate with an audio frequency response up to 10 kHz instead of the usual 5 kHz. However, only four experimental stations were ever licensed for this band, all operating at 1 kW: W1XBS 1530 Waterbury, CT; W2XR 1550 Long Island, NY; W6XAI 1550 Bakersfield, CA, and W9XBY 1530 Kansas City.

W45D FM antenna 1-27-1942. The two bay turnstile antenna of W45D above the beacon on top of the Penobscot Building. The workman is Ted Ryerse. (From the Detroit News Archives)

W2XR, the most prominent of these early hi-fi stations, was the direct predecessor to today's WQXR-FM in New York City. While the operations of these experimental stations solved some of the interference and fidelity issues of AM radio, it did not resolve the static problem.

About the same time, experiments were begun using high fidelity AM transmissions at what was then considered the upper limits of practical radio technology. Those frequencies, between 25 and 42 MHz, were called "Ultra Short Wave." The Columbia Broadcasting System (CBS) was the first to experiment on these frequencies with experimental broadcasts in New York with 50 Watts on February 6, 1932, using the call sign W2XDV. These irregular experimental transmissions relayed the programs of WABC (now WCBS), the CBS key station in New York. The initial results were promising, and other radio engineers soon started to take notice.

Within a few years, other broadcasters also wanted to conduct research on the new frequencies, and the FCC began receiving more applications for experimental licenses. FCC assistant chief engineer Andrew D. Ring referred to these radio stations as "Apex" stations because of their high frequencies and high antenna locations.

Broadcasting magazine first used the word in its December 1935 issue, defining apex as being "on the highest point," or "the highest point of a cone." It said "these ultra high frequency stations must be located upon a high point, since their signals simulate light and must 'rain down' for good reception."

Because they weren't limited to the 10 kHz channel width of the standard broadcast band, the new Apex stations could broadcast with wideband high fidelity AM. One Apex station quoted its frequency response as being from 20 Hz to 17,000 Hz + 1 dB, with a distortion from the microphone to transmitter output of 2.5%.

Recognizing that the technology held the possibility of resolving the static and interference issues, the FCC actively encouraged the creation of these Apex radio stations. Sections 4.111-4.117 of the FCC rules governed the operations of the experimental stations. They could operate up to 1,000 watts on several groups of frequencies at 25-26 MHz and 42 MHz. The stations were not allowed to sell commercials or charge for air time, except that retransmission of a standard medium wave AM station's programming was permitted. The stations were required to submit data on reception conditions, propagation, noise and interference, and transmission methods utilized.

Many broadcasters were interested in experimenting with this new class of radio station and, as a result, by 1939 there were Apex station stations operating in 34 cities in 22 states.

In technical terms, Apex stations were a cross between traditional AM broadcasters, ten meter amateur radio stations, and our modern FM broadcasters. They were generally operated by standard AM broadcasters as an adjunct to their main radio operations, and most of them just duplicated the programming of their mother stations in higher fidelity.

The First Apex Stations

The first Apex station to operate on a regular schedule was probably W8HX, which belonged to broadcaster WBEN in Buffalo. It began operating in 1934, relaying the programs of its mother station. In January of 1936, W8HX applied for a license to operate on the frequencies of 31,600, 35,600 and 38,600 kHz.

W2XDV, the original experimental CBS station in New York, also began broadcasting its programs on a regular schedule on 31,600 kHz on November 3, 1935.

On January 29, 1936, the Detroit radio station WWJ, which was owned by the *Detroit News*, inaugurated its Apex station W8XWJ on 31,600 kHz. The studio and antenna were located on the top floor of the Penobscot Building, one of the tallest structures on the Detroit skyline. A 100 watt RCA transmitter fed two crossed dipole elements mounted above the decorative ball on top of the building's rooftop spire. The programming was a simulcast of the regular WWJ programs.

The *Detroit News* pulled out all stops to publicize W8XWJ's inaugural broadcast. Sportscaster Ty Tyson and the *News'* aviation reporter James Pierson transmitted live via a shortwave link from the newspaper's airplane "The Early Bird" and gave listeners a birds-eye view of the new WWJ 5 kW AM transmitter plant, which

W8XWJ studio/transmitter 1-30-1936. Chief Engineer C.H. Wesser at the speech input and monitoring panel of W8XWJ. The RCA 100 Watt ultra-shortwave transmitter is at left. (From the Detroit News Archives)

W8XWJ shortwave receiving and monitoring station 1-24-1936. Equipment includes (top to bottom) a Western Electric monitor amplifier and speaker; oscilloscope modulation monitor; General Radio frequency meter; National HRO receiver; Western Electric meter panel; Hallicrafters SX-10 Ultra Skyrider receiver; audio mixer and switch panel. The operator is not identified. (From the Detroit News Archives)

Reporters E.L. "Ty" Tyson and James V. Piersol broadcast from outside the Detroit News airplane during the inaugural broadcast of W8XWJ in Detroit - 1-29-1936 (From the Detroit News Archives)

was then nearing completion. The signals from the plane were carried live over W8XWJ, and then received and rebroadcast over the AM band on WWJ.

In Milwaukee, the *Milwaukee Journal* newspaper's AM station, WTMJ, had been operating an experimental low-definition mechanical scan television station using the call sign W9XD since 1931. In 1933, the W9XD transmitter was taken off the air and converted into an Apex band transmitter. It debuted as Apex station W9XAS on 26.4 MHz in 1934, rebroadcasting the daily WTMJ programs.

In January of 1937, the *Milwaukee Journal* took the bold step of separating W9XAZ from its AM cousin, and it became the first (and perhaps only) Apex station to originate its own programs. As *Broadcasting* reported in the following months, W9XAS originated a series of live high-fidelity remote broadcasts, including a two-hour testimonial dinner for University of Wisconsin head football coach Harry Stuhldreher, and also broadcast the season's entire Marquette University basketball schedule. Transcribed (recorded) programs were broadcast to fill out the short-wave station's remaining program schedule.

WTMJ technical Director D.W. Gellerup established a team of "spotters" in the area in 1937 to send weekly reception reports back to the station. These reports were compiled into a report for the FCC which documented the station's reception performance. The *Journal* estimated that W9XAZ, operating with 500 watts, had an effective service radius of about 25 miles. It estimated that 5,000 receivers within the coverage area were capable of receiving the 26.4 MHz signal.

The Receiver Problem

WTMJ's receiver estimate was perhaps overly optimistic. Until the late 1930s, most broadcasters were reluctant to invest this much money into broadcasting on the Apex bands because of the lack of commercially-available receivers. The tuning range of the typical all-band radio receiver of the mid 1930s stopped at about 20 MHz, and so early listeners to Apex stations had to build their own receivers.

Some of them made complete radios, but most of them just built front-end frequency converters for use with conventional radios. The latter solution was the most economical, but the benefits of high fidelity transmission were lost in the process. In 1937, the *Journal* ran a contest in its pages and over the air on W9XAZ, offering a prize for the best design of an inexpensive shortwave converter that could be mass-produced by the station.

Finally, starting in 1937, several radio manufacturers began to introduce models that could tune all the way up to the Apex bands. The Raco R-S-R Clipper and several McMurdo Silver models were among the first. That same year, RCA introduced its "Magic Brain" series of receivers which had a top band that tuned up to 60 MHz. These early radios proved to be insensitive and unstable at those rarified frequencies.

Other Stations

As receivers started to appear on the market, the number of Apex stations also started to grow, as other broadcasters began to show interest in the Apex stations and apply for experimental licenses. W1XPW in Meriden, CT, (WDRC) began operating on 40.3 MHz in 1936. In 1937, WCHS in Charleston, WV, was authorized to operate in the 26 MHz band, and KGFJ in Los Angeles received permission to experiment on 88, 120, 240 and 500 MHz; General Electric in Albany, NY was authorized on 31.6 and 41.0 MHz.

1938 saw a license issued to WBOE in Cleveland for 500 Watts on 41.5 MHz. W1XER also began operations from Mt. Washington on 42.3 MHz that year. In 1939, Crosley's WLW in Cincinnati began broadcasts over W8XNU on 25.95 MHz with 1,000 watts. Despite this activity, broadcasters clearly did not have a business plan in mind for these new Apex stations. They were driven to jump into the new technology by their engineers' enthusiasm for experimenting with new technologies, and by managements' fears of being left behind in the forward march of technology.

Propagation

The FCC felt these frequencies were a good choice for high fidelity broadcasts because it was an unused part of the radio spectrum that had relative immunity from static interference. They felt each station would have a limited local range, which would allow reuse of the same frequencies in different regions without the stations causing interference to each other. However, not much was known about the propagation characteristics at 25-40 MHz in the early 1930s.

As today's ten meter ham radio operators know very well, propagation conditions on the frequencies that were used by the Apex stations vary tremendously over the eleven year sunspot cycle. The sun was just coming out of a sunspot minimum when the first Apex experiments began in 1932, so the new stations probably experienced mostly interference-free coverage during their first few years of operation. But sunspots were at their peak in 1936, and suddenly the experimental Apex stations were being heard all around the globe. W9XAZ in Milwaukee reported that its signal was stronger in Los Angeles than was the local station. Requests for QSL cards began coming in from

all over the world, especially England and New Zealand.

The FCC's solution to the Apex band's interference issues was announced in October of 1937. The plan was to channelize the VHF band, creating 16 channels in the 30-40 MHz range for relay stations, and 75 channels from 41.02 to 43.98 MHz separated by 40 kHz. The next year, the FCC reserved 25 of these 75 channels for educational stations. Stations were to use amplitude modulation unless they could show a need to operate with the experimental and still unproven Frequency Modulation (FM) method.

FM Tests Prove Successful

Major Armstrong first demonstrated his new "Staticless" FM technology to executives of RCA in 1934, and he described it in a paper published in the *Proceedings of the Institute of Radio Engineers* in 1936. It was created to be another solution to the same issues of broadcasting fidelity, static and interference. It offered about the same high fidelity advantage as Apex broadcasting, but was the first technology to effectively eliminate static interference.

Static and electrical noise is amplitude modulated, but Armstrong's new method transmitted audio information by creating minute instantaneous changes to the transmitter frequency. FM receivers do not detect the signal's amplitude, effectively ignoring all static in the process. Additionally, the well known "capture effect" of FM reception eliminated most cases of interference caused by weaker stations operating on the same frequency.

Despite these demonstrated advantages, industry leaders remained skeptical about the technology. RCA executives and other entrenched broadcasters, in particular, were fearful of the economic impact that would be caused by upsetting the status quo of the very profitable AM broadcasting business. FCC engineers were also unsure of FM's capabilities, but nonetheless authorized a few experimental licenses. W1XOJ in Paxton, Massachusetts, operated by the Yankee Network, received the first experimental FM construction permit on August 18, 1937.

The Yankee Network built an FM station on the top of Mt. Washington in New Hampshire, and then Major Armstrong built his famous FM station W2XMN in Alpine, NJ. Most of these early FM stations operated in the 42 MHz band, sharing spectrum with the existing Apex stations.

In January, 1939, the FCC sent out a team of engineers to investigate the Armstrong FM station W2XMN, which was transmitting with 20 kW on 42.8 MHz. They listened to the station 50 miles from the transmitter site in Sayville, NJ. They also heard FM station W2AG from Yonkers, operating on 110 MHz with 500 watts and came back clearly impressed with the results of the demonstration. Further tests demonstrated FM technology's clear superiority to AM.

In February of that year, an article in *Broadcasting* quoted the FCC's praise of FM which said that its tests showed that FM demonstrated "a material gain in effectiveness of reception through static, especially the type of static resulting from nearby thunderstorms and from some types of man-made electrical disturbances." The article said the FCC wanted to expedite FM testing before the Apex AM broadcasters could become too well entrenched.

Apex Stations Encouraged to Convert to FM

Major Armstrong made history on July 18, 1939, when he began regular commercial broadcasts on W2XMN. The first live classical music program originated at WQXR's New York studios and was conveyed to Alpine, NJ over special high fidelity phone lines. There were not many listeners because there were only 25 FM receivers in the world at that moment. But the privileged few who heard it all agreed on one thing – they had just witnessed a revolution in radio broadcasting.

The FCC conducted a series of hearings about FM during March and April of 1940. The often contentious proceedings pitted the proponents of Armstrong's wideband FM system against RCA and other interests who favored a narrowband FM approach that left more spectrum for the development of television. Its decision, announced on May 20, was a complete victory for the Armstrong interests and a major setback for RCA and the television interests. The Commission approved thirty five 200 kHz wide channels above 43 MHz for FM, reassigning TV channel 1 for FM radio. It announced that FM would be the modulation method to be used for television sound.

A wave of FM excitement quickly took over the industry, and the FCC was immediately deluged with 150 applications for FM stations. Three transmitter manufacturers and numerous receiver manufacturers announced FM products. Unfortunately, this first FM wave would never get off the ground before World War II brought all development to a standstill. The new FM stations hung on through the war, but the FCC's decision in 1945 to move all FM stations to a new 88-108 MHz band would make all of these early stations and receivers obsolete. It was a setback from which FM would not recover until the 1960s.

In its 1941 announcement, the FCC also announced that it would terminate all existing experimental high frequency licenses, both AM and FM on January 1, 1941, encouraging those stations to reapply for new commercial FM licenses. No AM broadcasting on the ultra-high frequencies would now be allowed. The Apex stations began shutting down or converting to FM in droves.

The first station to convert was at WTMJ in Milwaukee. W9XAZ had already been turned off by 1939 when the station applied for an experimental FM permit and a new television license. W9XAO debuted on May 15, 1940, as the first FM station west of the Alleghenies. It was programmed independently from WTMJ. Under the new regulations issued that same month, the station changed frequencies by the end of the year and became W55M.

Meanwhile, WWJ in Detroit shut down W8XWJ in April of 1940 after just over four years of operation and applied for an FM license on 44.5 MHz. The new station, W45D, was one of the first 15 commercial FM construction permits issued by the FCC in October of 1940. (W45D can be directly traced to today's WXYT-FM in Detroit.) Like W8XWJ, the new FM station also broadcast from the top of the Penobscot Building, operating from "special acoustically treated" studios that were designed for FM.

It's believed that the last Apex station to leave the air was WBOE in Cleveland, which converted to FM broadcasting in February of 1941.

Summary

Today, with the benefit of hindsight, we can clearly see that Apex broadcasting was only a short-lived transitional phase in the development of FM broadcasting. Nonetheless, at its peak near the end of 1938, there were over fifty Apex stations on the air in the country, and perhaps as many as a hundred stations had existed in total.

However, AM clearly paled next to the superiority of Frequency Modulation, which grew in stature until it finallybecame the preeminent means of radio broadcasting in the world today. Despite the efforts of many entrenched industry interests to subvert its development, and its numerous technical and commercial false starts, the superiority and genius of Major Armstrong's last and greatest invention ultimately could not be contained.

Nonetheless, a lot of important technical lessons were learned in the process of building and operating the Apex stations. They created a "real world" laboratory which served to establish a body of practical knowledge about the unique characteristics of VHF transmission and reception. Industry and broadcast engineers had to become familiar with VHF techniques that were vastly different from Medium Wave. Transmitters, antennas and transmission lines all worked on different principals. New issues in the creation and management of high fidelity audio had to be overcome. Propagation characteristics of the new "ultra short wave" frequencies were seriously studied for the first time.

Without these valuable experiences, the development of the nascent FM broadcasting industry would surely have taken much longer.

About the Author:

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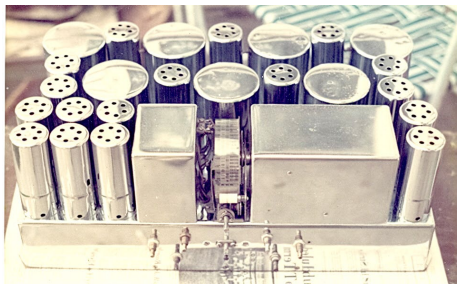
Grandpa Walter's Scott

Memories and Recollections of a Classic 1930s Radio Receiver

By Eric Beheim



The receiver chassis from the author's Allwave-23 when it was removed from the cabinet for cleaning in the mid-1970s.

Of all my relatives, my maternal grandfather was the family's one true radio enthusiast. Grandpa Walter first started tinkering with radio back in the 1920s. I don't think that he ever had an ambition or an interest to obtain his amateur radio operator's license, he just enjoyed staying up late at night tuning through the various bands to see what he could pick up.

For many years, my grandparents lived in Avon Lake, Ohio, just west of Cleveland. Sometimes, when we would be visiting, Grandpa Walter would turn on one of his shortwave radios (I remember him using a Zenith H500 Trans-Oceanic) to see what distant or interesting stations he could tune in for us: time signals from Canada, "powerhouse" outlets like the BBC and Radio Havana, weather stations, and ship-to-shore messages, where you could only hear one side of the conversation.

He would also regale us with fascinating accounts of the things he'd heard while monitoring the airwaves. The relative closeness of Avon Lake to Cleveland gave him good reception of the Cleveland police channels. Major holidays such as New Year's Eve and Labor Day would typically provide him with many unusual and/or humorous police calls to talk about later. Grandpa Walter undoubtedly inspired much of my own enthusiasm for radio listening.

About 1957 or 1958, my grandfather made the find of his life in a Cleveland second hand store: a 1936 Scott 23-tube all-wave console radio. I can remember the first time he showed it off to me and, even to a young person who knew nothing about custom-built radios, it was impressive. The cabinet lid opened up and you could look inside and see the large, chrome-plated chassis with its 17 tubes, each one inside of its own chrome-plated can. Down below, there was a heavy-duty chrome-plated 6-tube amplifier and three speakers: a 12" auditorium speaker and two tweeters.

Its four bands went from 540 kHz to 22.6 MHz and, most important, it was capable of fantastic DX reception on all bands. For my grandfather, owning that Scott was like owning a Rolls Royce or an original Van Gogh painting. Just to hear him talk about it filled me with a sense of awe and respect for it, too.

The E.H. Scott Story

But, who was E. H. Scott, the maker of my grandfather's radio, and what became of his business? Ernest Humphrey Scott (1887-1951) was an engineer, perfectionist, and super-salesman, whose all-consuming desire was to be first in whatever he did. A native of New Zealand, he came to the United States after World War I and settled in Chicago, where he wrote syndicated newspaper columns on automobile care and on the construction of radio sets.

A hands-on person, Scott designed, built and tested hundreds of radio circuits in his own, well-equipped laboratory. Traveling back to New Zealand for a visit in 1924, he took along a receiving set that he had constructed, and which he used to listen to radio broadcasts from stations located in the United States, 6,000 miles away. To verify his reception reports, Scott sent daily cables to those stations he had monitored the night before, providing them with program details. (The manager of KNX in Los Angeles was amazed that Scott was able to pick his station's 500-watt signal almost every night.)

Scott named his receiver the World Record 9. And, lest anyone think that it was a freak, he cabled back to Chicago and had a duplicate set of parts sent to him in New Zealand. There, he built a second World Record 9 receiver, which performed as well as the first one had. Upon his return to Chicago, Scott received hundreds of requests from radio enthusiasts around the country, asking for details on how to build a receiver like the one he had used. Realizing that in order to build such a set, it would first be necessary to have a properly matched pair of IF transformers, he organized the Scott Transformer Company to supply them.

Gradually he added other radio parts to his catalogue and was soon selling complete radio kits. As the reputation of his sets grew, Scott eventually began selling assembled receivers. In 1931, with the stated aim of producing the finest radio receivers possible, he changed the name of his company to E. H. Scott Radio Laboratories. By then, he had 97 employees and was operating out of a large, modern three-story building located at 4450 Ravenswood Avenue in Chicago.

In adherence to Scott's manufacturing philosophy that "The Finest Things Are Always Hand Made," each Scott receiver was custom-built and assembled by hand. Only the highest quality parts were used, and each set was thoroughly checked during every stage of its construction. The end result was a quality receiver built to out-perform any mass-produced set then available.

A master promoter and salesman, Scott wrote most of his own advertising copy and was a wizard at publicizing the prowess of his radios. To demonstrate the shielding in his Allwave Deluxe receiver, for example, he installed one in a control room at the top of the Sky Ride at the 1933 Chicago World's Fair. Despite being surrounded by motors, dynamos and control contactors, the radio consistently reproduced music and news without the slightest trace of electrical interference.

In 1935, a Scott Full Range High Fidelity Allwave receiver was installed on the stage of the Drake Theater in Chicago, so that patrons could hear the Joe Louis-Max Baer fight. Not only did the set bring in the desired station without a trace of the ambient downtown electrical noise, but it also "filled every corner of the theater with the volume turned only one-third up."

By the mid-1930s, Scott receivers were acclaimed for their performance and quality. The list of Scott owners was a veritable "who's who" of the rich and famous of the 1930s: Arturo Toscanini, Frank Lloyd Wright, Guy Lombardo, Walter Winchell, Deems Taylor, Kirsten Flagstad, Jascha Heifetz, Eugene Ormandy, Enzio Pinza, Lily Pons, actor Robert Montgomery, and many others.

During World War II, when no new consumer radios were being produced, the Scott Radio Laboratories manufactured low-radiation receivers intended for use on board Navy and Merchant Marine ships for communications and entertainment. It also designed and built the radio that was installed onboard the first presidential airplane *Sacred Cow*, used by presidents Roosevelt and Truman.

Following World War II and uncertain about the postwar future of radio, Scott sold his controlling interest in the E. H. Scott Radio Laboratories, staying on as one of its officials. Soon dissatisfied with the way the company was being managed, Scott resigned. And, in a 3,500-word letter printed in large ads in two of Chicago's leading newspapers, publicly announced his resignation. He then moved to Victoria, British Columbia, Canada, where he spent the remaining years of his life.

Without Scott's leadership, the company that bore his name eventually went into decline and finally closed its doors in the mid 1950s. (The company founded by E. H. Scott is some-

This ad for the 30-tube Scott Philharmonic appeared in November 1939, two months after war had been declared in Europe.

times confused with the company formed in 1947 by Hermon Hosmer Scott, and which produced a line of quality high-fidelity tuners and receivers. E. H. Scott Radio Laboratories and H. H. Scott, Inc. were two separate companies and had no connection.)

Glories of the 23-Tube Allwave

Other than the bits and pieces of Scott "folk lore" that I had heard from my grandfather over the years, I didn't really know that much about Scott radios until the early 1970s, when I ordered some reprints of vintage Scott literature from Puett Electronics in Dallas, Texas. I ordered everything that Puett had on the 23-Tube Allwave, including reprints of the instruction manual and various issues of *The Scott News*. Since I was then on active duty in the Navy, I had everything sent directly to my grandfather and didn't get a chance to look through this material until I was home on leave. When I did, it made for fascinating reading.

The 23-Tube Allwave was introduced in an article that appeared on the front page of the March 1935 issue of *The Scott News*. At that time, it was being referred to as the Scott Imperial Allwave. Later, after it was learned that another radio manufacturer was already using the name "Imperial," the Allwave-23 was renamed the Scott Full Range High Fidelity Allwave. The Allwave-23 was one of the first high fidelity radios ever sold, being able to reproduce a frequency range of 25 to 16,000 cycles – the entire tonal range of the human ear.

The article mentioned that there were "a number" of high fidelity stations broadcasting in the full frequency range. Later, on page 7, it acknowledged that the total number of high

The author's Scott Allwave-23 in its original Warrington cabinet.

fidelity stations then on the air was only four: W2XR in Long Island City, New York, W6XAI in Bakersfield, California, W1XBS in Waterbury, Connecticut, and W9XBY in Kansas City. It optimistically prophesized, however, that by 1937, domestic AM radio broadcasts in the full frequency range would be commonplace, and that Scott Allwave-23 owners would then be able to take full advantage of the high-fidelity reproduction their sets were capable of.

Scott advertising also stressed how much more realistic phonograph records would sound when played through an Allwave-23. This was another benefit that, for the most part, would not be realized until full frequency phonograph records began to appear commercially some 10 years later, following World War II.

The March 1935 issue of *The Scott News* also included an article describing a tour of the Scott factory or, as E. H. Scott always referred to it, the Laboratory. While describing the assembly process, no mention was made of the unique system used to create each set's serial number. The serial number of my grandfather's set, for example, is U591. The U prefix identified the assembler who had built this particular receiver. The number following the prefix indicated the total number of chassis that individual had assembled. Under this system, a particular receiver chassis could be traced back to a specific assembler for quality control purposes and allowed an assembler's productivity to be tracked. The article also pointed out that the technicians who assembled Scott receivers had all been trained in precision work by Scott Laboratory engineers.

The article described in some detail the precision measurements and adjustments that each Scott set received before being shipped to its new owner. A photo showed the Scott Laboratory's custom-built Standard Signal Generator, used to calibrate, measure and test each new Allwave-23. The Laboratory also had a special room which simulated humid conditions and which was used to see how sets would perform in tropical climates. The article made it a point to mention that "Scott Custom Built Receivers never have, and never will be built to a price mark, but always to a quality standard."

Cost of Perfection

Among the Puett reprints was an actual Scott invoice dated 10-30-35 giving the cost breakdown for an Allwave-23 that had been sold to a customer in Wampum, Pennsylvania. The basic package, consisting of the chassis, amplifier, a set of laboratory-matched tubes, auditorium speaker, a pair of high frequency speakers and a set of 10 spare tubes, cost $179.50. There was also an additional charge of $19.19 for federal excise tax and the RCA & Hazeltine licensing fee, making a grand total of $198.69. (Adjusted to 2009 dollars, that would be about $3,104.00.)

Not included in this price was the cost of a console cabinet. Many Scott receivers were custom-installed in special built-in enclosures in living rooms, music studios, onboard yachts, and in other locations that didn't require a stand-alone cabinet. Some Scott owners enclosed only the amplifier and speakers and left the chassis exposed in all its chrome-plated elegance.

If a cabinet was required, Scott offered them in prices ranging from $25, for the basic "Windsor," to $950 for the massive "Warwick Grande," which came with a Scott Allwave-23 automatic record changer. (My grandfather's set was in a striped walnut veneer cabinet designated as the "Warrington.") The Puett reprints also include an Allwave-23 order form that lists a cabinet as being included along with the radio at no extra charge as part of some special offer. (This free cabinet was not a "Warwick Grande!")

The cost of the electricity needed to operate a radio with 23 tubes must have caused some concern among Scott customers, since the November 1935 issue of the *Scott News* included a brief article about the Allwave-23's power consumption. According to the article, "The average electric light bulb used in a kitchen light fixture consumes over 100 watts, so . . . two of these use as much electric current as our receiver. (The) operation cost of the Scott 23 Tube Full Range High Fidelity Allwave is so small that even when operated continuously on an average of four hours every day in the month, it will add only a few cents over $2.00 per month to your electric bill."

Those customers who felt that paying $2.00 a month to operate a radio was too much would also not have been interested in the Scott Quaranta, a special-order set that sold for $2,500 and which was first introduced around December 1935. The first Quarantas utilized 40 tubes and had four speakers. Later variations had 48 and even 50 or more tubes and had five speakers. The Scott Philharmonic, the receiver that replaced the Allwave-23 in April 1937, had 30 tubes.

Owning a radio capable of full frequency range sound reproduction was probably not as important to the average Scott customer in 1935 was having one capable of receiving distant stations on both the AM and shortwave bands. Keenly aware of this, Scott made sure that letters from satisfied owners, telling about the many

stations they had received on their Scott radios, were reprinted in *The Scott News*. In the March 1936 issue, for example, a Scott owner in Santa Barbara, California wrote "On the broadcast band, I play the Eastern stations as quiet and clear as stations on this coast. As for short waves, all bands are good. Big Ben, London, at 7:00 P.M. comes in with a bang, also Radio Colonial, EAQ, Spain and Germany."

In the June 1936 issue, 49 letters – one from a Scott owner in each state plus the District of Columbia were reprinted. The Scott owner in Oklahoma wrote "Even on bad nights I get London clear as day. I thought I had Boston or Schenectady – it was so strong, but during the numbers I heard the violins being tuned and then the announcement 'This is London calling.'"

Of all the DX reports submitted by Scott owners and published in *The Scott News*, the one that most captured my imagination appeared in the November 1936 issue. Paul W. Dilg, an internationally famous DXer from Evanston, Illinois, spent a week's vacation in October 1936 using his Allwave-23 to see how many distant shortwave stations he could log.

Beginning on October 24th and continuing for seven straight days, Dilg would begin listening at around 6:00 a.m. in the morning and continue on until around 11:00 p.m. at night. (An accompanying photo showed Dilg, dressed in a coat and tie, seated next to his Allwave-23 with his logbook. He was, by the way, one of those Scott owners who chose to display his radio's chassis out in the open, rather hiding it inside of a cabinet.) For each station he heard, Dilg wrote down the country, city, station call sign, frequency (expressed in Megacycles), signal strength, the time heard, the station's distance from Evanston, and a brief description of the program material. His logs were mailed to E. H. Scott and reprinted in full in the November issue. During his seven days of marathon DXing, Delg logged programs from 448 foreign shortwave stations located in 186 foreign countries.

Between March 1935, when it was first introduced, until April 1937 when it was replaced by the 30-tube Philharmonic, approximately 2,500 Allwave-23 receivers were produced. Despite this low number, it is the most common of the "classic" E. H. Scott receivers made between 1932 and 1942, and is the one most likely to be encountered today at antique radio meets.

Incidentally, there were two variations of the Allwave-23. The first version had five knobs, while a second variation, introduced around March 1936, had seven knobs. (My grandfather's set is the latter variation.)

The Allwave-23 Lives

After being released from active duty naval service in 1974, I settled in the San Diego area. Whenever I was visiting my family in Ohio, Grandpa Walter and I would usually find time to spend an evening or two DXing with his Allwave-23. While we didn't hear as many interesting things as Paul Dilg did in 1935, it was still fun to see what foreign stations we could pick up.

Having the Puett reprint of the original Allwave-23 instruction manual proved most helpful. For example, in all the years my grandfather had had the set, two jumper wires required for unused connection terminals at the back of the set had been missing. After we installed these, I would like to think that the Scott performed even better.

Around 1978 the Scott fell silent. The tubes still glowed and the dial lit up, but only a hum came from the speaker. The troubleshooting suggestions given in the manual proved to be of no avail, and the chances of finding a local radio repairman knowledgeable about vintage tube model sets, particularly one as esoteric as a Scott, were virtually nil. For the next few years, every time I was back in Ohio, I would power up the Allwave-23 just to see if it would start working again, but it never did.

The last time I saw my grandfather was during the summer of 1983. By then, he was in a nursing home and only vaguely aware of his surroundings. Still he always carried around a little transistor radio so he could listen to Cleveland Indians ballgames. He remained an avid radio listener to the end.

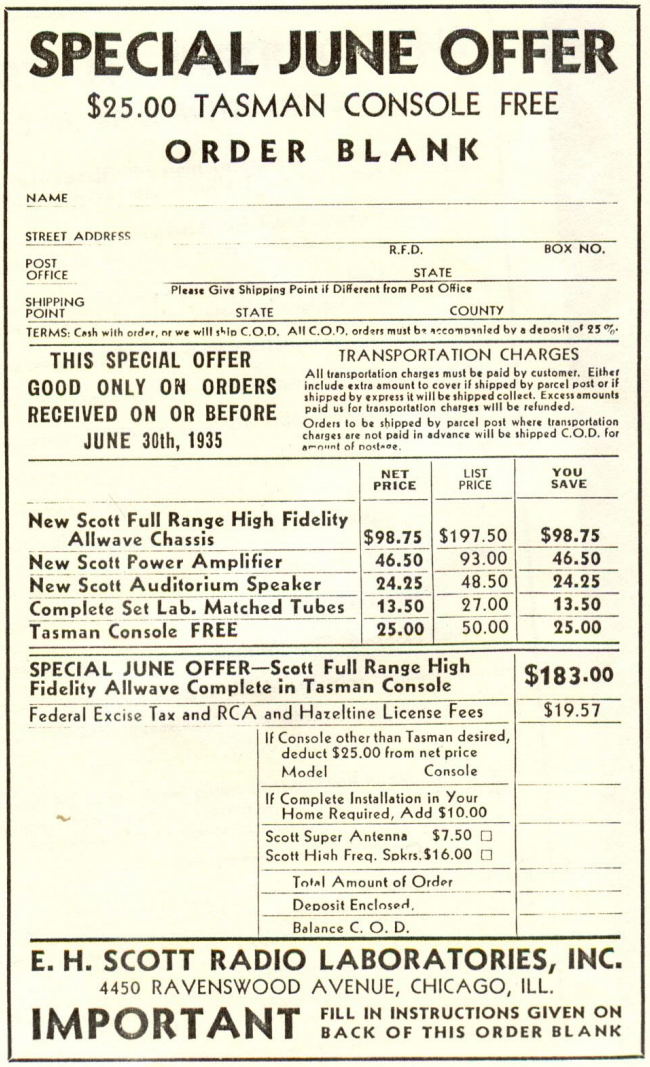
It was a foregone conclusion that I would someday inherit Grandpa Walter's Allwave-23, since no one else in my family was the least bit interesting in a radio the size of a modest refrigerator and inoperative to boot. After it passed into my possession, my first concern was to restore it back to working condition. JWF Puett recommended a Scott enthusiast in Texas who was qualified to do the work.

After the necessary arrangements had been made, my father custom-built three wooden shipping boxes – one for the receiver, one for the amplifier, and one for the three speakers, and shipped them off to Texas. The empty cabinet was shipped directly to me in San Diego, where I had it professional restored to its original appearance. By the summer of 1985 my Scott Allwave-23 was back together again and fully operational.

A member of the family now for over 50 years, Grandpa Walter's Allwave-23 is still in good working condition and remains one of my favorites among a modest collection of vintage, tube-model radios. Surprisingly, I seldom use it now for DXing. The dial is only slightly larger than a large postage stamp and is not particularly easy to read. Scott must have realized this shortcoming, too, since the Allwave-23's successor, the 30-tube Philharmonic, had a big, black round dial similar to the one on a Zenith Stratosphere.

I do, however, make full use of my Scott's PHONO IN terminals. When connected to a quality turntable, the Allwave-23 provides superior sound reproduction of my vintage records, particularly "high fidelity" monophonic LPs. When connected to a CD/MP3 player, it once again gives forth with old radio programs from the 1930s and '40s, including historical opera broadcasts, and news and commentary programs from World War II which might very well have been received on this set when they originally aired. And, when connected to my little Sony ICF-7600GR receiver, it provides a unique compromise of unbeatable sound reproduction along with the convenience of direct frequency readout, superior selectivity, and variable bandwidth tuning.

Like Zenith Trans-Oceanic radios, there will never be any more Scott Allwave-23s in the world than there are right now. I feel fortunate indeed to be the (temporary) custodian of this rare and unique piece of radio history. Sometimes when I'm sitting there listening to it reproduce an old record or a vintage radio broadcast from yesteryear, I can almost sense that Grandpa Walter is sitting there along with me, enjoying it too.



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	NET PRICE	LIST PRICE	YOU SAVE
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Federal Excise Tax and RCA and Hazeltine License Fees $19.57

If Console other than Tasman desired, deduct $25.00 from net price

Model Console

If Complete Installation in Your Home Required, Add $10.00

Scott Super Antenna $7.50 ☐

Scott High Freq. Spkrs. $16.00 ☐

Total Amount of Order

Deposit Enclosed.

Balance C. O. D.

E. H. SCOTT RADIO LABORATORIES, INC.

4450 RAVENSWOOD AVENUE, CHICAGO, ILL.

IMPORTANT FILL IN INSTRUCTIONS GIVEN ON BACK OF THIS ORDER BLANK

As indicated on this 1935 Scott order form, a cabinet was sometimes included along with a radio at no extra charge.

SUGGESTED READING

E. H. Scott ...The Dean of DX (1985) by Marvin Hobbs

Jim Clark's E. H. Scott Radio Collectors Guide (1925-1946) (1995) by Jim Clark

Silver Ghosts (1976) by JWF Puett

Eric Beheim's last article "Air Raid on Pearl Harbor: December 7, 1941 as Reported by Radio" appeared in the December 2009 issue of MT

Zenith Clamshell

Those Wonderful Vintage Radio Dials!

By Linton G. Robertson KJ6EF
(All photos courtesy the author)

"What the eye sees, the heart wants," as the old saying goes. They flashed, clicked, winked, blinked, flickered, and clacked. They clunked, whirled, twirled, and had two-color and even five-color displays. Talk about a "point-of-sale" item!

Dialing-in the Sales

They were round, square, triangular (yes, there were some) and rectangular. Along with the cabinet, the sound, and the price tag (which the gentleman in the double-breasted suit behind the counter may not have wanted you to dwell on), the way the radio dial looked was often one of the biggest things that attracted or repelled a prospective purchaser of a radio.

"Point-of-Sale" they called it, and it was considered in some sales circles to be as important as how the set pulled in stations and how well it sounded. The radio dial was the salesman's delight and the owner's pleasure. The manufacturers knew this and trotted out a bewildering array of highly fetching tuning dials in radio's golden age. How many fascinated eyes gazed upon these wonders during these times, thrilling the eye as well as the ear? The number of designs stagger the imagination; each new radio that was made seemed to come with its own specialized tuning mechanism and readout dial.

At the peak of the design era for this sort of thing, the variety was truly astounding, and seems to tax the imagination of the admirer and collector of today. It certainly kept some fine art designers and engineers of that great age of radio up very late into the night at their drawing boards, that's for sure.

Tuning Dials and the Mechanisms Behind Them

Things started out pretty simple. The very early Marconi-era receivers had knobs and switches galore, but this "talking furniture," as one wag put it, didn't really catch on with the general public until about 1922-24. And when it did, the average person usually wound up with something that had three round dials, a battery switch and controls for filament voltage (volume) and detector voltage (adjust for best results, and much luck may it do you!).

The early TRF (Tuned Radio Frequency) three-dialers, such as the 1924 Freshman Masterpiece, were something of a nightmare to tune: each black, bakelite knob was graduated in scales from 0-100, and you had to get all three in sync before you could actually receive a station. You started off with all three on 100 (or zero) and slowly (and I mean slowly) worked your way from there, each adjustment taking all three slightly higher (or lower) until you actually heard something. This could take quite a while.

Atwater Kent 55

Once you did hear a station, all three dials may have been reading the same, or they may not have. Usually they didn't, and for this purpose many sets like the Freshman had "logging sheets" affixed somewhere for you (under the lid in this case), the lucky finder of the pony in the slush pile, to record the settings of all three dials so you could find it again without all that agony. But God help you if a dial slipped on the shaft!

1930s dialset

Well, about 1926 or so the first "one-dial tuning" systems showed up, and were welcomed by anyone who had ever tuned a radio. Now we had the number of knobs and switches down to just four: tuning, detector, volume, and power on the Atwater Kent model 30, and just four for the AK Model 55. On the model 30, for those who wished to "fine-tune," a brass rubber-bottomed knob could be engaged right below the single (hooray!) tuning knob. Radios were getting friendlier and easier to tune, but mostly the scales were still in 0-100 formats, and no average user really had a close idea of what frequency he was on (or even near) until the next stage came in.

These models had a type of hybrid dial that included 0-100 as well as, every so often along the dial, an actual frequency in kilocycles. Single dial tuning with frequency readout (of a sort) had finally come into it's own. And there was an innovation with the first AC sets: dial illumination, if you could call the feeble light thrown by a clear 2.5 volt bulb "illumination!" Yes, there was even a joke about a Scotsman who returned his radio because, "Well, she works just fine, but the little light is too dim to read by!"

World of Tuning Wonders

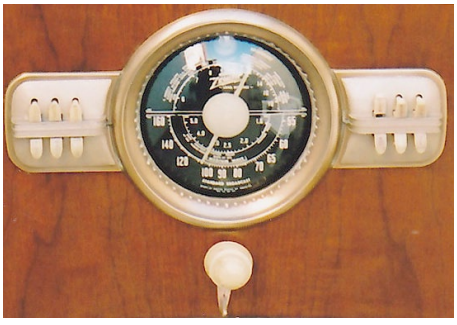
The next development in radio dials was tuning speed reduction. As SWBC bands gained interest in the early and mid 1930s, users found that a tuning speed that was perfectly fine on the BCB AM dial was just too "gitchy" on shortwave, so companies began to think of ways to slow it all down. Philco stands out as one of the companies that had at least fourteen separate tuning speed reduction mechanisms for its many models.

These were marvels of Swiss-watch-like gears, clutches, and some doubtful ideas involving springs, rubber, etc. Reductions of 16:1 or greater were possible now, and these models came with a "nested" tuning knob, one within the other; the small one in the center was for fine tuning and the large one it sat in was for coarse tuning. I've rebuilt a few of these, and wonder if the cabinet designers and the chassis designers ever went to the same bar. If and when they did, there was probably eventually some sort of unpleasantness.

But, as they say, "Wait, there's more!" In the mid 1930s, RCA blew everyone's socks off when they came out with the 6E5/6U5 "Magic

Philco fancy slide rule type

Eye" tuning tube, and everyone wanted a radio set with one. Not all radio companies wanted to pay the royalties for using the tube, though, and Philco was one of the notable standouts, going to great lengths to get around having to pay large sums of money on patent royalties. So, they invented a mad-scientist device called a "Shadowgraph." This little device was a wonder of electro-mechanical engineering. On many Philco sets of the mid-1930s this device resided



just above the tuning mechanism, and consisted of a small display screen about 1-1/2" X 3/8" onto which a backlit shadow was projected.

Tune the station in, and the shadow narrowed. Go off-station, and it broadened. Neat, eh? Well, when you consider the whole thing was wired into the AVC and came complete with a tiny, fine-wire wound electromagnetic movement (much like an old S-Meter, with about a zillion miles of #48 enameled wire in them), a moving vane in between the pilot light and the screen that cast a narrow or wide shadow depending on signal strength, it was a miracle the thing worked at all. (And no, you do not want to repair one. The phrase, "Now, I'm not a drinking man, but…" comes to mind. They are a perfect nightmare to repair correctly and many have been driven mad by the attempt.)

More Mechanical Tuning Delight/ Nighmares

Of course, in our technocratic society, "anything worth doing is worth overdoing," and you don't hear the word "over-invented" any more. (Facebook-Twitter-MySpace, CrackBerry,..well, you get my drift). The Zenith "Clamshell" dial was just that; a mechanically over-invented piece of engineering that made the customer gape in wonder. This thing was, in my humble opinion, the peak of mechanical tuning wonders.

Here's how it worked: You started off tuning the AM broadcast band, and when endless ads for cereal and beauty products bored you and the shortwave band lured, you turned the appropriate knob, and a mechanical miracle happened; the dial you were looking at actually split in two down the middle, top to bottom, and the two halves of the BCB dial fell away, left and right, to reveal the first shortwave band.

After noodling around in those frequencies for a while, and, deciding you wanted to to go higher in frequency, you turned the band switch once again, and the same thing happened to reveal yet another dial! After exploring the highest SW frequencies the set had to offer (around 18 MHz, as I remember), one simply reversed the process to get back to AM BCB with two bandswitch clicks opposite to the direction you'd been going. Clang-Clang! The set was a mechanical marvel in this fashion, but when these things broke down, it was a wise man who was not around the repair shop to hear the most unusual sort of colorful language coming from the repair bench. Many a radio tech went home red-eyed after a session of working on one of these!

There were other tuning aids, neon tubes, etc, but the Magic Eye took the field by storm. RCA made a lot of money off these tubes, believe me. The dial designers made the most of it, and knocked it right out of the park. The most outlandish dial feature I have ever seen was a magic eye tube that looked like it was encased in a chromium "winged globe of Egypt" set just above the glowing dial of the set.

Stromberg Carlson's octagonal dial.

In any case, receiver dials had now become extremely important, and some were the most complicated section of the set. Some sets now had huge circular dials with multiple bands on them, "magic eyes" (sometimes more than one!) in the dials, and as many as six or more pilot lights. Color-coding of dials appeared, and the flick of the power switch could reveal a multicolored dial to dazzle the owner.

"Teledials" looked like giant dial telephones. They were made of plastic, celluloid, steel, bakelite, clear plastic, and various combinations of these things. Counterweights, gears, multiple rubberoid drive bands, shafts within shafts and flywheels performed their peculiar gyrations to indicate bands and frequencies being heard, and it was sometimes hard to take your attention off the radio dial to look at someone else in the room. Sound familiar?

Changing Face of Radio Dials

Then about 1939-1942 something funny happened: the tables turned, and dials on US-made radios started becoming more simple. WWII was coming along, the equipment manufacturers knew it, and may have started to slack off on "gingerbread" as a result of perceived or current shortages of metals, materials, etc. "Slide-rule" types started appearing more frequently, and elaborate tuning mechanisms started to fade into the sunset, along with multiple pilot lights, flashy escutcheons, and other eye candy.

The "Magic Eye" hung in there for a bit longer, but, by the end of WWII, FM came in, and SW was on its way to being the domain of communication and ham rigs, or the blonde, long, heavy Grundig-style console. If you wanted SW without weight, you got something like a Zenith Transoceanic. By then television had come in big-time, and radio dials got smaller, less attractive in some ways, and Americans no longer had as many sets with SWBC dials on them, just AM and FM.

The Europeans kept this sort of thing (tuning eyes of various types) quite a bit longer in this respect, and had some very ingenious designs and displays. Shortwave bands on radios persisted on Euro sets long after they disappeared from domestic U.S. household radios. From 1922 to 1950 it was a long march for radio; but oh, those dials of the '20s and '30s and '40s! What a period of high tech art!

Lin Robertson KJ6EF runs American Radio Revival as well as American Radio Research at: www.moonlightsys.com/revival and www.moonlightsys.com/research. He has been a ham for 30 years and an SWL since 1967. His most recent article, "Restoring Vintage Broadcast and Shortwave Sets" was the cover story for the July2010 issue of MT.

MT

My Lifelong Fight for Free Speech Radio

By Allan Weiner, General Manager WBCQ Shortwave
(All photos courtesy the author)

My first radio was given to me by my uncle Irving in 1958 or '59, when I was seven or eight years old. It was a small Emerson tube portable that used 1 volt tubes and I remember the day he gave it to me. We were over there for dinner and there was this Emerson portable in the living room. I kind of took a shine to it. He asked me if I wanted it and I said, "Yeah!" And, he gave it to me.

I took it home, went to my room with my little desk, and I took that radio apart, dissected it. I took every single resistor, capacitor, and coil out of it. I examined each part, drew pictures of it, found the schematic representation for all the parts in there and took the precious speaker out, which I thought was the most fascinating device in it, the thing that actually made the sound. That was my first interaction with a radio.

Finding a Passion for Radio

After that I started collecting radios left and right. We lived in Yonkers, New York and several times a year the city would have a clean-up where people could just throw out anything on the street and the crews would pick it up and take it to the dump. I used to take my little red Radio Flyer wagon up and down the various neighborhoods where we lived and pick up all manner of radio receivers: consoles, sets from the 1920s, 1930s, TVs, everything. At one time I probably packed over a hundred radios in the basement of my dad's house. He wasn't too happy about it, but that's where I cut my teeth on learning how to get these things working, about tubes and electronic circuits.

Allan at WBCQ Shortwave Master Control

We had a great library, Carnegie Library, right in downtown Yonkers and I used to go there all the time. The library had a technical section crammed with every textbook on electronics and radio that could be imagined. I would take the bus down there and take out books on transmitters, receivers, radar sets – I mean, here I am, this little kid with all these books on electronics. In fact, certain reference and electronics books I was only able to take out with my father because I was too young. Dad had to go with me and we would have this stack of stuff to check out. We'd bring it home and I would just start reading. That's how I learned. I taught myself.

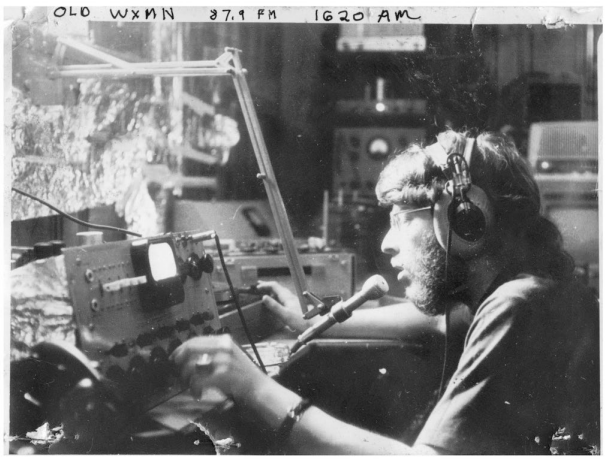
My dad thought it was great. He was very supportive and I think sometimes he was sort of amazed, because as I got older, I used to go down to Courtland and Canal Streets, downtown Manhattan – that's where all the surplus electronics houses were in the 1950s and '60s. You could go down there with a couple of bucks and come back with receivers, transmitters, test gear, cathode ray tubes, parts, walkie-talkies – all kinds of stuff left over from the Second World War.

"My mother invited the agents in for coffee, tea and cake."

I would go down there on the weekends with my buddies. We'd take the subway down, and I would drag everything from radar sets to periscopes back, bring it down to the basement shop and take the stuff apart, fire it up, try to get things to work. Dad would just look at it in amazement and mom was mainly concerned I didn't electrocute myself; and that's how I got into this passion for radio.

WRAD Hits the Air

Several years later, after I got my first radio (I must have been 12 or 13 years old), I was watching a special on NBC television about the history of broadcasting. They were celebrating the history of radio broadcasting showing pictures and movie clips of all the early radio stations during the "golden days of radio" in the 1930s, when people would crowd around the radio receiver in the living room and get all their entertainment news and information. As I looked at it, I was totally glued to the black and white images on our TV and I said to myself, "I want one of these things." I wanted to be able to transmit too. People said, "Well, you should get a ham license." So, I looked into it and soon discovered that broadcasting on ham radio is strictly verboten. It was basically two-way communications and I was not interested.



Free Radio WXMN 1971

That's when I started thinking about the ramifications of starting up a legal radio station. I mentioned it to my father and he kind of looked at me and said, "Look, son, you're going to need millions of dollars to do something like that." So, I wrote to the FCC asking for information about starting a radio station. They sent the standard political crap; I looked it over and said to myself, "This is ridiculous."

At thirteen or fourteen years old I was of the age where I was becoming aware. It was the beginning of the Woodstock generation and I thought, "Well, this is free speech and I really want to put a radio station on the air." There was great political turmoil going on, people marching in the streets, the war in Vietnam; everyone was pretty much dissatisfied with the government, kind of like today! There was change in the air. I had read the Constitution and I believed

Radio New York International QSL

in individual rights and I really had a burning desire to broadcast. So, I thought, "This is a First Amendment thing, and I have a constitutional right to get on the air." So, I decided then and there that I would build my own radio station and put it on the air.

By the time I was 16 years old, I had modified an old marine transmitter that put out about 50 watts to broadcast on shortwave. For two hours a day, Monday, Wednesday, and Friday, my buddies and I did some rudimentary shortwave broadcasting from the basement of my dad's house.

I had put up a big, base-loaded 30 foot whip antenna which I strapped to the sun porch of my dad's house. I had taped antenna wire, twin lead, any wire I could find (with masking tape, no less!) to build up enough transmission line to get out to the antenna. We did field checks with my father's portable shortwave radio and during the day and it got out about two or three miles. Who knows how far it got out at night? That first station, which we called WRAD, went on the air and never got a QSL request. We never heard from anyone.

But, a few months later I dragged home from Canal Street a 50 watt military transmitter that we converted to go on 1620 AM, a little bit above the AM broadcast band as it was in those days. We put that thing on the air with 50 watts.

Tim Smith WA1HLR, the technical wizard behind WBCQ.

I had improved the antenna system, and everything changed. We started getting QSL requests from New York City, New Jersey, Michigan and all over the East Coast of the U.S. We went on the air September 23, 1969, operating Monday, Wednesday and Friday from 4-5 PM. My buddies and I would go down to the basement and broadcast my father's old cha-cha and can-can records, because that's all we had. We'd go on-the-air and talk about stuff and within two weeks we got busted. We had been ratted out by a ham.

The FCC Hits Back

FCC field agents came to the house and we split. My buddies and I just kind of ducked out of there. My mother invited the agents in for coffee and tea and cake and they gave my mom a letter saying that, "Your son shouldn't broadcast without a license," and took all the tubes out of the transmitter. After about a month we got new tubes, another transmitter and went back on the air with even a little bit more power. It just kept escalating from there.

Meanwhile, dad kind of pretended that all this didn't exist. My father was an attorney, so he kind of took the position, "I see nothing and I know nothing." He knew that what I was doing wasn't 100% legal but he knew that we were doing no harm. And, of course, at that time my father was tickled pink that I was home, doing creative and constructive stuff in the basement instead of out on the street getting drunk and taking drugs, which was a problem that was cropping up around that time. So, he was good about it and even my mom was kind of good about it.

The FCC hadn't stopped us. And later, when we got on FM, everything changed. We used a military surplus, self-contained, communications transmitter, called a TRC-1, which we modified to operate on 87.9 MHz. In those days it was so much cheaper just to buy the WWII military surplus stuff, with the power supplies and everything already there, than to start from

WBCQ 2 Transmitter

Allan's dad, Samuel S. Weiner, provided quiet support throughout.

scratch. You could pick up stuff like that, in those days, for ten or twenty bucks. We built our own turnstile antennas using RG/8 coax and aluminum tubing that we'd buy in New York City. The antennas were all erected on my dad's sun porch and at one time the house looked more like an airport control tower. But, as I've said, dad was really good about stuff like that.

I had a good friend, J.P. Ferraro, and between us we had four stations going: my stations in south Yonkers, WXMN 87.9 FM and WKOV 1620 AM, and in north Yonkers we had J.P's stations, WFSR on 1620 AM and WSEX on 87.9 FM. By the summer of 1970 we had a full operating schedule. We would stagger the broadcast days and we had a staff of 50 volunteer DJs and we had a lot of fun. We were getting thousands of people listening.

The station took a very anti-war, anti-establishment stance, and we were probably the first radio station in the New York area to do talk radio. We opened up the phone lines without any delays, putting people on the air to express their viewpoint, practicing the ideals of free radio. We talked about things that were going on in the world and about high school, because we were mostly all high school students. We played all the latest rock and roll music. A lot of the people who were working with us at the station had thousands of albums and they'd come over and play all the latest music. We developed quite a following. We had listeners all over the greater tri-state area and we were on for about a year.

But then, we got busted. Big time got busted. I mean, Federal Marshalls, guns, handcuffs, and everything. That was August of 1971.

WBCQ and WREM antennas at dusk

They came down, busted my station, and J.P.'s station, they hauled us away, hauled all of our equipment away and we were cited for violating the Communications Act of 1934. We didn't get any fines, they just gave us a year of probation and said, "Don't go on the air again without a license or else!" From there I got into commercial radio and built AM and FM and TV stations for colleges.

But, then I got the idea to start Radio New York International and it was to become the single biggest broadcast event in my life. The idea was based on the pirate radio ships for Radio London and Radio Caroline that operated off the coast of England in the '60s, '70s and '80s. I bought a ship and equipped it with an old Gates 5000 watt AM transmitter, the BC- 5P which was on 1620 kHz; we had a Bauer 1 kilowatt FM transmitter operating on 103.7 MHz; we had a military BC610 for 6.270 kHz shortwave, and we had a we had an old Coast Guard transmitter operating on 190 kHz for longwave. So, we had AM, FM, shortwave and longwave transmitters all operating off the *M/V Sara*, named after my first wife. That was July of 1987.

We dropped anchor three and a half miles off the coast of Long Beach, Long Island, New York and let me tell you, the signal at 5 kW from a ship on a saltwater ground was outstanding. We basically had a clear channel signal. People heard us all up and down the East Coast of the United States with no problem. The FM signal wasn't too bad; it was receivable in the greater New York City metropolitan area. The FM tower was only 120 feet above the waterline but it got some good coastal penetration.

And, again, it was going to be a free speech radio station giving people the opportunity to give their music, their political or religious viewpoint and do it from a ship right off shore and we were on the air a magical four or five days before the Coast Guard came out, seized our vessel, and arrested us. Not for violating any FCC rules, but for "impeding the function of the U.S. government." They threw so much paper at us and so much litigation at us that we went broke.

Vintage TDE-3 Transmitter

"You've got it, now, don't lose it!"

Still, my dad knew how I thought; he knew my political reasons for doing this. He was upset of course, because, as he said, "You could've gotten killed very easily." But his basic line was, "I don't always agree with how you do things, but I'm proud that at least you give it a try." From a legal standpoint, my father knew that what I was trying to do and he knew that basically I was not breaking the law. I was in international waters in a vessel registered to Honduras, and he knew, on paper, I was not violating the law. But, as a parent, he was concerned for my personal safety.

As a lawyer he said, "You know, the government can do what they want. They can trump stuff up and really create a lot of trouble for you and you have to be careful." I would say that there was always this pride with him where, as I've said, he didn't always agree on my methods but he would always give me a pat on the back that at least I tried to do something that might have temporarily ended in failure.

But, the day I was granted a license from the FCC to operate a shortwave station, and he was the first person I told, he just broke down crying and my father does not cry. That day he started to cry because he knew it was the culmination of so much effort to try to get a radio station on the air that covered a large area to broadcast free speech radio. He knew what I was trying to do and when we finally got licensed as WBCQ he was so proud and he was so outrageously happy. All the stuff that we did; the pirate stuff from dad's basement; the broadcast from the ship off the coast; and decades later, in December 23, 1997, we finally got our license. My broadcast consultant, George Jacobs, a great guy, called me up and said, "Well, you've got it. Now, don't lose it!"

The FCC had not wanted to give me a license. But, after ten years my attorneys said, "Look, he's an American citizen; it's been ten years and, by your own rules, after ten years the slate's wiped clean. You can't deny him a license. You can't do it." Finally, the FCC said, "OK, we'll give him a chance."

They did, and so far, the Commission has been very good to me and WBCQ, they've been easy to get along with and I haven't had any problems with the FCC. We're doing our free speech thing and we've put hundreds and hundreds of people on the air and we're going to continue to do that. It's an absolute blast: real radios with transmitters and receivers, and it's a hell of a lot of fun.

But, getting the license was just the beginning of actually getting on the air. After I got the license, dad stepped in and put some cash on the line. We sold some property, raised some money, and I did pretty much what I did with all the stations; I found surplus and used equipment.

WBCQ dipole curtain array

Allan's Radio Nook

We bought old 50 kW AM broadcast transmitters and 50 kW military transmitters and converted them for shortwave broadcasting. We bought some commercial antenna systems. We built our own rhombic antenna; we bought a log periodic beam for the 7415 transmitter, and we bought surplus transmission line.

This is what I learned from building all those free radio stations: how to build an on-air presence cheaply. It just required a little bit more money at this scale. We bought everything used. We have no bank loans, no mortgages, we paid for everything with cash and that's the way I do it. That's the way I've always believed in doing it. Because a new 50 kW shortwave transmitter costs a half-million bucks and there's just no money for that, so we take a 50 kW medium wave broadcast transmitter and convert it for shortwave.

The big broadcast companies in the U.S. are always upgrading their equipment every ten or twenty years. That's a lot of transmitters on the market at any given time. Years ago I had to pay good money for a tube-fired 50 kW transmitter, but now they're hauling those off to the dump because they're being replaced with 50 kW solid state rigs.

We've bought a lot of surplus military 50 kW transmitters that the government had used for transoceanic traffic and we've modified all that for shortwave. I also have an AM station here in Monticello, Maine, (WXME-AM) 5 kW on 780 kHz and an FM station (WBCQ-FM) on 94.7 MHz and we've done the same with that; used transmitters, surplus equipment, and it works great.

I love the old, used gear because they're easier to repair; either we have the parts or we can make them, no "mystery boxes," no "mystery modules," no outrageously complicated digital stuff, it's basically all relay switches, vacuum tubes, hard-wiring: simple to operate and easy to repair.

While I hold the title of General Manager, my Chief Engineer is Tim Smith WA1HLR. He goes by "Timtron," and he's a famous AM amateur radio operator and a fascinating person, plus he is probably the greatest transmitter genius on the planet. This guy can take any kind of transmitter and not only make it work, but modify it, especially for broadcast use, for super high fidelity.

More Power!

As far as the future goes, I want to continue to improve the facilities. I would like to get more powerful transmitters here. I'd like to get some 100 and 200 kW sets on site and build our own power plant. Our next big project is to become as energy independent as we can. We want to be as green as we can, but if we can take one man's waste oil and burn it in a diesel generator to turn it into electrons, we'll do it. We have two wind turbines, but we run four shortwave transmitters and need hundreds of thousands of watts of energy.

Our budgets are tight because our expenses keep going up: taxes, fees, and especially electricity, which is double what it was when we signed on in 1998. It's our single biggest expense. If it weren't for the many semi-retired volunteers who do much of the work around here for nothing, we wouldn't be here.

Every time we turn on our shortwave transmitters we get new listeners. I get emails every day from people who "discovered" us, mainly our 7415 frequency because that one has the most diverse programming.

Radio will never die because it's cheap. You don't need any fees to listen and it ain't controlled by the government, yet! My wife Jennifer and I run this radio station as a real "mom and pop" station with a handful of volunteers who help us, and we've got individuals from around the world leasing time on our free speech voice. That's liberty, and that's what this country's about.

Tune in to WBCQ on 5.110, 7.415, 9.330 and 15.420 MHz. For schedules and more information about programming go to www.wbcq.com.

WBCQ entrance

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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www.signalharbor.com

Making Do with Tried and True

In this final month of the year I'll answer some questions about a couple of older scanners from users who may be hoping that Santa brings them something new under the tree. Until that happens, I'll try to give them some advice on how to get the most use out of what they already have.

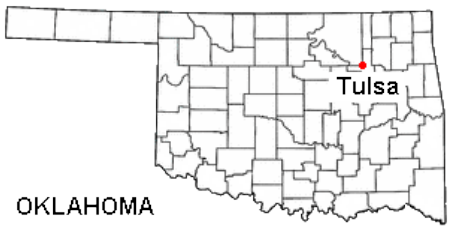
❖ Tulsa, Oklahoma

I use my Radio Shack Pro-94 scanner to know what is going on in the areas I am working. My scanner was set so I could just put in, let's say, 31024 (the south side police dispatch number in Tulsa) or 31248 (the north side number). Now, since my granddaughter got hold of the scanner, every time I put in my dispatch numbers I get an "ERROR" code.

I really know "zip" about scanners but have gone crazy trying to figure this out. I also took the scanner to Radio Shack and they don't know how to fix it either. The scanner is really useless to me now. I bought it specifically for the above reason. Help!

Grandfather in Oklahoma

Tulsa is the second-largest city in Oklahoma with nearly 400,000 residents. It is the county seat of Tulsa County, located in the northeastern portion of the State.



❖ Radio Shack PRO-94

The PRO-94 is a handheld analog trunking scanner introduced in October of 1999. There are also follow-on 'A' and 'B' models with a few additional features. The scanner is able to track Motorola and EDACS (Enhanced Digital Access Communications System) networks and can store up to 50 channels in each of 20 storage banks. The scanner can also store up to 50 talkgroup identifiers in each of five trunk scanning banks.

The [TRUNK] button in the upper right corner of the keypad switches between conventional and trunked scanning. To enter trunking mode, press [TRUNK] until the word "TRUNK" appears on the left-hand side of the display, then press the [Up-Arrow] button to see the Motorola systems – the bank numbers containing trunked Motorola frequencies will flash. At this point if you press the number key of the bank you want to scan (whichever bank you have programmed for the Tulsa system), then press [SRC], the scanner will search for an active control channel and begin trunking.

If you want to monitor a specific talkgroup ID, like 31024 or 31248 (these are decimal talkgroup identifiers, also listed below), follow these instructions:

1. While scanning in trunking mode, press the [HOLD A/B] button in the upper left-hand side of the keypad. The word "Hold" should appear on the display.
2. Enter the talkgroup ID using the number keys.
3. Press [HOLD A/B] again. The word "Hold" should flash and the scanner will monitor the talkgroup you just entered.
4. Press [SRC] to go back to trunked scanning.

There might also be an easier way to achieve your goal of scanning individual talkgroups. The PRO-94 has the ability to scan specific talkgroup IDs held in lists in the scanner. Each of the 20 channel banks in the scanner can be used to track trunked systems. When a bank is used in this way, the scanner sets up five lists that can contain as many as ten talkgroup IDs. You could, for instance, set up one list for talkgroups that are active on the north side of Tulsa and a second list for the south side. Then, when you travel to a work site, you can activate the appropriate scan list and deactivate the other. In this way you can monitor more than one talkgroup at a time without having to enter anything on the keypad.

The instructions for setting up scan lists involve a number of steps, each of which are explained in the manual beginning on page 53. If you can't find your manual or don't have one, you can always find one on the Internet. Radio Shack has manuals for most of their scanners, so go to **www.radioshack.com** and enter PRO-94 in the search box.

I know that reading manuals is not exactly the fun part of scanning, so it might be worthwhile looking at the "Easier to Read PRO-94 Scanner Manual" at **www.markscanners.com/94/94.shmtl**. You'll find instructions for different tasks organized in a different way from the official manual and perhaps the steps will make more sense to you. Mark has done this for a number of scanner models and his site has a number of links to additional scanning resources.

❖ Tulsa Trunked Radio

The State of Oklahoma and the City of Tulsa operate a Motorola trunked radio system that carries voice traffic in both analog and digital formats.

In Tulsa the system uses the following frequencies: 856.4625, 856.7625, 856.9375, 856.9625, 856.9875, 857.4625, 857.7625, 857.9375, 857.9625, 857.9875, 858.4625, 858.7375, 858.7625, 858.9375, 858.9625, 858.9875, 859.4625, 859.7375, 859.7625, 859.9375, 859.9625, 859.9875, 860.4625, 860.7375, 860.7625, 860.9375, 860.9625 and 860.9875.

Talkgroups in the Tulsa area include:

Decimal	Hex	Description
25904	653	City of Tulsa Police (Explorers)
26000	659	Tulsa City Hall (Maintenance)
26032	65B	Tulsa City Hall (Security)
26064	65D	Tulsa City Hall (Building Operations)
26096	65F	Tulsa County Probation Services
26128	661	Tulsa City Hall (Janitorial)
26224	667	Tulsa County Jail)
26256	669	Tulsa County Jail (Operations)
26288	66B	Tulsa County Jail
26320	66D	Tulsa County Jail (Maintenance)
26352	66F	Tulsa County Jail (Supervisors)
30736	781	City of Tulsa Police (East Dispatch)
30768	783	City of Tulsa Police (North)
30800	785	City of Tulsa Police (South Car-to-Car)
30832	787	City of Tulsa Police (Utilities)
30864	789	City of Tulsa Special Events
30896	78B	City of Tulsa Police (Utilities)
30928	78D	City of Tulsa Police (Utilities)
30960	78F	City of Tulsa Police Records
30992	791	City of Tulsa Police (Utilities)
31024	793	City of Tulsa Police (South Dispatch)
31056	795	City of Tulsa Police (Utilities)
31088	797	City of Tulsa Police (Utilities)
31120	799	City of Tulsa Police (Investigations)
31152	79B	City of Tulsa Police (East Tactical)
31184	79D	City of Tulsa Police (Utilities)
31216	79F	City of Tulsa Police Records
31248	7A1	City of Tulsa Police (North Dispatch)
31280	7A3	City of Tulsa Police (Street Crimes 1)

31312	7A5	City of Tulsa Police (South Tactical)
31344	7A7	City of Tulsa Police ("Teletype")
31376	7A9	City of Tulsa Police (Utilities)
31408	7AB	City of Tulsa Police (North Car-to-Car)
31440	7AD	City of Tulsa Police Street (Crimes 2)
31472	7AF	City of Tulsa Police (North Tactical)
31504	7B1	City of Tulsa Police (Utilities)
31536	7B3	City of Tulsa Police (Utilities)
31568	7B5	City of Tulsa Police Service
31600	7B7	City of Tulsa Police (South)
31632	7B9	City of Tulsa Police (East Car-to-Car)
31664	7BB	City of Tulsa Police (Street Crimes 3)
31760	7C1	State Mutual Aid A
31792	7C3	State Mutual Aid B
31824	7C5	State Mutual Aid C
31856	7C7	State Mutual Aid D
31888	7C9	State Mutual Aid E
31920	7CB	State Mutual Aid F
31952	7CD	State Mutual Aid G
31984	7CF	State Mutual Aid H
32016	7D1	State Mutual Aid I
32048	7D3	State Mutual Aid J
32080	7D5	State Mutual Aid K
32112	7D7	State Mutual Aid L
32144	7D9	State Mutual Aid M
32176	7DB	State Mutual Aid N
32208	7DD	State Mutual Aid O
32240	7DF	State Mutual Aid Announcements
32432	7EB	City of Tulsa Police Special Operations Team
33808	841	Tulsa County Sheriff (Tactical 2)
33840	843	Tulsa County Sheriff (Tactical 3)
33872	845	Tulsa County Sheriff Courthouse 1
33904	847	Tulsa County Sheriff Courthouse 2
33936	849	Tulsa Health Department 1
33968	84B	Tulsa Health Department 2
34000	84D	Tulsa Health Department 3
34064	851	Tulsa County Highway Maintenance District 1
34096	853	Tulsa County Highway Maintenance District 2
34128	855	Tulsa County Highway Maintenance District 3
34160	857	Tulsa County Highway Maintenance District 4
34320	861	Oklahoma Highway Patrol Troop B (Dispatch)
34352	863	Oklahoma Highway Patrol Troop B
34384	865	Oklahoma Highway Patrol Troop B (Supervisors)
34416	867	Oklahoma Highway Patrol Troop B Turnpikes 1 (Dispatch)
34448	869	Oklahoma Highway Patrol Troop B Turnpikes 2
34480	86B	Oklahoma Highway Patrol Troop B Turnpikes (Supervisors)
35344	8A1	Tulsa Airport Authority Channel 1
35376	8A3	Tulsa Airport Authority Channel 2
35408	8A5	Tulsa Airport Authority Channel 3
35440	8A7	Tulsa Airport Authority Channel 4
35472	8A9	Tulsa Airport Authority Channel 5
35504	8AB	Tulsa Airport Authority Channel 6
35856	8C1	City of Tulsa Fire Dispatch (Dispatch)
35888	8C3	City of Tulsa Fire (Non-Emergency Dispatch)
35920	8C5	City of Tulsa Fire (District 1 Tactical)
35952	8C7	City of Tulsa Fire (District 2 Tactical)
35984	8C9	City of Tulsa Fire (District 3 Tactical)
36016	8CB	City of Tulsa Fire (District 4 Tactical)
36048	8CD	City of Tulsa Fire (District 5 Tactical)
36080	8CF	City of Tulsa Fire (Hazardous Materials)
36112	8D1	Tulsa Fire (Airport)
36144	8D3	City of Tulsa Fire (Radio Technicians)
36176	8D5	City of Tulsa Fire Rescue Task Force
36208	8D7	City of Tulsa Fire (Training)
36240	8D9	City of Tulsa Fire Staff
36272	8DB	City of Tulsa Fire Administration
36304	8DD	City of Tulsa Fire Investigators
36368	8E1	Metropolitan Tulsa Transit Authority 1
36400	8E3	Metropolitan Tulsa Transit Authority 2
36432	8E5	Metropolitan Tulsa Transit Authority 3
36624	8F1	Tulsa Zoo
36880	901	City Tulsa Fire Training
36912	903	City of Tulsa Fire Training (District 1)
36944	905	City of Tulsa Fire Training (District 2)
36976	907	City of Tulsa Fire Training (District 3)
37008	909	City of Tulsa Fire Training (District 4)
37040	90B	City of Tulsa Fire Training (District 5)
37264	919	City of Tulsa Fire Administration 1
37296	91B	City of Tulsa Fire Administration 2
37328	91D	City of Tulsa Fire Administration 3
37552	92B	Tulsa County Jail (Visitation)
37776	939	Tulsa Convention Center 1
37808	93B	Tulsa Convention Center 2
37840	93D	Tulsa Convention Center 3
38032	949	Olahoma Civil Emergency Management Agency
38064	94B	Tulsa Area Emergency Management Agency 1
38096	94D	Tulsa Area Emergency Management Agency 2
38128	94F	Tulsa Area Emergency Management Agency 3
38592	96C	Tulsa County District Attorney
38704	973	Tulsa Mayor's Office
38736	975	Tulsa County District Attorney
38768	977	Attorney General
38832	97B	Tulsa Code Enforcement 1
38864	97D	Tulsa Code Enforcement 2
39056	989	Tulsa Parks and Recreation 1
39088	98B	Tulsa Parks and Recreation 2
39184	991	Tulsa River Parks Authority 1
39216	993	Tulsa River Parks Authority 2
39248	995	Tulsa River Parks Authority 3
39696	9B1	Tulsa Equipment Management (East Yard)
39728	9B3	Tulsa Equipment Management (West Yard)
39760	9B5	Tulsa Equipment Management (Fuel Islands)
39792	9B7	Tulsa Equipment Management (Operations)
39824	9B9	Tulsa Equipment Management (Administration)
39952	9C1	Tulsa Public Works (Building Inspections)
39984	9C3	Tulsa Public Works (Quality Assurance)
40016	9C5	Tulsa Public Works (Engineering)
40048	9C7	Tulsa Public Works (Street Maintenance)
40112	9CB	Tulsa Public Works (Building Maintenance)
40144	9CD	Tulsa Public Works (Security and Administration)
40176	9CF	Tulsa Public Works (Customer Service)
40080	9C9	Tulsa Public Works (Traffic Engineering 1)
40240	9D3	Tulsa Public Works (Traffic Engineering 2)
40432	9DF	Tulsa Public Works (Supervisors)
40464	9E1	Tulsa Public Works (Garbage Collection)
40496	9E3	Tulsa Public Works (Water Department)
40528	9E5	Tulsa Public Works (Storm Drainage)
40560	9E7	Tulsa Public Works (District Operations)

40592	9E9	Tulsa Public Works (Water Department)
40624	9EB	Tulsa Public Works (District Support)
40656	9ED	Tulsa Public Works (Waste Systems)
40688	9EF	Tulsa Public Works (Water Department)
40976	A01	Tulsa County Sheriff (Dispatch)
41008	A03	Tulsa County Sheriff
41040	A05	Tulsa County Sheriff Car to Car
41072	A07	Tulsa County Sheriff (Tactical 1)
41104	A09	Tulsa County Sheriff Special Operations Team 1
41136	A0B	Tulsa County Sheriff Special Operations Team 2
41968	A3F	Oklahoma Highway Patrol (Statewide Dispatch)
42000	A41	Oklahoma Highway Patrol 2 (Statewide)
42032	A43	Oklahoma Highway Patrol Supervisors (Statewide)
42832	A75	State Emergency Management 1
42864	A77	State Emergency Management 2
42896	A79	State Emergency Management 3 (simulcast 155.235 MHz)
42928	A7B	State Emergency Management 4
42960	A7D	State Emergency Management 5
42992	A7F	State Emergency Management 6
43024	A81	State Emergency Management 7
45360	B13	Department of Corrections Prisoner Transport
46000	B3B	State Law Enforcement (Tulsa Area) Warrant Service
46256	B4B	Prison Fugitive Apprehension
57840	E1F	Tulsa Public Works (Security and Administration)

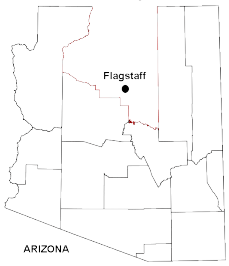
❖ Flagstaff, Arizona

Hey Dan,

I found your column very interesting. I have been scanning in my small town for a while now, but we're all still on 150 MHz systems. In short, I have an old school Realistic PRO-2022 (before trunking). I'm leaving for college in Flagstaff soon, and can't afford a new scanner. The problem is, i need Flagstaff police, but they're running a trunked 800 MHz system. How do I make my old school scanner work with this?

Thanks!
Nathan in Arizona

Flagstaff is a city of about 60,000 located in northern Arizona. Northern Arizona University is located there and is close to such tourist attractions as the Grand Canyon, Meteor Crater and Route 66. Flagstaff is the county seat of Coconino County, which covers an area of more than 18,000 square miles, making it the second largest county in the continental United States and larger than nine states.



The PRO-2022 is a desktop scanner from the mid-1990s that covers 30-54 MHz, 108 to 174 MHz, 380 to 470 MHz, and 806 to 960 MHz (less cellular). It is very easy to program and has a good reputation, but as Nathan notes, it does not trunk-track at all. It is limited to conventional scanning across a maximum of 200 channels.

❖ Conventional Scanning of a Trunked System

Most trunked systems have a dedicated control channel that is used to instruct radios where to tune in order to participate in a conversation. The conversation may "jump" from one frequency to another as different users take turns speaking, making it difficult to follow with a conventional scanner. Because several conversations may be going on at the same time, scanning the voice frequencies in order will give you "snippets" of each person talking.

For instance, say that we're monitoring a trunked system with three voice channels and that all of them are idle when we start monitoring with a conventional scanner. The scanner will check each channel in turn, listening for activity and moving on when it finds none. At some point a police officer starts using the trunked system on voice channel 1. The scanner will stop on channel one and begin passing the audio to the speaker. While that officer is speaking, a maintenance worker across town wants to talk, so the trunk system assigns him to channel 2, since channel 1 is busy. When the officer on channel 1 stops speaking, the scanner resumes checking each channel and immediately stops on channel two, allowing you to hear the maintenance worker in mid-sentence. Meanwhile, the dispatcher answers the police officer on channel 1 or channel 3, and you miss the response. By the time the maintenance worker stops talking and your scanner resumes checking channels, the dispatcher has moved on to another call and you've missed a second officer's transmission. And so on.

However, on a small system that is not very busy, perhaps like a University trunked system early on a Sunday morning, there may not be much radio traffic and a conventional scanner can keep up with the one conversation occurring on the system.

❖ Northern Arizona University

Northern Arizona University operates a Motorola Type II trunked radio system on six frequencies. Three of them are identified as control channels, specifically 857.2125, 857.9875 and 859.4375 MHz. The other three, 855.2125, 856.2125 and 858.9875 MHz, are voice channels. If you're attempting to use a conventional scanner to monitor this system, program in all six channels and lock out the active control channel (the one that sounds like a buzz saw). Keep in mind that the control channel may change every 24 hours, so you'll need to lock out the new control channel and unlock the old one when that happens.

NORTHERN ARIZONA UNIVERSITY

Decimal	Hex	Description
1616	065	Northern Arizona University Police (Dispatch)
1648	067	Northern Arizona University Police
1680	069	Northern Arizona University Police
1712	06B	Northern Arizona University Police
1744	06D	Northern Arizona University Police
1776	06F	Northern Arizona University Police
3216	0C9	Northern Arizona University Parking
4816	12D	Northern Arizona University Transportation
6448	193	Northern Arizona University Maintenance
6480	195	Northern Arizona University Maintenance
6544	199	Northern Arizona University General Services
6608	19D	Northern Arizona University General Services
9712	25F	Flagstaff Police (Records)
9904	26B	Flagstaff Police (Special Events)
9936	26D	Flagstaff Police (Dispatch)
11248	2BF	Flagstaff Streets Maintenance

There is also a six-channel Motorola trunked system operated by the City of Flagstaff on the following voice channels: 854.9625, 857.7375, 858.4875 and 860.4375 MHz. Two frequencies are identified as control channels: 856.7375 and 858.7375 MHz.

Decimal	Hex	Description
3216	0C9	Police (Dispatch)
3248	0CB	Police (Records)
3280	0CD	Police (Tactical)
3312	0CF	Police (Special Events)
3344	0D1	Police (Car-to-Car)

Even though monitoring these trunked systems might be frustrating with the PRO-2022, there are a number of conventional frequencies in operation around the Flagstaff area.

Frequency	Description
152.285	EMS Helicopter to Flagstaff Medical Center
152.315	Summit Fire District
152.435	Highlands Fire Department
153.935	Flagstaff Fire and Emergency Medical Services (Dispatch)
154.100	Flagstaff Fire Department Crew 1
154.175	Flagstaff Fire Department (South)
154.220	Fireground
154.280	Fire (Mutual Aid)
154.310	Pinewood/Sedona Fire Departments
155.130	County Jail
155.325	Guardian Medical Transport
155.490	County Sheriff
155.550	Flagstaff Streets Department
155.640	Flagstaff Streets Department
155.745	Flagstaff Fire Department (Fire Dispatch)
155.790	Emergency Medical Services
155.835	County Sheriff (Dispatch)
155.880	Flagstaff Streets Department (Snow Plows)
155.940	County Probation Department
156.210	Flagstaff Fire Department Logistics
171.550	United States Forest Service (Fire Dispatch)
463.000	County Emergency Medical Services (Dispatch)

That's all for this month and this year. As always, send comments, corrections, new finds and tips to *danveeneman@monitoringtimes.com* and check my web site at **www.signalharbor.com** for more frequencies and scanner information. Until next month, have a Merry Christmas and a happy, peaceful New Year.

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *I have my shortwave portable radio audio feeding my laptop computer to make recordings, but they are badly distorted. Both are battery operated. What could be the problem? (Ted, email)*

A. You shouldn't have such a problem if you are using well-shielded cable, stereo plugs on each end, reasonably-close impedance matching, and the audio output from the radio isn't overdriving the input on your computer.

Q. *Is VOA still heard on the shortwave frequencies? Are there still domestic transmitter sites? (J.J. Owens, NC)*

A. With shrinking economic support and increased satellite distribution, the Voice of America (VOA) is not as prevalent on shortwave as it was in the past. Former U.S. sites like Delano, CA, Dixon, CA, and Bethany, OH have already been closed. Greenville, NC hosts the last remaining domestic VOA site, and it's facing imminent closure due to federal budget cuts.

You can see their currently-reported frequencies and schedules right here in the pages of the *MT* Shortwave Guide.

Q. *Using the D-Star wireless Internet connection to communicate via ham radio between Florida and North Carolina, would this be considered skip? (Bill, email)*

A. The term "skip" refers to a phenomenon in which the straight, horizontal path of a transmitted signal gradually leaves the distant horizon, eventually hits the ionosphere, and then bounces back, skipping over the surface between those two points.

D-Star simply receives the local, low-power signal from a VHF or UHF handy-talkie and feeds it point-to-point through Internet wired routing. In this regards, then, since the actual VHF or UHF RF signal never left the earth's surface environment or bounced off the ionosphere, no, regardless of the distance between, skip did not occur.

Q. *What type of antenna is used for submerged U.S. submarines to receive very low frequency (VLF) signals, and where are these transmissions sent from? (J.J.O.)*

A. When a submarine is surfaced, it uses conventional antennas including short, tuned verticals, patches, and dishes for two-way communications. Frequencies throughout the spectrum from VLF to microwave are employed for ship to shore, ship to ship, ship to air, and satellite comms.

When submerged, it's a different story. Seawater can only be penetrated a few feet by normal radio frequencies – the lower the frequency, the deeper the signal can be received from ground stations. Command instructions are received by a buoyed antenna which may remain just below the surface to avoid detection. Trailing cable antennas are also employed.

The primary U.S. Navy VLF station is NAA located at Cutler, ME and running nearly two million watts of power at 24 kHz.

The former extremely low frequency Project Sanguine was replaced by Seafarer (Project ELF) operating on 76 Hz. Transmitting stations were built at Clam Lake, WI and Republic, MI. Submarines did not transmit back. That system, with its 32 mile antenna, was dismantled in 2004, but the Russian ZEVS ELF system (82 Hz) is still in use.

Q. *What is the closest practical spacing between antennas to minimize interaction? Does it matter whether they are passive or active antennas? (John A. Sullivan, Carlisle, IN)*

A. The general rule of thumb in separating parallel antennas is that they should be no closer than 1/4 wavelength at the frequency of interest, otherwise they have a "beaming" affect on the pattern, both for receiving as well as transmitting.

Their relative physical lengths are also important. If they are similar in size (within a few percent, or a whole-number multiple of that length), there will be more pattern skewing than if they aren't.

It doesn't make any difference whether the antennas are active or not, only the physical wavelength relationships of the element itself will affect the reception (or transmission) pattern.

The quarter-wavelength effect is more noticeable the higher in frequency you go, because the wavelengths grow shorter and the masses of interactive metal occupy a greater percentage of that smaller environment.

Q. *In your series on antennas, you said that it's best to attach the coax lead-in to the end of a random wire antenna that's under 40 feet in length, but to the center of the wire (divided by an insulator, and center conductor to one side, shield to the other) if it's longer (40-150 feet). What's the rationale for this? (Bob Gorsch, Concord, CA)*

A. It really doesn't make a lot of difference, but it's a question of impedance matching. At shortwave frequencies, a short wire (that's the arbitrary "under 40 feet") will have a closer impedance match to the 50-70 ohm coax at the end of the wire. Much longer, and the impedance gets higher and higher on the end of the wire. For receiving purposes, you'd probably never hear the difference either way you attach it.

Q. *What characteristics make a "superheterodyne" receiver? (John Bishop, Hawthorne, FL)*

A. Edwin Armstrong invented the heterodyne, the mixing of the incoming radio frequency with an oscillator to produce two products, one higher and one lower in frequency (the sum and the difference of the two frequencies). The lower frequency was chosen for detection since it was much easier to design.

This frequency conversion scheme was an improvement over the earlier neutrodyne, or tuned radio frequency (TRF) receiver, which consisted simply of several RF amplification stages in series.

Armstrong's upgrade, the superheterodyne, followed the frequency conversion with amplification in the successive stages (intermediate frequency or IF). Not long after that, an RF amplifier was added before the mixer for greater sensitivity.

A later variation of the superheterodyne was the autodyne, which employed a pentode (five element) tube which could oscillate as well as convert the incoming signal in the same stage.

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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http://mt-utility.blogspot.com

Wired Radio: Using Remote Internet Receivers

Lately we've been seeing quite a few loggings that our contributors have actually made via someone else's radio. This is done by tuning and receiving signals via the Internet. Once again, this suggests that terrestrial radio and computer networking are not really in competition over the same tasks. They are both evolving toward a future with plenty of room for both.

Obviously a distant station (DX) catch made partially over wires can't count toward one's own utility accomplishments. However, it does provide the first chance to actually hear some of the utility stations that will never propagate to one's own area.

Out here, on the U.S. West Coast, night time propagation often favors regions inhabited mostly by fish. Many an otherwise dull night has been livened up by searching busy European frequencies. It's one thing to spend years reading about all the action over there, but quite another to finally get to hear some.

Radios that are available for remote use on the World Wide Web come in two types. First is the SDR. This stands for Software-Defined Radio. Typically, a simplified radio-frequency (RF) front end captures a band of 500 to maybe 2000 kilohertz (kHz). This goes directly into a computer or dedicated device as one big lump. Code running on the machine emulates such functions as filters, mixers, and detectors.

The military has been very high on the SDR concept, due to its flexibility in changing "waveforms" quickly. For us, though, it's more like a giant RF version of the audio "waterfall" displays we're all used to. One clicks an interesting-looking signal, sets the filter selectivity for the best streaming audio, and attacks it with the appropriate software to decipher it.

The best example of this approach is the WebSDR, coming from a university ham radio club in the Netherlands. It's at **websdr.ewi.utwente.nl:8901/**

The same site also has links to several other very interesting SDRs. Most are also operated by ham clubs, and so amateur frequencies dominate. However, some regional utility bands with deliberately restricted coverage are also available. Your editor has nailed a lot of European Navtex (NAVigational TELex) on 490 and 518 kHz this way.

Another approach to remote radio tuning is the GlobalTuners system. It is at **www.globaltuners.com**. Its user interface looks like a virtual radio panel, with all the knobs and numbers we're used to. These operate a standard, analog radio at the other end. Again, audio streams come to the listener's computer.

GlobalTuners has a far-flung and interesting range of receivers, all of which have been made available by dedicated radio hobbyists. Some radios tune utility bands, while others specialize on things like air traffic control chatter or broadcast DX.

Accounts are free of cost. The first two weeks are probationary, until it's clear the user plays well with others.

So, there's the big difference. SDRs allow, in fact encourage, multiple listeners at once. Setups like GlobalTuners are one at a time. The trade-off is that GlobalTuners have many more frequency choices, plus a chat box that invites interesting shop talk with other radio fans.

In either case, it is absolutely necessary, not to mention just common courtesy, to read up on system etiquette and rules first. You're a guest on someone else's equipment. Good hunting!

❖ UVB-76 Mystery Continues

A couple of weeks ago (as this is being written), everyone thought the strangeness on 4625 kHz had ended. After all, the traditional "Buzzer" had come back, as if nothing had happened. It had the same weird noise, the same suppressed lower sideband, and even the same multi-frequency spurious signals.

Well, everyone was wrong. The buzzing stopped, and everything got weird again. There have been new voice messages, more off-frequency Morse code, and the usual run of likely pirate activity. This includes totally unauthorized broadcast relays, Russian music, and just plain weirdness.

In the past month, however, there have been at least 21 legitimate voice messages. Contrast this to the three that were heard in the station's previous *28 years* of operation. It's easy to conclude that the Russian military has greatly increased its use of this frequency.

Also, it seems likely that either two stations are now using the frequency, or that UVB-76 has switched to a tactical callsign. This call, sent at the beginning of all but one message, is "MDZhB." The "Zh" is a single character in the Russian Cyrillic alphabet, when it's mapped to our English alphabet. Cyrillic appears frequently in the Russian four-letter tactical calls.

The other possibilities, of course, are these: UVB-76 was never the call sign; MDZhB is now the call sign; or there is no static call sign at all. It's too soon to say.

Regardless of what's really going on, the most recent voice message used a very familiar format. It went as follows: "MDZhB. 73 557. Boris, Roman, Olga, Nikolai, Zinaida, Ivan, Tatjana. 2583." The female Russian speaker read the "557" as one number (five hundred fifty seven) instead of a string of figures.

The series of names in the middle is undoubtedly the code word BRONZIT, spelled from a slightly variant list of Russian radio phonetics. This is normal. This particular format has been around long enough to get the S28 designation from the European Numbers Information Gathering and Monitoring Association (ENIGMA).

Two Morse code signals continue to be heard clearly. Both are actually different frequencies and stations, though the low-pitched one used 4625 kHz for a few days while The Buzzer was silent. This one is a Russian military tactical net which has been on for years. The control station uses the standard four-figure changing identifiers. It runs roll calls of similar stations, which are never heard. They are probably transmitting "duplex" on an unknown frequency. This net's real frequency is actually 4626 kHz, continuous wave (CW).

The high pitched signal, which transmits once per minute, is an automated target tracking string from the Russian Air Defense. It begins with the standard short-break sign (BT, sent together), then a formatted string of characters. Four of these are a local time stamp (Moscow time). It is also CW, on 4628.1 kHz. It, too, has been around for many years.

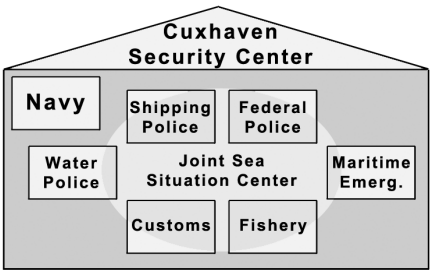
Neither of these networks is affiliated with S28, The Buzzer, or any other weirdness actually coming from UVB-76. Many thanks go to Ary Boender, of *Numbers & Oddities*, for his major contribution in sorting out all this bizarre stuff.

❖ German Water Police

Last month, we made brief mention of a German law enforcement agency called the *Wasserschutzpolizei*, or Water Security Police (WSP). Units of this agency have been heard using Automatic Link Establishment (ALE) linking protocols on frequencies also assigned to the German customs ("*Zoll*") service.

The Water Police are part of the German State Police (*Landespolizei*). All but one state in the Federal Republic has them. They are responsible for inland waterways, rivers, and the coast out to 12 nautical miles. At that distance, responsibility shifts to the Offshore Security division of the Federal Police (*Bundespolizei*).

Maritime Security Center Network



WSP vessels range in size from 34 down to 13 meters in length. All are sophisticated, high speed vessels, and the larger ones can launch agile inflatable rafts. Since some of these larger vessels have responsibilities in the North Sea and Baltic waters, they occasionally display the large *Küstenwache* ("Coast Guard") livery on the side of their hulls. Others only have a *Polizei* ("Police") sign higher up on the wheelhouse.

The coastal state WSP branches participate in the Cuxhaven Maritime Safety Center, along with the Federal agencies. This is why we are hearing them on HF ALE.

We now have some more hits from this agency, and some better identification of old ones. Let's start with the old ones. The ALE identifiers WSPAN and NDSWSPOL turn out to be the same station. WSPAN is an old call used by the Lower Saxony line patrol headquarters in Oldenburg. NDSWSPOL is the new one, short for *Niedersachsen Wasserschutzpolizei*.

Similarly, W03 is an old call, and has been changed to just W3. It refers to a patrol boat, the *Wasserschutzpolizei 3*.

German Water Police boats have been known to recycle the same names, leading to confusion. For example, there's the neighboring German state of Schleswig-Holstein, also heard on HF ALE. Its identifiers are constructed from

"SH" plus the vessel name. SHSYLT is the big, new patrol boat *Sylt*, replacing a previous vessel with this name. Similarly, SHFALSHFT is the new iteration of the *Falshöft*. Their international call signs are DF5118 and DB4330.

Hopefully we'll keep seeing new ALE catches from this interesting agency. Have a good holiday!

ABBREVIATIONS USED IN THIS COLUMN

ALE .....Automatic Link Establishment
AM.....Amplitude Modulation
AWACS .....Airborne Warning and Control System
BOM.....Australian Bureau Of Meteorology
COTHEN.....US Customs Over-The-Horizon Enforcement Network
CW.....On-off keyed "Continuous Wave" Morse telegraphy
DHFCS.....UK Defence High Frequency Communications Service
DSC.....Digital Selective Calling
E10.....Israeli female phonetic voice, 5-letter groups
FAX.....Radiofacsimile
G11.....German version of "Strich" family
HFDL .....High-Frequency Data Link
HF-GCS .....High-Frequency Global Communication System
LDOC .....Long-Distance Operational Control
M51.....French Morse code training net, 5-letter groups
M89.....Chinese military, 4-figure changing CW calls
MARS.....US Military Auxiliary Radio System
MCW .....Modulated CW, full AM or with tone
MFA.....Ministry of Foreign Affairs
MX.....Generic for Russian single-letter CW beacons/markers
NAT .....North Atlantic air route control, families A-F
PACTOR .....Packet Teleprinting Over Radio, modes I through III
RTTY .....Radio Teletype
Selcal.....Selective Calling
SITOR.....Simplex Telex Over Radio, modes A & B
UK.....United Kingdom
Unid .....Unidentified
US .....United States
USAF.....US Air Force
USCG .....US Coast Guard
V13.....New Star, music and female w/ Chinese numbers
VOLMET.....Aviation weather broadcasts ("Flying Weather").
XB.....Russian Buzzer, marker for UVB76, aka S28
XUP.....Mystery Pulser, 43.75 millisecond length

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 ().

198.0 DIW-Non-directional aero beacon, Dixon, NC, identifying in MCW at 0313 (Prez-MD).
2311.0 Arklow-Arklow Shipping, Europe, working vessel *Arklow Rebel*, daily check in at 0718 (Michel Lacroix-France).
3297.0 Q7NW-Chinese CW military net (M89), calling GKVZ at 1504 (Ary Boender-Hong Kong) *[HK GlobalTuner. -Hugh]*.
4100.0 Unid-Two males at sea, chewing the rag in Spanish, at 0139 (Prez-MD).
4146.0 Unid-Two males at sea, shop talk and weather complaints, at 0430 (Prez-MD).
4225.0 QV5B-Chinese military CW tactical net (M89), calling 7NPE, parallel on 5500, at 1500 (Boender-Hong Kong).
4360.0 Unid-Two males on fishing boats, shop talk and salty language, at 0436 (Prez-MD).
4380.0 Unid-Several males, discussing boat problem in Spanish, at 0145 (Prez-MD).
4532.0 UN2T-M89, calling JA3L, CW at 1505 (Boender-Hong Kong).
4601.5 OA Haulbowline-Irish Navy, SITOR-A with vessel at 1908 (Lacroix-France).
4618.0 ZLST-German Customs Control Center, Cuxhaven, calling BMEK (Fishery Protection Vessel *Meerkatze*), ALE at 1928 (PPA-Netherlands).
4625.0 F6J6-Russian military CW tactical net, checking in QFZM, at 2204 and 2210 (Boender-Netherlands) *[During one of Buzzer's outages. -Hugh]*.
4626.0 FINQ-Russian military, daily CW tactical net, radio checks with VSJX, KMMN, 8OB5, E4LU, six others, at 1900 (Hugh Stegman-Russia) *[On Internet remote. Net freq when "Buzzer" is up. -Hugh]*.
4628.1 Unid Russian Air Defense, Moscow sector, formatted CW target datagrams with embedded local time, at 1900 (Stegman-Russia).
5081.0 RDA97-Russian Navy, calling RMP (Baltic Fleet headquarters, Kaliningrad), CW at 0251 (ALF-Germany).
5110.0 VJI-Royal Flying Doctor Service, Queensland, Australia, station announcements at 0913 (Eddy Waters-Australia).
5153.7 "D"-Russian Navy cluster beacon (MX), Odessa/ Sevastopol, CW identifier at 1650 (MPJ-UK).
5153.9 "S"-MX, Severomorsk, CW identifier at 1650 (MPJ-UK).
5195.0 DRA5-KielRadio, Germany, RTTY solar forecast at 0618 (Lacroix-France).
5207.5 SAT-Unknown, ALE soundings and modem traffic with F15, also on 5829 and 6808.5, at 1315 (ALF-Germany).
5310.0 WOXN-M89, calling QPZM, parallel on 7833, CW at 1510 (Boender-Hong Kong).
5424.0 Unid-Commonwealth of Independent States, RTTY traffic in 5-figure groups and signing "NIL SK," at 0945 (ALF-Germany).
5526.0 Cayenne-South American air route control, French Guiana, position from an Air France flight in French, at 0159 (Prez-MD).
5583.0 002-Unknown, link check with ALETEST and 001; also on 6338, 6537, 7662, and 7943; ALE at 0118 (ALF-Germany).
5598.0 IRA100-IranAir Flight, position for Santa Maria, at 0147 (ALF-Germany).
5616.0 Gander-NAT-B, Newfoundland, position from Reach 563, USAF Air Mobility Command, at 0115 (Allan Stern-FL).
5652.0 "04"-HFDL ground station, Riverhead, NY, working G-DHLE (DHL Air, B767 freighter), and N948AC (Avianca A330), at 0612 (Lacroix-France).
5720.0 Navy Prestwick-UK Royal Navy, Prestwick, Scotland, working vessel "T-0-D," at 1255 (ALF-Germany).
5746.0 Unid-French Morse code practice net (M51), Favieres/Vernon, USB open mike room noises mixing with usual CW practice groups, at 0947 (ALF-Germany).
5750.0 MTX-Unknown net, calling MTK, ODI, QSN, SUF, ALG, and ALM; all no joy, ALE at 2014 (PPA-Netherlands).
6292.0 Unid-Unknown Ukrainian vessel, position for unknown shore station, CW at 0435 (ALF-Germany).
6300.0 MTX-Georgian military, ALE link checks with ALG, ALM, ARG, GLT, GRM, MTK, and ODI, at 0413 (ALF-Germany).
6324.0 RGR35-Russian Navy vessel, came from 6838 for modem traffic with RMP, at 1005 (ALF-Germany).
6362.0 MGJ-UK DHFCS, Forest Moor, RTTY channel availability marker, at 1657 (MPJ-UK).
6391.0 AQP2-Pakistani Navy, Karachi, CW marker at 0139 (ALF-Germany).
6467.0 VTG5-Indian Navy, Mumbai, CW marker at 0134 (ALF-Germany).
6496.4 CFH-Canadian Forces, Halifax, NS, poor FAX chart at 0615 (Lacroix-France).
6510.0 GWPWIN-Brazil Navy Frigate *Independencia*, ALE link check with GWPWF33 (Fortaleza Naval Radio), at 2239 (ALF-Germany).
6512.5 On/Off-Keyed Oddity-New CW signal with random switching on and off, tends to broaden out and move around, also 6946, at 2036 (MPJ-UK).
6521.5 RLD67-Russian Navy vessel, working RCV (Black Sea headquarters, Sevastopol), CW at 0410 (ALF-Germany).
6535.0 Dakar-African air control, Senegal, selcal AG-MJ and position with an Air France flight, at 0215 (Prez-MD).
6577.0 Santa Barbara 1224-Santa Barbara Airlines, Venezuela, position for Piarco at 0448 (ALF-Germany).
6638.7 FB2-French "Echo Charlie" band pirate, CW with unknown station at 1237 (ALF-Germany).

6640.0 New York-Atlantic LDOC, weather for Ascot 6839, UK Royal Air Force C-17A, came from 8933 at 2146 (Stern-FL).

6649.0 BRK 159-Briansk State Air Enterprise flight (Russia), position for Atlantico, Brazilian South Atlantic control, at 0412 (ALF-Germany).

6673.0 San Francisco-East Pacific oceanic air control, position from Alaska Airlines 859, at 0218 (Prez-MD).

6690.0 DHN66-North Atlantic Treaty Organization, Germany, voice orderwire traffic for RTTY setup with Magic 82, an E-3D AWACS back end, at 0940 (ALF-Germany).

6701.0 Unid-Religious Muslim talks and Quran readings in Arabic, at 0332 (ALF-Germany).

6733.0 Snapshot 01-UK Royal Air Force intelligence aircraft, a Bombardier BD-700-1A10 Sentinel R1, patch to Waddington via TASCOMM (UK Tactical Air-Sea Comm, Forest Moor), at 0940 (ALF-Germany).

6745.0 202E3F-French Air Force E-3F AWACS, ALE link check with ground station MOBE3F, then voice in French as "202," at 0948 (ALF-Germany).

6821.0 K21-Unknown net, raises J02 in ALE, followed by 22-tone data modem exchanges, also uses 6926.5 and 6973, at 1834 (PPA-Netherlands).

6826.0 Unid-Middle Eastern stations chattering in Arabic, using "Roger" beeps, at 2255 (ALF-Germany).

6838.0 RMP-Russian Navy, Kaliningrad, CW orderwire for a data link on 6324, at 1003 (ALF-Germany).

6840.0 E10, Israeli intelligence, AM numbers in progress, at 1847 (Lacroix-France).

6851.7 PRV-Unlicensed CW beacon, Preveza, Greece, identifying at 2145 (ALF-Germany).

6884.0 HQ3-Libyan Great Man-Made River Authority, Tripoli, calling GHADAMES, also using 10375, ALE at 1918 (PPA-Netherlands).

6957.0 Unid-German Red Cross, calling DEK26 (Düsseldorf), DEK8810 (Berlin mobile), DEK30 (Quickborn), DEK31 (Munich), and DEK3110 (Munich mobile), PACTOR-I at 0910 (ALF-Germany).

6967.5 ICI-Italian Coast Guard, Rome, working Nemo 02, at 1336 (ALF-Germany).

6989.0 RAL2-Russian military, CW radio checks with RIB2 and RHQ2, at 1809 (PPA-Netherlands).

6992.5 MFM01-UK Sea Cadet Corps, Northern Area, working PHAS in voice and CW, at 1933 (PPA-Netherlands).

6995.0 5GXS-Unknown exercise Combined Endeavor 2010 player, voice with EK7B, then ALE to CROATIA2, at 0935 (ALF-Germany).

6998.0 HWK7-"The Crazy Italian Pirate," CW marker only, at 1444 (ALF-Germany).

7000.0 NPABOC-Brazilian Navy, River Patrol Vessel *Bocaina,* SITOR-B plain text traffic in Portuguese for Amazon River forces, at 0030. MORCEGO-Brazilian military, working ARARA, ALE and data modem, at 2300 (DL8AAM-Germany).

7521.3 Unid-Swedish Volunteer Radio Organization, calling F00HAA (headquarters), PACTOR-I at 1410 (ALF-Germany).

7548.5 Unid-Australian military, encrypted message in 600/600 RTTY, also on 8458.5, 8555.5, 10405.5, 12810.5, and 13438.5; at 1157 (Waters-Australia).

7633.5 AFA5QW-USAF MARS, attempting patch from USAF Air Mobility Command Reach 472, came from 13927, at 2256 (Stern-FL).

7726.0 APM-Chilean Navy. Link check and text message with CA2, also on 8042, 8096, at 0036 (ALF-Germany).

7735.0 L11-Unknown net, calling L12, ALE at 1902. L12, calling L13, ALE at 1920 (PPA-Netherlands).

7759.7 Unid-Egyptian MFA, Cairo, SITOR-A selcal TVVX (Algiers embassy), at 2023 (PPA-Netherlands).

7833.0 WOXN-M89, calling QPZM, CW at 1500 (Boender-Hong Kong).

8000.0 U3-Possible, Brazilian Navy, traffic in Portuguese at 0411 (ALF-Germany).

8082.0 YW6-Unknown, calling TXZ6, also on 8163, ALE at 1200 (Waters-Australia).

8190.0 TARANTO-Italian Financial Police, calling CALABRESE, ALE at 1738 (PPA-Netherlands).

8414.5 003669998-USCG Communication Station NMG, New Orleans, LA, DSC call to 636091993 (vessel *Consul Poppe*, A8VE7), at 1904 (PPA-Netherlands).

8419.0 WLO-ShipCom, AL, SITOR-B news bulletin at 0624 (Lacroix-France).

8424.0 SVO-Olympia Radio, Greece, SITOR-B news in Greek, at 0626 (Lacroix-France).

8765.0 MORTON25-Polish Army, raised WATFORD87 in ALE, then voice as MO5 working WA7 (in English), at 2006 (PPA-Netherlands).

8785.0 N26-Unknown, calling A16, ALE at 1942 (PPA-Netherlands).

8810.5 LBJ-Norwegian military headquarters, Bodo, calling KLV, ALE at 1926 (PPA-Netherlands).

8829.0 Ankara-Turkish Airlines ground station on company LDOC, selcalling ER-HK to TC-JPL, an A330, then voice in Turkish, at 2012 (PPA-Netherlands).

8864.0 Gander-NAT-B, Canada, selcal EM-LP to USAF Reach 576, a C-17A Globemaster III, at 1921 (PPA-Netherlands).

8879.0 Express India 435-Air India Express B737, registration VT-AXD, selcalled AR-CE from unknown ground station, at 1625 (Privat-France).

8888.0 Syktyvkar-Russian Volmet "C" net, aviation weather in Russian at 0120. Luanda-African air control, Angola, position with Springbok 236, South African Airways, at 2046 (Prez-MD).

8891.0 Reykjavik-NAT-D, Iceland, position from Air France 405, at 0206 (Prez-MD). Reykjavik, clearing COA087, told to contact Murmansk on 8950 (primary) and 11390 (secondary), at 1915 (Privat-France).

8903.0 F-GSPY-Air France B777, answered selcal HK-BE from Manila, Philippines, at 1424 (Lacroix-France).

8912.0 YWL-USCG Cutter *Thetis*, ALE sounding on COTHEN, also 005 (USCG HC-130J), N04 (USCG HC-144A), RKN (Cutter *Bear*), T07 (Customs Beech A200), and 500 (USCG HC-130H), at 0021 (ALF-Germany).

8918.0 Beauty 104-JetAirFly B767, cleared to destination (Brussels) by New York (on Caribbean net), at 0020 (Stern-FL).

8933.0 New York-LDOC, sending Ascot 6839, UK Royal Air Force, to 6640 for weather info, at 2145 (Stern-FL).

8942.0 Singapore-Oceanic air control, selcal BC-FQ to Cebu Pacific 804, an A320 registration RP-C3244, at 1722 (Privat-France).

8945.0 Unid-Sondre Stromfjord Information, Greenland, working Canforce 2249, at 1735 (ALF-Germany).

8970.0 Operations-Kuwait Airways LDOC, Kuwait, arrival info from Kuwaiti 382, at 0344 (ALF-Germany).

8992.0 Sigonella-USAF HF-GCS, arrival weather at Ramstein for Reach 161, at 1721 (Lacroix-France).

9025.0 GHM-Unknown US military "3-letter net" player, ALE-initiated radio check with ADW, then voice as Resurface working Andrews AFB, then went to 11175, at 1343 (Mark Cleary-SC).

9067.7 Unid-Egyptian MFA, Cairo, SITOR-A selcal to OOVF (Pyongyang embassy, North Korea), at 2019 (PPA-Netherlands).

9069.0 LCR154-Polish Ministry of Defense comm center, Warsaw, calling SPI324, ALE at 1608 (ALF-Germany).

9086.0 RHI-Saudi Arabian Air Force, calling AAI, ALE at 1849 (PPA-Netherlands).

9253.0 Manaus-Brazilian Navy, Amazon flotilla base Manaus, calling Roraima, River Patrol Vessel *Roraima*, no joy in voice; tried ALE as MANAUS and raised PWRO, same vessel; went to teleprinting on about 9253.7 with a CW identifier of NPFRRMID; all starting at 0148 (ALF-Germany).

10027.0 Praha-Czech Airlines company LDOC, working unknown flight in Czech, at 0639 (Lacroix-France).

10057.0 San Francisco-East Pacific air control, positions from Air Canada 047 and American 247, at 0126 (Prez-MD).

10066.0 SQ0638-Singapore Airlines A330, registration 9V-SKG, HFDL position for Hat Yai, Thailand, at 1834 (Lacroix-France).

10075.0 VP-BDO-Aeroflot A319, HFDL position for Muharraq at 1630 (Lacroix-France).

10176.7 Unid-Egyptian MFA, Cairo, SITOR-A selcal to KKXB (Kinshasa embassy, Republic of the Congo), at 2030 (PPA-Netherlands).

10522.0 New Star Radio Station-Chinese numbers (V13), in progress at 1214 (Boender-Australia). *[Australian GlobalTuner. -Hugh]*

10555.0 VMW-BOM, Wiluna, Australia, weak FAX chart at 0628 (Lacroix-France).

10871.7 "D"-MX, Odessa/ Sevastopol, CW at 2006 (MPJ-UK).

10871.9 "S"-MX, Severomorsk, CW at 2006 (MPJ-UK).

10872.0 "C"-MX, Moscow, CW at 2006 (MPJ-UK).

10872.1 "A"-MX, Astrakhan/ Baku, CW at 2006 (MPJ-UK).

10872.3 "K"-MX, Petropavlovsk, CW identifier at 0628 (Boender-Hong Kong). "K," CW at 2052 (PPA-Netherlands).

11000.0 RIW-Russian Navy headquarters, Moscow, working RCIG in CW, at 1753 (PPA-Netherlands).

11010.0 GWPWNI Brazilian Navy frigate *Niteroi*, calling GWPWZP, ALE at 1830 (PPA-Netherlands).

11030.0 VMC-BOM, Charleville, Australia, fading FAX chart at 0634 (Lacroix-France).

11152.0 1111-Unknown, calling 49336 and later 493200, ALE at 1815 (PPA-Netherlands).

11175.0 Resurface-US military, radio check with Andrews HF-GCS, came from 9025, at 1345 (Cleary-SC).

11300.0 Tripoli-African air control, Libya, positions from KLM 102 and KLM 569, at 0027. Tripoli, advising Cairo that Emirates Airlines 788 is enroute to Dubai, at 2052 (Prez-MD).

11330.0 New York-Caribbean air control net, selcal check LM-BF to NOAA 42, a hurricane WP-3D (N42RF, "Kermit the Frog"), also on 8918, at 1432 (Stern-FL).

12577.0 XVG-Haiphong Radio, Viet Nam, DSC with Singapore flag container ship *OEL Singapore*, at 1652 (Lacroix-France).

12579.0 NMF-USCG, Boston, SITOR-B weather, simulkeying on 12579, at 1649 (Lacroix-France).

12581.5 WLO-Shipcom/ Mobile Radio, AL, CW identifier in SITOR-A marker, at 0639. XSV-Tianjin Radio, China, CW in SITOR-A marker at 1858 (Lacroix-France).

12585.0 NRV USCG, Apra, Guam, CW in SITOR-A marker at 1540 (Lacroix-France).

12599.5 UAT-Moscow Radio, Russia, CW in SITOR-A marker, at 1902 (Lacroix-France).

12637.5 XSG-Shanghai Radio, China, CW in SITOR-A marker at 1904 (Lacroix-France).

12843.0 HLO-Seoul Radio, Korea, CW marker at 1659 (Lacroix-France).

13514.0 4XZ-Israeli Navy, CW message in 5-figure groups, at 1717 (Lacroix-France).

13527.7 "D"-MX, Odessa/ Sevastopol, CW identifier at 1728 (Lacroix-France).

13528.1 "A"-MX, Astrakhan/ Baku, CW identifier at 1731 (Lacroix-France).

13528.2 "F"-MX, Vladivostok, CW at 0628 (Boender-Hong Kong).

13528.3 "K"-MX, Petropavlovsk, CW at 0628 (Boender-Hong Kong).

13528.4 "M"-MX, Magadan, CW at 0628 (Boender-Hong Kong).

13927.0 Teal 78-USAF Reserve 53rd Weather Recon "Hurricane Hunter," a WC-130J flying through Karl, requesting a MARS patch at 0250 (Stern-FL).

16135.0 KVM70-US National Weather Service, Honolulu, HI, FAX tropical surface analysis showing Tropical Depression Sixteen south of Cuba, at 2150 (Stegman-CA).

16332.4 "M"-MX, Magadan, CW at 0628 (Boender-Hong Kong).

DIGITAL DIGEST

DIGITAL MODES ON HF

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Mysterious Pulsers Get ENIGMA Designation

Back in the July 2010 issue of this column, I documented the work of a number of monitors who spotted a mysterious pulsed signal occupying a number of channels from 6 to 15MHz. These narrow-band pulsed signals are on-air for many hours at a time on multiple frequencies, with differing pulse rates and also with interesting jumps and drifts in frequency that are often synchronized across the active channels. Frequencies end in "31" and "81" adding to the intrigue:

6081, 7431, 7481, 9531, 9581, 9631, 9831, 9881, 10031, 11631, 11681, 11831, 11881, 11981, 12031, 13881 and 15381 kHz

Following some correspondence with the ENIGMA (European Numbers Information Group and Monitoring Association) who keep the official records and classification of Numbers stations, these signals received the designation "XUP":

X = Noise Station Group
U = Unknown Mode
P = Pulser

A posting or two about this news to the UDXF utility monitoring mailing list on Yahoo Groups brought this reply from "Carl Bernstein":

"These appear to be always associated with Fidel's jam targets 50-60 kHz lower, and also are always accompanied by a single, wayward, unambiguously Cuban buzz-saw about 16 kHz below the pulses.

Today just before and after 2200Z:
13881 (pulses); 13865 (solitary buzz-saw);
13820 (Radio Marti unless otherwise indicated)
11981; 11965; 11930
10031; 10015; 9955 (WRMI)
9631; 9615; 9565
6081; 6065; 6030

At 2200Z, Marti pulled the plug on 13820; immediately all the on-target Cuban jammers went off, along with the 13865 buzz-saw, and the 13881 XUP."

Carl's observations certainly match my initial findings as outlined in the original article so perhaps the mystery is solved after all?

❖ UK MIL HF Transmissions

In the September 2010 issue of this column, I noted some increased levels of activity connected with the UK's DHFCS (Defense HF Communications System), most notably the appearance of at least one, and sometimes two, roving 75bd/850Hz STANAG4481 FSK (*aka* RATT) systems. The UK's long-established MATELO transmissions using the same mode also disappeared from air.

A few months later, the MATELO transmissions have reappeared on all previously known frequencies (23238, 11213, 8988, 6759 and 4732kHz), but our roving friend now seems much less active, having made only sporadic appearances on 12181.7 and 14357.7 kHz. Perhaps there was a connection with some long-term exercise or British operations in the Persian Gulf of Afghanistan?

However, as the roving 75bd/850 Hz transmissions wound down in activity, many new channels carrying STANAG4285 HF modem traffic appeared. Some of these channels have remained in regular use, whereas others come and go, presumably due to need or additional capacity requirements. Here are the most recently heard channels:

11015, 12152, 13892, 14350, 14444, 14460, 15803, 16160, 16270, 16551, 16588, 17971, 18032, 18040, 18633, and 20028 kHz USB

The majority of these signals originate from the facilities at St. Eval and Inskip (UK) and Akrotiri (Cyprus), but a few also appear to be sent from Gibraltar or Ascension Island. It's clear too that a number of frequencies are switched between Akrotiri and St Eval at times.

The stations have a preference for 1200bps speed and long interleaving, but 600bps is also used. All traffic is encrypted. The decoders from Wavecom, Hoka, SkySweeper (Professional), MultiPSK and Sigmira are all able to demodulate the STANAG4285 signal.

❖ Bulgarian Diplomatic Service

A few days of mid-week vacation in order to finish some odd jobs at home gave me some rare opportunities at the radio, too. On one particular day, I couldn't help bumping into the stations of MFA Sofia. Given that day's activity levels and the usual rarity of these stations, it's quite likely that I happened on a "link test" day where the MFA and embassies were testing HF gear to ensure proper operation when needed.

Much of the Bulgarian activity is coordinated using 75bd/500Hz shift ASCII, a mode which is quite a rare catch these days. A distinctive offset of .75 kHz (or, rarely, .25kHz when using a half kilohertz point for the carrier) is also used. The main traffic is sent using a proprietary 8 tone MFSK mode (see Resources), which sounds like a faster but more distorted version of standard MIL-188-141A ALE. This system runs at a little above 240bd with an ACF of 200 when sending traffic and is quite distinctive when heard.

Call-ups using the 75bd ASCII are usually like the following: DKI DKI DKI RYRYRYRYRYRYRYRYRYRY

DKI, in this case, is the tactical callsign of the Embassy in Havana, while MFA Sofia uses DOR. The operators also make extensive use of Z-codes to communicate things like "send your message," "message received," etc.

Here's a list of recently heard frequencies:

11130, 11175, 12160, 12215, 12220, 12226, 13394, 13440, 14375, 14438, 14697, 14764, 14770, 14786, 15896.5, 16212 and 18036 kHz USB

Note that these are the USB frequencies. The ASCII is centered 1750Hz higher in frequency. Take a listen and get some practice with a rare digital HF mode!

❖ Two Mysterious US Networks

This first network has been active for many years using the same three letter tactical callsigns including:

ALN, BFG, BGD, BRX, BVO, CNU, EDK, FNF, FSM, GHM, GWO, HPT, IRK, JES, MBY, MHE, PUC, RHV and UWO

Frequencies heard so far include:

7835, 8045.6, 9019, 10150, 11238, 12103, 13438.6, 15037, 16090 and 18021 kHz USB

The network uses standard MIL-188-141ALE for call-ups and link checks. Traffic is STANAG4197, otherwise known as ANDVT digital voice. Most activity is on Wednesdays during the third full week of the month, though stations have also been heard on Tuesdays and Thursdays. At least two of these stations were close to me in Maine, being received weakly but exhibiting clear signs of backscatter.

The second network carries much of the same operating habits, but uses MIL-188-110A high speed modem for traffic with the same underlying protocol as seen on a number of US National Guard networks. This protocol usually reveals the sender and recipients of the messages, but the content remains encrypted.

This network operates on 11504.5 kHz USB and features players BON, ENO, HEB, MII, and TES.

Any reports or information on these networks would be gratefully received. Until next month, enjoy your digital listening and keep the emails and letters with your comments and suggestions for future issues coming.

RESOURCES

Sigmira Decoder Software
http://saharlow.com/technology/sigmira/index.htm
Bulgarian 8 Tone Modem Clip
http://signals.taunus.de/WAV/BUL-240_ISS.WAV
Bulgarian Diplo Profile
www.chace-ortiz.org/umc/mfatext/Bulgaria.txt

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

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Should Auld Acquaintance Be Forgot

The term nostalgia is usually defined as a yearning for the past, often in idealized form. In most areas, the pursuit of the nostalgic requires taking oneself out of the modern world and recreating or reenacting the past. Those of us with an interest in amateur radio have no need to do this. With the exception of firing up a Spark Gap transmitter, a thoroughly modern ham can participate in amateur radio using the same skills and even the same equipment that was the bees knees back in the days of Marconi and Armstrong. It is quite easy for a ham to put down his or her current generation handheld and kick it old school using the tools and techniques of the first days when all radio was amateur radio.

With this in mind, let's take a look at how you can experience a blast from the past when playing radio.

❖ Back to First Principles (Yet Again)

Okay, many of you have heard me give this rant in various forms over the years, but it still holds true. Even though it is no longer required to obtain an amateur radio license, all hams still have the opportunity to use the earliest mode of radio communication, on the air, right here, right now.

Today, CW operation is no longer a required skill, but neither is it a lost art. You will find this mode alive and well on the lower portions of all amateur radio HF bands and even in the weak signal portions of the VHF and UHF bands. Further, CW, once learned, can open up whole new worlds for the ham, such as low power operation (QRP) and even leading edge communication methods such as Weak Signal communication.

It doesn't take a lot to get in on the fun of Old School communication. Studying on your coffee break can lead to mastery of the code characters, numbers and prosigns within a month. I find that most folks come out of this period of memorization able to operate at about 7 words per minute. Sure, you'll sound slower on the air than many other folks, but you will find the CW crowd to be true gentlemen and ladies of the hobby. Send PSE QRS and they will gladly slow down to work with you. Build your speed and you'll be in amongst the CW crowd in high style. You'll be using radio to communicate just like the earliest hams in the hobby.

And guess what else? Don't be too surprised if you run across a few of those old timers down there in the CW sections of the band plan. You'll get to learn about the early days of radio from folks who were there.

❖ Speaking of Old Timers

If you want to learn more about the early days of amateur radio and how you can still apply the techniques of those days, you probably have to look no further than your local ham radio club. At your next meeting, take some time during the coffee hour to get to know some of the older members better. I have learned so much about ham radio's history and even some ideas about how to practice amateur radio today by talking with the senior members of the clubs I have been involved with.

If you're very fortunate, you might run across a few folks who were involved in the early engineering and experiments that made modern radio possible. You don't even have to look that far back to find some fun nostalgia. Track down some folks in your club who were licensed in the 1950s when the switch was being made to SSB.

Folks who "fought" in the sideband wars have a lot of interesting stories to tell as well. In the 1960s all those vacuum tube circuits were being replaced by transistors; ask a ham from that era about how carefully you had to handle those early, and often expensive, semiconductors.

Move up to the 1970s and you will find folks who can tell you about setting up the local repeaters that are now such a ubiquitous part of amateur radio practice. Even the folks who got into ham radio in the 1980s have some stories to tell about how the personal computer revolution changes ham radio forever. Many of the pioneers of the personal computer world were hams.

I've found that, when I talk to hams from the "good old days" I am more likely to run across folks who built their equipment rather than bought it. If you want to really understand how radio works, or if you want to get in on the experience of building your own gear, making friends of a few of these folks is the biggest asset you can have.

I've mentioned this in the past but it requires repeating: Every amateur radio club should be making a serious effort to record and document the living history of its more senior members. Few other hobbies have access to folks that were around in the earliest days of the activity. It would be a great loss to amateur radio for the thoughts, musings and (most importantly) the knowledge of our founders to go undocumented.

❖ Read a Good Old Book

At a recent hamfest, I found a copy of the *ARRL Handbook* from 1953, the year of my birth. I quite literally read it cover to cover. I was fascinated with the nature of radio technology from that era. Gordon Teal's first silicon based transistor was still a year away from being invented, so this book was steeped in vacuum tube design and theory.

Just about everything hams do today with integrated circuits and other semi conductors was being done just fine in the presence of the warm glow of glass tubes. If you hang around on the bands long enough, especially down on those CW portions of the band plan, you will hear a lot of this fine old tube gear still doing a great job filling the aether with sweet sounding signals.

While reading this old *Handbook*, I came across a nice simple one tube transmitter built around the 6AG7. You can bet that got me digging through my junk box looking for the stuff I needed to put myself on the air in the same style any Novice would be operating in the year that my parents got me started. Old ARRL handbooks and magazines from the early days are full of circuits for consideration. If you don't want to build with vacuum tubes, no worries: find materials from the late 1960s and early 1970s. There are thousands of circuits that are just waiting to be revived and put back to work.

I mentioned hamfests as a source for old radio reading, but there are other places you can find fine books and magazines from the earlier days of amateur radio. Libraries are great sources for older books on radio and other technologies as well. I am not sure why, but I have yet to come across a library that didn't have quite a few "obsolete" technology books in the stacks. For whatever reason, this resource is a treasure trove of radio roots information. Used books stores are also a great sources for early age radio writings.

Personally, I am a sucker for issues of the fine old magazine *Electronics Illustrated*. In its pages, I learned the ham radio craft from mentors such as Wayne Green W2NSD and Tom Kneitel K2AES. I not only learned about radio from these folks, I learned about writing about radio. They gave me a great gift. Maybe someday a kid will pick up a musty old issue of *Monitoring Times* out of a pile under the table at a hamfest and get a jolt of inspiration from the rantings and ruminations of Old Uncle Skip.

❖ Fine Old Radios

I recently took a trip up to ARRL headquarters and had the pleasure of operating W1AW on the air. The operating position I sat at was

You can't get on the air with a rig like Hiram Percy Maxim's "Old Betsy" Spark Gap transmitter, but you can use equipment nearly as old on the air today.

equipped with a Yaesu FT-DX9000D. This rig has a $12,800 list price and a street price of about a buck under ten grand. It sure was cool. It had every feature a modern radio could possibly have and a few I didn't even think were possible. I was in ham radio hog heaven!

Later that week, from my home station (not nearly as sophisticated as W1AW, I can assure you), I worked a gentleman operating with a Johnson Viking 1 Transmitter, a fine old tube rig from the early 1950s. His rig was still warming up and had a touch of drift, but it was loud and strong. He picked it up at a hamfest for $75. I am sure he was having just as much fun with that old Boat Anchor as I was having when I was sitting at the super station in Newington, CT. Keeping these old radios alive is challenging but tons of fun. You'll also spend a lot less than what you'll need to drop on a modern high end rig, too.

Getting started in old rig restoration and repair is really not that hard. A good place to start is networking through your ham club. Remember those conversations over coffee with the club old timers? They are often a great place to start as they may have something collecting dust under their workbench. That's how I came across a fine old Hallicrafters Super Defiant receiver that will be just the thing to use on the air with that one tube transmitter I mentioned earlier. Further, many of those senior ham folks know a thing or three about tweaking and repairing tube gear. Learn from the masters.

Ham fests and swap nets are great places to find gently used, older equipment; online swap lists are helpful as well. Sites like eBay can also be a source, but tread carefully. Folks on the auction sites are often trying to sell the older equipment as "collectable" and will be trying to get a premium prices for their wares.

Once you have settled on a piece of older equipment, if it does not come with a manual, you will need to locate one on line or from vendor such as **www.hamradiomanuals.com**.

If you are bringing a "hollow state" rig back to life, your next quest will be to locate spare tubes to replace any within the rig's tube complement, should any fail or go stale.

Yes, it is going to take time and tears to bring a dead boat anchor back to life, but those great old radios, like great old cars, deserve to keep running under the care of someone who loves the hobby.

❖ Heathkit Forever

Hams "of a certain age" (including Old Uncle Skip) had the pleasure of building magic boxes from Benton Harbor, Michigan. While you can't find an unopened Heathkit kit today for less than a king's ransom, already built kits show up in the marketplace all the time. Of course, you take a chance based upon the building skills of the original owner, but every Heathkit manual offers troubleshooting information to help get you over the rough spots. When I die, I want my coffin painted in Benton Harbor Green wrinkle finish paint!

❖ Old Antennas

I'm not sure how well an actual antique antenna system might work. Years of exposure to the elements will probably render such a thing useless. But you can enjoy experimenting with the kinds of antennas folks used to use before the days of coaxial cable.

First and foremost is the simple random wire. Sometimes these simple wire antennas were hooked directly to the tank circuit of the transmitter. (Ask those old timers at your ham club about RF burns.) A better way to go is through an antenna tuning circuit.

If you want to try something more sophisticated out of the old playbook, try building a "Cage" antenna. Think of a dipole with multiple wires formed in a cylindrical pattern on each leg. (Note: Frisbees work great as wire spreaders for this project.) The purpose of the cage antenna is to increase the effective diameter of the antenna radiating elements. This causes an increase in capacitance and a decrease in inductance. This type of antenna exhibits a wider bandwidth than a traditional dipole. Cage antennas are a bit tricky to construct and erect, but they work very well.

As hams, we are truly blessed with the ability to reach back to the very roots of radio in so many ways. We can talk with the fathers and mothers of the hobby in our ham clubs. We can learn the classic skills and continue to put them to use. We can take the time and effort to bring fine old radios back to life. I don't think any other hobby offers so much opportunity to bring nostalgic thoughts to fruitful reality.

❖ Fare Thee Well

With this issue of *Monitoring Times*, I must announce that Old Uncle Skip's run at *Monitoring Times* will become a bit of amateur radio nostalgia as well. I will be leaving the pages of *MT* to pursue writing about amateur radio in other venues. My time at *MT* has been long and rewarding. I wish to thank Bob Grove for taking a chance on me all those years back and Rachel Baughn for being the best editor anyone could hope for.

If you are still interested in what I have to say about ham radio and other aspects of the radio hobby, I will still be writing for Canadian International DX Club (CIDX) in their *CIDX Messenger* newsletter at **www.cidx.ca**. I have a couple of other radio writing projects in the works, and, as always, you can find me on the bottom end of 40 meters. Have Fun! Vaya con Dios!

GETTING STARTED

THE BEGINNER'S CORNER

Ken Reitz, KS4ZR
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Beginner HF Protocol Part II: Chasing DX

In last month's column I wrote about the difficulties of newcomers to the high frequency (HF) amateur bands including knowing where various modes (sideband, AM, digital, CW, SSTV, etc.) are allowed and how to check-in to various nets. This month I look at the bug that bites hard when it bites: DX.

❖ Just what is DX?

Every niche in radio has a different definition for what constitutes DX. Usually DX means any station that's operating outside your own country. But on HF, distances can be less important than location. For instance, an east coast U.S. operator working Ontario, Canada, with its VE call sign prefix, is not really "working DX" because it's so close that it's a snap to work on virtually any band. On the other hand, the Turks and Caicos Islands, even though they're only a hundred or so miles off the Florida coast, are considered DX because there are so few stations on the air with the VP5 call sign prefix.

Whether or not a station is DX depends on what band you're operating as well. An east coast amateur station working a California ham on 160 meters is, to my mind, definitely working DX.

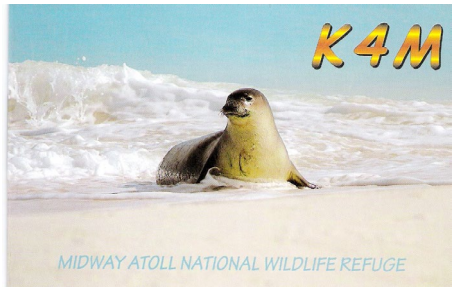
In fact, the whole subject of call sign prefixes is in itself an interesting subject. Generally, you can learn something about the history of a DX entity, as they're called, just by examining the prefix. It's a radio hobbyist's way to learn geography and history just by knowing call signs.

Remnants of the British Empire are mostly identified with the first letter in the call sign prefix: V. Former French colonies usually begin with an F, while former U.S. colonies, possessions and territories begin with a K. And here's where you can run into trouble. Just casually tuning around the band you might run into a KH8 prefix and just assume that it's someone stateside in the 8 call district (Michigan, Ohio, and West Virginia), when in fact, it could be a rare DX station from Swain's Island or American Samoa.

❖ Habits of DX

Being a DX station seems glorious to those of us stateside chasing the DX: the exotic call sign, the romance of living in distant lands, the pile-ups generated every time you key the mic. But, for many DX operators it's a pain in the neck to be the target of QSL mania, especially if they are in-country on a limited budget or living in a place where conditions are minimal, such as on-again-off-again electricity.

Many DX operators set up their own

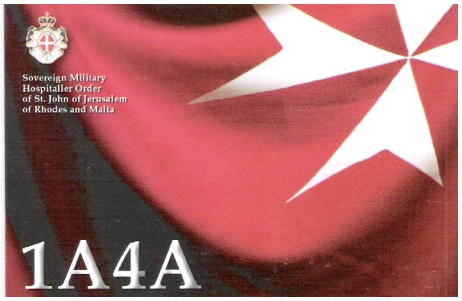


What part of the 4th call district is K4M? Would you believe, Midway Island in the Pacific Ocean?!

seemingly arbitrary operating rules. One ham in Papua New Guinea, exasperated at the antics of QSL hounds, refuses to QSL at all and says so routinely on the air. That cuts down on the number of contacts he makes! An operator out of Zimbabwe asks that he not be posted on any DX cluster. He just wants to chat and insists on a nice full conversation with each contact. He'll QSL gladly, but insists on doing it his way. One operator from the Falkland Islands simply shuts down when DX chasers become too rude; jumping in when he's trying to hear the other station with whom he's talking.

Some DX operators are vacationing in exotic locales and have received a local amateur license. They'll offer to make contacts "vacation style." That means that, unlike a real DXpedition where several operators arrive at a DX location and trench in for 24/7 DX shift duty, they'll operate when they can, in between trips to the shore, shopping, sightseeing, or hobnobbing with local hams. They may slip a couple of hours a day into their schedule to make contacts, but it's not their reason for being there. Even so, DX hounds vent their frustration on air at the operator for pulling the plug when there's good propagation.

Many native DX operators have had to work



The Sovereign Military Hospitaller Order of St. John and Jerusalem of Rhodes and Malta: Smallest "country" has the longest name.

hard to get a station on the air. Between their own national bureaucracy, local corruption and other difficulties, these hams really struggle to put out a signal. It's something that American hams can scarcely imagine. Many operate in countries where there is no QSL bureau or if there is one, it's painfully slow or inept. QSLs get lost or mail is routinely intercepted and stripped of its "green stamps" (U.S. dollars) or IRCs (International Reply Coupons). That's why it's the DX operator's call as to how they'll deal with QSL requests. Normally, they'll use a "QSL manager" – a person (usually in a much more accessible country) who the operator trusts to collect the QSLs and match them with the operator's log for verification. Such QSLs will often bear a rubber stamped imprint noting something like, "QSL Verified by XX1ZZ," to indicate that the QSL is valid.

Some native DX operators try to tough it out with their conditions and the results are spotty at best. Their requests for $3 to cover postage are often met with derision from DX hounds who believe such operators are fleecing hams for their QSL card or trying to set up a tidy income via ham radio. I don't believe there has ever been a documented case of this happening. Still, bad feelings persist among many who sent in the money and never received a card. It's not hard for such feelings to slip into ethnic stereotyping or racism on the DX cluster. While no ham is responsible for his or her country's postal problems, such issues could be resolved by the ham in question using a manager in a more accessible country. It remains the DX's call, but if you're chasing DX you've got to go along or give it up.

❖ How to Work the DX

The United Nations counts 192 countries among its membership. But the number of DX entities is 338. How's that possible? The best way to explain it is that hams love a challenge. Working *and confirming* 338 "countries" is much harder than working and getting QSLs from 192. To get the total up, there are seemingly innumerable organizations that also qualify as DX entities: the UN and ITU; the Vatican, and my favorite: the Sovereign Military Hospitaller Order of St. John of Jerusalem of Rhodes and Malta. (Yes, really!)

But, I have to warn you that once you start down the DX path you may be gripped by a compulsion to work 'em all. This will require a substantial monetary outlay for QSLs, IRCs, and return postage, to say nothing of time away from your family, friends and, occasionally, work. Your best friends may not recognize you.

Additionally, after you've worked several

hundred DX entities, you'll realize that they're all via SSB (single sideband) and that you should also work them all via CW (Morse code) and digital modes and QRP (low power) and all bands. Why not work all DX entities via Slow Scan TV QRP on all bands? Now, that's got to be hard. You can see there's no end to it, so you have to set your own rules and limits.

Believe it or not, there are "purists" who believe you should not have any aids in working DX. They frown on DX chasers who monitor the DX cluster for announcements of what DX entities are on which bands and in what modes. They believe you should spend all your time tuning relentlessly up and down the bands stumbling on the DX the old fashioned way, the way they did it (or *claim* to have done it). They sneer at DX bulletins sent via email that announce weeks or months in advance which DXpeditions will be at which entities. They bristle at the concept of DX nets that let hams with modest equipment and limited antenna space work DX that the "big guns" work almost daily. Again, you have to set your own rules.

Working DXCC (worked and confirmed at least 100 entities) is a bookkeeping nightmare, but the easiest and cheapest way to keep track is to print out an official list of DX entities (an excellent list is found on the ARRL web site: **www.arrl.org/country-lists-prefixes**). As you work each entity you can make a note. (I put a check mark by the entity and when it's confirmed I highlight the check mark with a yellow highlighter. It's easy to see at a glance if I've worked a DX prefix or not.)

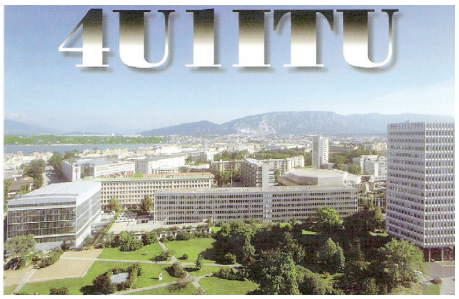
Today, there are many amateur radio logging programs that automatically keep track of your DXCC count regarding mode and band as you enter the contact in the electronic log.

The fastest way to DXCC is to monitor the DX clusters. I use this site: **http://dxcluster.ham-radio.ch**: it's accurate, fast, and makes picking out a needed prefix and mode a real snap. Some DX hounds have programs that monitor the DX cluster for them and send them an alert that a DX prefix they need is on the air. The site above lists the latest 50 DX stations spotted on all bands and is updated every 30 seconds.

❖ What's the Frequency?

The ARRL has a DX bulletin you can receive regularly in your email for free. If you're an ARRL member (and I strongly urge you to join) you can go to the "member profile" at **www.arrl.org** and set up to receive the DX bulletin. If you're not an ARRL member, you can still receive the bulletin by sending an email to: **w1aw-list-request@arrl.org**. In the subject of the message, type: subscribe your e-mail address. It's a great way to get a heads-up on elusive DX prefixes you may need.

Another great source is the 425 DX News Bulletin, the English version of which is on-line at **www.425dxn.org/425/indbulle.html.** Archived issues are also found here; click on the first issue to read the latest DX News. At the end of each bulletin is a list of DX stations and their managers, a valuable source of information that will help speed up the QSL results (more on that subject later).



Bureaucracies can be their own DX entity: United Nations and International Telecommunications Union headquarters offer hams two different "countries."

Monitoring the above-mentioned DX cluster site and the two bulletins just now mentioned, you'll be hard pressed not to work DXCC in a matter of weeks or, if you're not really trying, months. But, just knowing where the DX is won't matter if you don't know how to work them. Here are some tips:

Most DX stations in Europe, Africa, South America and Asia operate simplex. They are transmitting and listening on the same frequency. There's usually little in the way of a pile-up, great masses of hams calling at once in an HF free-for-all. But, when a real DX station is on the air with a sought after prefix, bedlam breaks out and normally patient hams lose all sense of propriety, just trying to get a "you're 5-9, QRZ?" exchange in the log.

To avoid such an on-air debacle, smart DX operators will operate split: transmitting on one frequency and listening on another frequency or a specific set of frequencies. For instance: "This is 4U1ITU listen up 5." That means he will listen for any calls 5 kHz up the band from where you're hearing him. If it's a rare DX station that's getting a huge pile-up, the station may announce, "This is K4M listening 5 to 15 up." That means he'll be listening over a 10 kHz band to stations calling. This allows the stations trying to make a contact to spread out and makes it easier for the DX station to distinguish calls.

But, operating split can create problems, especially on 20 meters, which is a crowded band to begin with. Daily nets, groups of hams who have been meeting on the same frequency for years, may be in the middle of the band on which the DX station announced he would be listening, causing the net to be bombarded by miscellaneous call signs unrelated to the net's activities. Since the hams calling aren't listening on that frequency, but the one the DX station is transmitting on, they don't hear the complaints arising from their piling into the net. It's a frustrating situation that's impossible to resolve. Since no individual or group of hams are entitled to a frequency at any given time, the net is usually forced to abandon activities for the day and let the DX pile-up take over.

Some net members, however, will show their displeasure at the invasion by finding the DX operator's frequency and jamming it, either by holding down the CW key for long stretches at a time, thus preventing the DX chasers hearing if their call has gotten through, or by sending an unidentified digital transmission on top of the DX frequency. Some will send SSTV transmissions with unseemly images on the frequency. Now everybody's unhappy.

Another problem that invariably arises from DX working split is the inevitable presence of Frequency Cops. These are jobless hams who appoint themselves to police DX frequencies. They typically have very big signals and never identify themselves when they're being frequency cops. When a ham doesn't realize the DX is working split, they holler "Up, up, up, you lid! What don't you understand about 'up'?!" or "He's working split, old man, you're on the wrong VFO! Up, up, up!!"

While it may seem helpful, they're also covering up the DX station just as surely as the intentional jammers, so those trying to call can't hear if their call was acknowledged. Before you transmit split, find out if anyone is on the frequency you plan to use and make sure you have the right VFO transmitting.

Working the DX is the easy part. Next month: "How to successfully QSL the DX."

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

Fred Waterer
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www.doghousecharlie.com/radio

Festive Programming around the World

December means it's the end of yet another year and we'll soon begin another. Hey wait a minute: Didn't this one just begin? Can I have a do over? No? Oh well.

As usual, I will be devoting a page on my website to Holiday and Festive programming. Go to **www.doghousecharlie.com** and look for the link to Christmas and Festive Programming 2010-11 on the home page. I'm updating the 2009-10 listings. It takes up 29 pages in a Word document, so there's a lot there to digest!

The special programming begins before Christmas, with treats like *EBU Day of Music*. Each year, the European Broadcasting Union presents a day of Christmas music, spanning some 12 hours. It usually falls on the Sunday before Christmas. Heavy on classical and choral music, the program is, in fact, 12-one hour broadcasts from individual EBU members. You can hear music in the Russian choral tradition, a philharmonic orchestra from Slovenia, Christmas Jazz from Iceland, and folk tunes from Denmark and England.

This program will be broadcast on many stations worldwide, including CBC Radio 2 in Canada, beginning at 6 a.m. local. You can hear it via the internet by going to **http://www.cbc.ca/radio2/**, pick a city and click on that city's Radio 2 stream. Most of this program should also be heard on BBC Radio 3.

If you are a fan of the *Old Time Radio Shows*, check out stations like CHML in Hamilton, Ontario (900 kHz). On Christmas Eve, Christmas Day, New Years Eve and New Years Day, you can hear hours and hours of holiday favorites from Jack Benny, Fibber McGee, Our Miss Brooks, (even Dragnet!) and so many more. It's a tradition here at home to listen to these shows as we prepare to celebrate the holidays. If you can't hear them on 900 kHz, listen online at **http://www.900chml.com/**

Many of these Christmas favorites can be downloaded at **www.archive.org**. One neat collection includes the Christmas shows from 1942-46 of Command Performance, a program for "the boys" overseas. **www.archive.org/details/CommandPerformanceChristmas** At one time you could download a collection of dozens of Christmas episodes from the Golden Age of Radio, but I no longer see it listed.

CHML was home for many years to legendary Canadian broadcaster Paul Reid. Every year at this time, CHML rebroadcasts A Paul Reid Christmas, a traditional and heartwarming program that many listeners look forward to every year. You can learn more about it at the website maintained by Paul's son at **www.paulreidchristmas.com** The program has been aired every year on CJAD in Montreal as well. When he was alive, Reid would do the show live every year.

The recorded version that survives dates from 1974. From the Paul Reid website: "While Paul was alive, in the true Christmas spirit, he gave the show to anyone who wished to broadcast it. As a result, it played in a number of countries and on the Armed Forces Network. We were told it also played during the war in Vietnam." Who knows how many people this program has touched over the years?

Christmas Eve brings old favorites like "Fireside Al" Maitland's reading of *The Shepherd* on CBC Radio One's *As It Happens* (this year it should be heard on Dec 22), along with that program's annual salute to Canadian troops abroad.

The BBC will have quite a few special programs across its many networks. The World Service will as well, although to a much lesser extent. You can hear the *Festival of Nine Lessons and Carols* at 1502 UTC, Christmas Eve, live from the Chapel of King's College, Cambridge.

Vatican Radio will keep you up to date on the activities of the Pope, as will WEWN.

Hanukah starts on December 1 this year. "All Israeli stations have different programs for Jewish holidays. The more religious stations will offer programming dealing with the religious parts of the holiday. The non-religious stations just change their schedules and air special programs (not necessarily always related to that specific holiday" (Elad Benari)

While December means snow and cold in the Northern Hemisphere, our friends in the Southern Hemisphere slip on their swimsuits and celebrate at the beach. So throw another reindeer on the barbie and enjoy the summer programming from Radio Australia, Radio New Zealand International, and their respective domestic networks.

Like the CBC in Canada, many regular programs go on hiatus and are substituted with summer replacement shows. Perhaps the best of these is *Matinee Idle* from Radio New Zealand National. For a month or so, the New Zealand afternoons are taken over by Phil O'Brien and Simon Morris, who spin some really funny, weird and occasionally bizarre tracks, accompanied by their quirky sense of humour. If you liked Dr. Demento, you'll love these guys!

Radio New Zealand National also has a concert series, which follows *Matinee Idle*. Recordings of great concerts from around the world from many genres are aired. It's brilliant. In fact, I first stumbled onto *Matinee Idle* a few years ago when I was looking for a Louis Armstrong concert.

New Years Programming

Auld Lang Syne is forever associated with New Years' Eve, especially in North America where Canadian-born band leader Guy Lombardo made it the centerpiece of his annual New Year's broadcasts on Radio and TV from 1929 to the 1970s. Here is an audio clip of Lombardo being introduced from 1972: **www.youtube.com/watch?v=VBHxfkKm0Ck**

Listening to this clip takes me back to childhood, being allowed to stay up to see the New Year while listening to these tunes (which I thought at the time were terribly old fashioned, but which I find endearing today).

In 2005, I wrote an article for *Monitoring Times* about listening on New Year's Eve. It describes the adventure one can have, touring the globe in 24 hours from the comfort of one's own home, thanks to shortwave radio and the internet: **www.monitoringtimes.com/Around-in-24-hrs.pdf** Naturally, some of the details in the article are becoming a bit dated.

Last year at this time, due to some health issues, I didn't have the stamina to try to listen all day, but I did concentrate on late afternoon and evening here in Southern Ontario and managed to hear some really interesting stuff!

2100 – Midnight in Moscow. I tuned in via the Radio Rossii website, **www.radiorus.ru/** The audio wasn't the best, but I did hear the Kremlin chimes and President Medvedev's brief speech to the nation. If you can manage to find a decent signal, this might just be

audible in Russian at this time, on shortwave.

2200 – Midnight in Bucharest: I went to the Radio Romania International website and got a Romanian language broadcast of celebrations, hosted by a male presenter, and they seemed to be having a lot of fun. It made me wish I could speak Romanian.

2300 – RAI in Rome: A New Years Broadcast was heard in progress about 10 minutes before midnight. It was hosted by a woman who spoke in such a rapid-fire way that by about two minutes to midnight, I was willing her to stop and take a breath. It seemed like audio portion of a traditional glitzy RAI Television production, but I can't be sure.

0000 – Portugal: I really wanted to try to find RDP International on shortwave, but I struck out, so listened online. It was the first time in years that I didn't listen to Big Ben strike midnight (although I did catch it later via the BBC on demand audio archive (is that cheating?)

0100 – Slim pickings at 0100. Tried a web stream in the Azores, but they almost ignored New Year. I won't bother with this one in future.

0200 – Found **Radio Universal** online in Uruguay.

0300 – Listened to **Radio Nacional** in Buenos Aires. The stations in Uruguay and Brazil provided a couple of hours of very lively entertainment.

0400 – Listened to pop station C-100 FM in **Halifax, Nova Scotia**, not unlike any station one can hear in Southern Ontario/Western NY.

0430 – Caracas. Managed to bag a couple of internet stations. Very interesting programming, worth investigating further. It was my first taste of radio from the land of Chavez. I just wish my Spanish was better. Pounding dance music interspersed with apparent propaganda.

0500 – Just before my local midnight, I "tuned in" to an extremely wonky webcast from **Radio Rebelde** in Cuba, which was almost like trying to listen through jamming (oh, the irony). Either there were too many people trying to tune in or they needed a new string attached to their tin can. It sounded like someone beating his chest to pretend he was doing a traffic report from a helicopter. **www.radiorebelde.cu/**

0600 – Finally listened to **Radio Educacion, Mexico** on line. After this one I slipped into something comfy…like my bed.

❖ The Modern Radio France Int'l

Radio France Internationale is a very interactive radio station. Along with some very compelling English-language programming, thanks to the internet age listeners can interact with the programs and the station in a number of innovative ways. Let's look at these first.

Twitter – Twitter can be a handy tool. Many stations are now using this, and RFI is one of them. Logging on to the RFI Twitter account (**http://twitter.com/rfi_english**) provides you with regular news updates from France, Europe, Africa and the Francophone world. You can't squeeze a lot of details into 140 characters, but most times there is a link provided to much longer stories.

RSS – For non-Twitter users, RSS (Really Simple Syndication) is a handy way to subscribe to timely updates from websites or to aggregate these feeds in one place. You can check out RFI's RSS feed at **www.english.rfi.fr/contenu/rss**. There are more articles and links here than Twitter, and you can pick and choose which types of information you want to receive.

Facebook – The ubiquitous social networking website Facebook is also in play. With half a billion members, Facebook is a handy way to stay informed about RFI, which has a very active Facebook presence. One can find background information about the stories featured in RFI's broadcasts, and often links to the latest program audio. Fewer stories, more detail than Twitter. If you Facebook, become one of the 2,000 plus listeners who "Like" RFI at **www.facebook.com/pages/Radio-France-Internationale-English-Service/28764872018.**

Flickr – RFI even has a Flickr account, posting pictures related to their stories and promotional pictures. It's worth a quick look at **www.flickr.com/photos/rfi_english/**

Of course these web features are complimentary to the actual programs. One can hear R F I online at **www.english.rfi.fr/broadcasts**. Here you will find links to all the English-language RFI programs for the last 24 hours or so. Options include listening to individual programs, creating a playlist consisting of a number of (or all of) the current programs, and downloading programs as mp3 files. One can also listen live at **www.english.rfi.fr/**

RFI can be heard in English at a number of times throughout the day, the most interesting broadcast being the one hour transmission at 1600 UTC to Africa. This program features *News* (African and International), *Focus on France, Sports News* and a "*Feature Program*." These features include: Monday - *Mission Paris* (French language course)/*Talking Europe*; Tuesday – *Crossroads*; Wednesday – *Voices*; Thursday – *Rendezvous*; Friday - *World Tracks*; Saturday - *Network Europe*; Sunday - *Club 9516/The Sound Kitchen*

Crossroads is an interesting program looking at how people live their lives and fight for survival across Africa and around the world. *World Tracks* is a look at World Music, with particular emphasis on the Francophone world. The 1600 UTC broadcast used to be heard in *Hour One* of the CBC Overnight programming block, but was dropped some years ago. It's too bad, because Radio France Internationale is sadly one of those stations that flies under a lot of people's radars, but provide a lot of quality programming. As this column was prepared the 1600 UTC transmission was broadcast on 15605 and 17605 kHz, but these frequencies may change with the season.

❖ What's New

It looks like **Radio Romania International** has added a Romanian by Radio language course. *Romanian Without Tears* seems to be a new feature on RRI. As this column is written, there are three episodes listed on the website, with such topics as "A Walk in the Park," "Geography," and "Asking For Direction." While listening to the 0530 UTC Monday program online (see link below), a short 3 minute language lesson was heard about 15 minutes into the program. Romanian is a Romance language lost in a sea of Slavic languages; it bears similarities to Italian, also descended from Latin. There is an old joke I read years ago about the Romanian who visited Rome in Italy. He is said to have remarked that the city was beautiful but the locals spoke Romanian very poorly!

It is also very convenient to have the text (archived) of these program vignettes posted on the website for review. As an example: "The food is delicious. -Mancarea este delicioasa."

The RRI website is, in some respects, quite comprehensive and in others a bit lacking. It would be helpful to have a program schedule posted, so listeners can know just when during the week a certain feature can be heard. Some of this information is there but one has to dig for it.

Some sections of the website are updated regularly and promptly; others not so much. Still, RRI should be commended for at least making the effort to have a useful web presence. The website is vastly improved over just a few years ago, when the audio used to be horrible.

Radio Romania International was noted here in Southern Ontario with a booming signal through most of September and October. 7385 kHz at 0000 UTC has provided excellent reception recently. Hopefully, RRI's winter frequencies will be equally reliable.

If not, RRI is audible online in a number of ways. Listen to a live feed of RRI via the main webpage, or listen on demand via WRN. Click on **www.rri.ro/cod.shtml?lang=1&set=501** or just click the WRN ON Demand logo on the right side of the RRI website.

How to Use the Shortwave Guide

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

① ② ⑤ ③ ④ ⑥ ⑦

CONVERT YOUR TIME TO UTC

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

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

FIND THE STATION YOU WANT TO HEAR

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

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

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

CHOOSE PROMISING FREQUENCIES

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

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

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

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

Target Areas

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

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

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

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

Adelheid Lucas/Deutsche Welle; Adrian Sainsbury/Radio NZ Int'l; Alokesh Gupta, New Delhi, India; Arnie Coro/Radio Havana Cuba; Drita Cico/Radio Tirana; Evelyn Marcy/WYFR; Gerard Adriaanse/HCJB Australia; Jeff White/WRMI; Mrs. Robinson/WTJC; Mike Barraclough, UK; Ivo Ivanov/Radio Bulgaria; Valentine Stoyanov/Radio Bulgaria; Tom Taylor, UK; Radu Ianculescu/Radio Romania Int'l; Sean Gilbert, UK; Stephen John Jones/IRRS; Wolfgang Büeschel, Stuttgart, Germany; Yimber Gaviria, Colombia; Rachel Baughn/MT; Rich D'Angelo/NASWA-Flash Sheet, NASWA-Journal.

SHORTWAVE BROADCAST BANDS

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

Notes

Note 1	Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.
Note 2	Broadcasters can use this frequency range on a (NIB) non-interference basis only.
Note 3	WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007
Note 4	WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

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

0000	0004		Canada, Radio Canada International	6100na		
0000	0015	mtwhf	Moldova, (Transnistria) Radio PMR	6240na		
0000	0027		Czech Republic, Radio Prague	9790na		
0000	0030		Egypt, Radio Cairo	11590na		
0000	0030	vl	Guyana, Voice of Guyana	3290va		
0000	0030		Thailand, Radio Thailand World Service	15275na		
0000	0030		USA, Voice of America	7555af		
0000	0045		India, All India Radio	6055as	7305as	
			9705as	9950as	11645as	13605as
0000	0057		Canada, Radio Canada International	11700as		
0000	0058		Germany, Deutsche Welle	9445as	9785as	
0000	0100		Anguilla, Worldwide Univ Network	6090am		
0000	0100		Australia, ABC NT Alice Springs	4835do		
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek	4910do		
0000	0100		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15230pa	15415as	17715pa
			17750as	17795pa		
0000	0100		Bahrain, Radio Bahrain	6010me		
0000	0100		Bulgaria, Radio Bulgaria	5900na	7400na	
0000	0100		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St Johns NF	6160na		
0000	0100		Canada, CKZU Vancouver BC	6160na		
0000	0100		China, China Radio International	6020eu		
			6075as	6180as	7350eu	7415as
			9570eu	11790as	11885as	13750as
0000	0100		Germany, Deutsche Welle	11855as		
0000	0100		Malaysia, RTM/Traxx FM	7295do		
0000	0100	twhfas	New Zealand, Radio NZ International	15720pa		
0000	0100	DRM/twhas	New Zealand, Radio NZ International	17675pa		
0000	0100		Russia, Voice of Russia	5900na	9665na	
0000	0100		Spain, Radio Exterior de Espana	6055na		
0000	0100		Sri Lanka, SLBC	6005as	9770as	15745as
0000	0100		UK, BBC World Service	5970as	6195as	
			7395as	9740as	12095as	13725as
0000	0100		Ukraine, Radio Ukraine International	7440na		
0000	0100		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0000	0100		USA, EWTN/WEWN Irondale, AL	11520me		
0000	0100		USA, FBN/WTJC Newport NC	9370na		
0000	0100		USA, WBCQ Monticello ME	7415am	9330am	
0000	0100	sm	USA, WBCQ Monticello ME	5110am		
0000	0100	m	USA, WHRI Cypress Creek SC	7315am		
0000	0100	Sun	USA, WHRI Cypress Creek SC	5875am		
			5920am			
0000	0100		USA, WINB Red Lion PA	9265ca		
0000	0100		USA, WTWW Lebanon TN	5755va		
0000	0100		USA, WWCR Nashville TN	4840na	7465na	
			9980na			
0000	0100		USA, WWRB Manchester TN	3185va	3215na	
			6890va			
0000	0100		USA, WYFR/Family Radio Worldwide	5950na		
			6985na	7360sa	7520sa	9505na
			15440na			
0005	0100	twhfa	Canada, Radio Canada International	6100na		
0030	0100		China, China Radio International	11730as		
0030	0100	mtwhfa	Serbia, International Radio of Serbia	9675na		
0030	0100		Thailand, Radio Thailand World Service	15275na		
0030	0100	fas	UK, Bible Voice Broadcasting Network	7405as		
0030	0100		USA, Voice of America/Special English	7430as		
			9715as	9780va	11725va	15205va
			15290va	15560va	17820va	
0045	0100	mtwhf	Moldova, (Transnistria) Radio PMR	6240eu		
0045	0100	Sun	Palau, T8WH/WHRI/Sound of Hope Radio			
			15710as			

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

0100	0105	twhfa	Canada, Radio Canada International	6100na		
0100	0125		Vietnam, Voice of Vietnam	6175na		
0100	0127		Czech Republic, Radio Prague	7345na		
0100	0130		China, China Radio International	11730as		
0100	0130		Slovakia, Radio Slovakia International	5930na		
			9440sa			
0100	0157		North Korea, Voice of Korea	9345as	9730as	
			11735sa	13760as	15180as	
0100	0159		Canada, Radio Canada International	9620as		
0100	0200		Anguilla, Worldwide Univ Network	6090am		
0100	0200		Australia, ABC NT Alice Springs	4835do		
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek	4910do		
0100	0200		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15230pa	15415as	17715pa
			17750pa	17795pa		
0100	0200		Bahrain, Radio Bahrain	6010me		
0100	0200		Canada, CFRX Toronto ON	6070na		
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St Johns NF	6160na		
0100	0200		Canada, CKZU Vancouver BC	6160na		
0100	0200		China, China Radio International	6020eu		
			6175eu	9410eu	9470eu	9535eu
			9570eu	9580na	9790na	11870as
			15785as			
0100	0200	DRM	China, China Radio International	6080na		
0100	0200		Cuba, Radio Havana Cuba	6000na	6050na	
0100	0200	vl	Guyana, Voice of Guyana	3290va		
0100	0200		Malaysia, RTM/Traxx FM	7295do		
0100	0200	twhfas	New Zealand, Radio NZ International	15720pa		
0100	0200	DRM/twhfas	New Zealand, Radio NZ International	17675pa		
0100	0200		Romania, Radio Romania International	6145na		
			7330na			
0100	0200		Russia, Voice of Russia	5900na	9665na	
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, Radio Taiwan International	11875as		
0100	0200		Uganda, UBC Radio	4975do		
0100	0200		UK, BBC World Service	5970as	6195as	
			7395as	9410as	9740as	11750as
			12095as	13725as	15310as	15335as
			15360as	17615as		
0100	0200		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0100	0200		USA, EWTN/WEWN Irondale, AL	11520me		
0100	0200		USA, FBN/WTJC Newport NC	9370na		
0100	0200		USA, KJES Vado NM	7555na		
0100	0200		USA, Voice of America	7430va	9780va	
			11705va			
0100	0200		USA, WBCQ Monticello ME	7415am	9330am	
0100	0200	sm	USA, WBCQ Monticello ME	5110am		
0100	0200	twhfa	USA, WHRI Cypress Creek SC	5920am		
			7315am			
0100	0200		USA, WINB Red Lion PA	9265ca		
0100	0200		USA, WRNO New Orleans LA	7505am		
0100	0200		USA, WTWW Lebanon TN	5755va		
0100	0200		USA, WWCR Nashville TN	3215na	4840na	
			9980na			
0100	0200		USA, WWRB Manchester TN	3145va	3185va	
			6980va			
0100	0200		USA, WYFR/Family Radio Worldwide	6985na		
			9505na	15440na		
0130	0145	twhfas	Albania, Radio Tirana	6130na	7425na	
0130	0200		Iran, VOIRI/IRIB	7245na	9495na	
0130	0200	twhfa	USA, Voice of America/Special English	7465ca		
			9820ca			
0140	0200		Vatican City State, Vatican Radio	7335va		
			9580as	9650va	11850va	

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

0200	0215		Croatia, Croatian Radio	3985eu	7375am	
0200	0227		Iran, VOIRI/IRIB	7245na	9495na	
0200	0230		Thailand, Radio Thailand World Service	15275na		
0200	0230		USA, KJES Vado NM	7555na		
0200	0245		USA, WYFR/Family Radio Worldwide	11835na		
0200	0257		North Korea, Voice of Korea	13650as	15100as	
0200	0300		Anguilla, Worldwide Univ Network	6090am		
0200	0300	twhfa	Argentina, Radio Nacional RAE	11710am		
0200	0300		Australia, ABC NT Alice Springs	4835do		
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek	4910do		
0200	0300		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0200	0300		Bahrain, Radio Bahrain	6010me		
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St Johns NF	6160na		
0200	0300		Canada, CKZU Vancouver BC	6160na		
0200	0300		China, China Radio International	11770as		
			13640as			
0200	0300		Cuba, Radio Havana Cuba	6000na	6050na	
0200	0300		Egypt, Radio Cairo	6270na		
0200	0300	vl	Guyana, Voice of Guyana	3290va		
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300	twhfas	New Zealand, Radio NZ International	15720pa		
0200	0300	DRM/twhfas	New Zealand, Radio NZ International	17675pa		
0200	0300		Philippines, PBS/ Radyo Pilipinas	11880me		
			15285me	15510me		

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0200	0300		Russia, Voice of Russia	7440na	15425na	
0200	0300		South Korea, KBS World Radio		9580sa	
0200	0300		Taiwan, Radio Taiwan International		5950na	
			9680ca			
0200	0300		UK, BBC World Service	6005af	6195as	
			9410as	12095as	15310as	
0200	0300		Ukraine, Radio Ukraine International		7440na	
0200	0300		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0200	0300		USA, EWTN/WEWN Irondale, AL		11520me	
0200	0300		USA, FBN/WTJC Newport NC		9370na	
0200	0300		USA, WBCQ Monticello ME	7415am	9330am	
0200	0300	m	USA, WBCQ Monticello ME	5110am		
0200	0300	twhfa	USA, WHRI Cypress Creek SC		5875na	
			7315am			
0200	0300		USA, WINB Red Lion PA	9265ca		
0200	0300		USA, WRNO New Orleans LA		7505am	
0200	0300		USA, WTWW Lebanon TN	5755va		
0200	0300		USA, WWCR Nashville TN	3215na	4840na	
			5890na			
0200	0300		USA, WWRB Manchester TN	3145va	3185va	
			5050va	6890va		
0200	0300		USA, WYFR/Family Radio Worldwide		5985ca	
			6100sa	6985na	9385ca	9505na
0215	0230		Nepal, Radio Nepal	5005as		
0215	0300		Uganda, UBC Radio	4975do		
0230	0300		Vietnam, Voice of Vietnam	6175na		
0245	0300	twhfas	Albania, Radio Tirana	6130na	7425na	
0245	0300		Australia, HCJB Global Australia		15400as	
0245	0300		India, All India Radio	3945do		
0250	0300		Vatican City State, Vatican Radio		7305am	
			9610am			

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

0300	0315	Sun	Swaziland, TWR Swaziland	3200af		
0300	0327		Czech Republic, Radio Prague		7345na	
0300	0330		Egypt, Radio Cairo	6270na		
0300	0330		Myanmar, Myanmar Radio	9730do		
0300	0330		Philippines, PBS/ Radyo Pilipinas		11880me	
			15285me	15510me		
0300	0330		Sri Lanka, SLBC	6005as	9770as	15745as
0300	0330		Vatican City State, Vatican Radio		7360af	
			9660af			
0300	0355		South Africa, Channel Africa	6135af		
0300	0357		North Korea, Voice of Korea	7200as	9345as	
			9730as			
0300	0358		Germany, Deutsche Welle	11695as		
0300	0400		Anguilla, Worldwide Univ Network		6090am	
0300	0400		Australia, ABC NT Alice Springs		4835do	
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek		4910do	
0300	0400		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0300	0400		Bahrain, Radio Bahrain	6010me		
0300	0400		Bulgaria, Radio Bulgaria	5900na	7400na	
0300	0400	twhfas	Canada, CBC NQ SW Service		9625na	
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St Johns NF	6160na		
0300	0400		Canada, CKZU Vancouver BC		6160na	
0300	0400		China, China Radio International		9690na	
			9790na	11770as	15110as	15120eu
			15785as			
0300	0400		Cuba, Radio Havana Cuba	6000na	6050na	
0300	0400	vl	Guyana, Voice of Guyana	3290va		
0300	0400		Italy, IRRS/NEXUS 7385va			
0300	0400		Malaysia, RTM/Traxx FM	7295do		
0300	0400	twhfas	New Zealand, Radio NZ International		15720pa	
0300	0400	DRM/twhfas	New Zealand, Radio NZ International		17675pa	
0300	0400		Oman, Radio Sultanate of Oman		15355af	
0300	0400		Russia, Voice of Russia	15425na	15585as	
0300	0400	DRM	Russia, Voice of Russia	15735as		
0300	0400		South Africa, Channel Africa	3345af		
0300	0400		Taiwan, Radio Taiwan International		6875na	
			15320as			
0300	0400		Turkey, Voice of Turkey	5975va	6165va	
0300	0400		Uganda, UBC Radio	4975do		
0300	0400		UK, BBC World Service	3255af	6005af	
			6145af	6190af	6195va	7255af
			9750af	11945af	12035as	12095as
			15310as	17790as		
0300	0400		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0300	0400		USA, EWTN/WEWN Irondale, AL		11520me	
0300	0400		USA, FBN/WTJC Newport NC		9370na	
0300	0400		USA, Voice of America	4930af	6080af	
			9885af	15580af		
0300	0400		USA, WBCQ Monticello ME	7415am	9330am	
0300	0400	Sat	USA, WHRI Cypress Creek SC		7315am	
0300	0400		USA, WINB Red Lion PA	9265ca		
0300	0400		USA, WRNO New Orleans LA		7505am	
0300	0400		USA, WTWW Lebanon TN	5755va		
0300	0400		USA, WWCR Nashville TN	3215na	4840na	
			5890na			
0300	0400		USA, WWRB Manchester TN	3145va	3185va	
			5050va	6890va		
0300	0400		USA, WYFR/Family Radio Worldwide		6985na	
			9505na	11740sa	15255sa	
0315	0330		Palau, T8WH/WHRI/Sound of Hope Radio			
			15700as			
0330	0357		Czech Republic, Radio Prague		9445me	
0330	0400	twhfas	Albania, Radio Tirana	6100na		
0330	0400	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0330	0400		UK, BBC World Service	11945af		
0330	0400		Vietnam, Voice of Vietnam	6175na		
0340	0400		Vatican City State, Vatican Radio		15460va	
0345	0400	vl/Sat/Sun	Uganda, UBC Radio	4975do		

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

0400	0430	mtwhf	France, Radio France Internationale		7425af	
			9805af			
0400	0430	Sun	Sri Lanka, SLBC	6005as	9770as	15745as
0400	0430		USA, Voice of America	4930af	4960af	
			6080af	9885af	15580af	
0400	0445		USA, WYFR/Family Radio Worldwide		6985na	
			9505na			
0400	0457		Germany, Deutsche Welle	5905eu	5945eu	
			6180af	9450af	15600af	
0400	0458	twhfas	New Zealand, Radio NZ International		15720pa	
0400	0458	DRM/twhfas	New Zealand, Radio NZ International		17675pa	
0400	0500		Anguilla, Worldwide Univ Network		6090am	
0400	0500		Australia, ABC NT Alice Springs		4835do	
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek		4910do	
0400	0500		Australia, Radio Australia	9660pa	12080pa	
			13690pa	15230pa	15415as	15515pa
			17750as	21725pa		
0400	0500		Bahrain, Radio Bahrain	6010me		
0400	0500	twhfas	Canada, CBC NQ SW Service		9625na	
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St Johns NF	6160na		
0400	0500		Canada, CKZU Vancouver BC		6160na	
0400	0500		China, China Radio International		6020na	
			6080na	13750as	15120eu	15785as
			17730af	17855af		
0400	0500		Cuba, Radio Havana Cuba	6000na	6050na	
0400	0500	vl	Guyana, Voice of Guyana	3290va		
0400	0500		Italy, IRRS/NEXUS 7385va			
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Romania, Radio Romania International		6105na	
			7310na	9690as	11895as	
0400	0500		Russia, Voice of Russia	13775na		
0400	0500		South Africa, Channel Africa	3345af		
0400	0500		Sri Lanka, SLBC	6005as	9770as	15745as
0400	0500		Uganda, UBC Radio	4975do		
0400	0500	DRM	UK, BBC World Service	3995eu		
0400	0500		UK, BBC World Service	3255af	6055af	
			6190af	7255af	7310af	9410eu
			12035af	12095as	13675eu	15310as
			15360as	17790as		
0400	0500		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0400	0500		USA, EWTN/WEWN Irondale, AL		11520me	
0400	0500		USA, FBN/WTJC Newport NC		9370na	
0400	0500	Sun	USA, WHRI Cypress Creek SC		7365eu	
0400	0500	Sat	USA, WHRI Cypress Creek SC		9825me	
0400	0500		USA, WRNO New Orleans LA		7505am	
0400	0500		USA, WTWW Lebanon TN	5755va		
0400	0500		USA, WWCR Nashville TN	3215na	4840na	
			5890na			
0400	0500		USA, WWRB Manchester TN	3185na		
0400	0500		USA, WYFR/Family Radio Worldwide		9680na	
0400	0500		Zambia, 1 Africa-CVC Africa	5925af		
0430	0500	twhfas	Albania, Radio Tirana	6100na		
0430	0500	Sat/Sun	Greece, Voice of Greece	11645eu		
0430	0500	mtwhf	Swaziland, TWR Swaziland	3200af	4775af	
0430	0500		USA, Voice of America	4930af	4960af	
			6080af	9885af	15580af	

0455 0500 Nigeria, Voice of Nigeria/External Service 15120eu
0459 0500 New Zealand, Radio NZ International 11725pa
0459 0500 DRM New Zealand, Radio NZ International 13730pa

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

0500 0507 twhfas Canada, CBC NQ SW Service 9625na
0500 0520 Vatican City State, Vatican Radio 4005eu 5965eu 7250eu 9660af 11625af 13765af
0500 0527 Germany, Deutsche Welle 9755af
0500 0530 China, CNR-11/Holy Tibet 9530do 11685do 15570do
0500 0530 Czech Republic, Radio Prague 9955ca
0500 0530 mtwhf France, Radio France Internationale 11995af 13680af
0500 0530 Germany, Deutsche Welle 6130af 6155af 6180af 12045af
0500 0530 Japan, NHK World/ Radio Japan 5975eu 6110na 11970as 15205as 17810as
0500 0530 Sun UK, BBC World Service 15420af
0500 0555 Sri Lanka, SLBC 6005as 9770as 15745as
0500 0600 Anguilla, Worldwide Univ Network 6090am
0500 0600 Australia, ABC NT Alice Springs 4835do
0500 0600 Australia, ABC NT Katherine 5025do
0500 0600 Australia, ABC NT Tennant Creek 4910do
0500 0600 Australia, Radio Australia 9660pa 12080pa 13630as 15160pa 15230pa 15415as 17750as
0500 0600 Bahrain, Radio Bahrain 6010me
0500 0600 Bhutan, Bhutan Broadcasting Service 6035as
0500 0600 Canada, CFRX Toronto ON 6070na
0500 0600 Canada, CKZN St Johns NF 6160na
0500 0600 Canada, CKZU Vancouver BC 6160na
0500 0600 China, China Radio International 6020na 6190na 11710me 11895as 15350as 15465as 17505af 17540as 17730af 17855af
0500 0600 Cuba, Radio Havana Cuba 6000na 6010na 6050na 6060na 6150na
0500 0600 mtwhf Greece, Voice of Greece 11645eu
0500 0600 vl Guyana, Voice of Guyana 3290va
0500 0600 Italy, IRRS/NEXUS 7385va
0500 0600 Kuwait, Radio Kuwait 15110as
0500 0600 Liberia, Star Radio 3960do 4025al
0500 0600 Malaysia, RTM/Traxx FM 7295do
0500 0600 New Zealand, Radio NZ International 11725pa
0500 0600 DRM New Zealand, Radio NZ International 13730pa
0500 0600 Nigeria, Voice of Nigeria/External Service 15120eu
0500 0600 Russia, Voice of Russia 13775na
0500 0600 South Africa, Channel Africa 7230af
0500 0600 Swaziland, TWR Swaziland 3200af 6120af 9500af
0500 0600 Taiwan, Radio Taiwan International 6875na
0500 0600 Uganda, UBC Radio 4975do
0500 0600 UK, BBC World Service 3995eu 7255af 7310af 9410eu 11945af 12095va 15310as 15360as 15560eu 17640af 17790as
0500 0600 mtwhf UK, BBC World Service 15420af
0500 0600 Ukraine, Radio Ukraine International 9840na
0500 0600 USA, American Forces Network 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0500 0600 USA, EWTN/WEWN Irondale, AL 11520af
0500 0600 USA, FBN/WTJC Newport NC 9370na
0500 0600 USA, Voice of America 4930af 6080af 12080af 15580af
0500 0600 Sun USA, WHRI Cypress Creek SC 11565pa
0500 0600 USA, WTWW Lebanon TN 5755va
0500 0600 USA, WWCR Nashville TN 3215na 4840na
0500 0600 USA, WWRB Manchester TN 3185na
0500 0600 USA, WYFR/Family Radio Worldwide 9680na
0500 0600 Zambia, 1 Africa-CVC Africa 9430af
0515 0530 Rwanda, Radio Rwanda 6055do
0530 0600 Thailand, Radio Thailand World Service 17655eu

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

0600 0629 Germany, Deutsche Welle 5945af 7240af 15205af
0600 0630 Sat/Sun Australia, Radio Australia 15290as
0600 0630 China, Xizang PBS/Holy Tibet 4905do 4920do 5240do 6110do 6130do 6200do 9490do 9580do
0600 0630 mtwhf France, Radio France Internationale 11615af 15160af 17800af
0600 0630 Sat/Sun Greece, Voice of Greece/Radio Filia 11645eu
0600 0645 mtwhf South Africa, TWR Africa 11640af
0600 0658 New Zealand, Radio NZ International 11725pa
0600 0658 DRM New Zealand, Radio NZ International 13730pa
0600 0700 Anguilla, Worldwide Univ Network 6090am
0600 0700 Australia, ABC NT Alice Springs 4835do
0600 0700 Australia, ABC NT Katherine 5025do
0600 0700 Australia, ABC NT Tennant Creek 4910do
0600 0700 Australia, Radio Australia 9660pa 12080pa 13630as 13690pa 15160pa 15230pa 17750as
0600 0700 Bahrain, Radio Bahrain 6010me
0600 0700 Canada, CFRX Toronto ON 6070na
0600 0700 Canada, CFVP Calgary AB 6030na
0600 0700 Canada, CKZN St Johns NF 6160na
0600 0700 Canada, CKZU Vancouver BC 6160na
0600 0700 China, China Radio International 11710me 11870af 11895as 13660as 15140af 15350as 15465as 17505af 17540as
0600 0700 Cuba, Radio Havana Cuba 6000na 6010na 6050na 6060na 6150na
0600 0700 vl Guyana, Voice of Guyana 3290va
0600 0700 Kuwait, Radio Kuwait 15110as
0600 0700 Liberia, Star Radio 3960do 4025al
0600 0700 Malaysia, RTM/Traxx FM 7295do
0600 0700 Malaysia, RTM/Voice of Malaysia 6175as 9750as 15295as
0600 0700 Nigeria, Voice of Nigeria/External Service 15120eu
0600 0700 Papua New Guinea, Radio Wantok Light 7325do
0600 0700 Russia, Voice of Russia 15405pa
0600 0700 South Africa, Channel Africa 7230af
0600 0700 Swaziland, TWR Swaziland 4775af 6120af 9500af
0600 0700 Uganda, UBC Radio 4975do
0600 0700 UK, BBC World Service 3995eu 6005af 6190af 7310af 9410af 9860af 12015as 12095as 15310as 17640af 17790as
0600 0700 Sat/Sun UK, BBC World Service 15420af
0600 0700 DRM UK, BBC World Service 3995eu
0600 0700 USA, American Forces Network 4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
0600 0700 USA, EWTN/WEWN Irondale, AL 11520af
0600 0700 USA, FBN/WTJC Newport NC 9370na
0600 0700 USA, Voice of America 6080af 12080af 15580af
0600 0700 Sun USA, WHRI Cypress Creek SC 7365eu
0600 0700 USA, WTWW Lebanon TN 5755va
0600 0700 USA, WWCR Nashville TN 3215na 4840na
0600 0700 USA, WWRB Manchester TN 3185na
0600 0700 USA, WYFR/Family Radio Worldwide 5850ca 7520va 9680na 11530af 11580va
0600 0700 Zambia, 1 Africa-CVC Africa 13590af
0600 0700 vl Zambia, Radio Christian Voice/The Voice Africa 6065af
0600 615 Sat/Sun South Africa, TWR Africa 11640af
0630 0645 Vatican City State, Vatican Radio 4005eu 5965eu 7250eu 9645af 11740eu 15595eu
0630 0700 Romania, Radio Romania International 7370eu 17780pa 21600pa
0630 0700 DRM Romania, Radio Romania International 6020eu
0630 0700 Vatican City State, Vatican Radio 11625af 13765af 15570af
0645 0700 Sun Germany, TWR Europe 6105eu
0645 0700 Sun Monaco, TWR Europe 9800eu
0659 0700 New Zealand, Radio NZ International 9765pa
0659 0700 DRM New Zealand, Radio NZ International 13730pa

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

0700 0727 Czech Republic, Radio Prague 9880eu
0700 0730 mtwhf France, Radio France Internationale 13675af
0700 0730 Myanmar, Myanmar Radio 9730do
0700 0730 Slovakia, Radio Slovakia International 9440va 11650va
0700 0730 Sun UK, Bible Voice Broadcasting Network 5945eu
0700 0745 USA, WYFR/Family Radio Worldwide 7520va

0700	0750	mtwhf	Germany, TWR Europe	6105eu		
0700	0750	mtwhf	Monaco, TWR Europe	9800eu		
0700	0758	DRM	New Zealand, Radio NZ International	13730pa		
0700	0800		Anguilla, Worldwide Univ Network	6090am		
0700	0800		Australia, ABC NT Alice Springs	4835do		
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek	4910do		
0700	0800		Australia, Radio Australia	9475as	9660pa	
			9710as	11945pa	12080pa	
0700	0800		Bahrain, Radio Bahrain	6010me		
0700	0800	m/DRM	Belgium, TDP Radio	6015eu		
0700	0800		Canada, CFRX Toronto ON	6070na		
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St Johns NF	6160na		
0700	0800		Canada, CKZU Vancouver BC	6160na		
0700	0800		China, China Radio International	11895as		
			13660as	13710eu	15125me	15350as
			17710as			
0700	0800	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
0700	0800	Sun	Germany, TWR Europe	6105eu		
0700	0800	vl	Guyana, Voice of Guyana	3290va		
0700	0800		Kuwait, Radio Kuwait	15110as		
0700	0800		Liberia, Star Radio	3960do	4025al	
0700	0800		Malaysia, RTM/Traxx FM	7295do		
0700	0800		Malaysia, RTM/Voice of Malaysia	6175as		
			9750as	15295as		
0700	0800		Myanmar, Myanmar Radio	9730do		
0700	0800		New Zealand, Radio NZ International	9765pa		
0700	0800		Papua New Guinea, Radio Wantok Light			
			7325do			
0700	0800		Russia, Voice of Russia	15405pa	17495va	
0700	0800		South Africa, Channel Africa	7230af		
0700	0800		Swaziland, TWR Swaziland	4775af	6120af	
			9500af			
0700	0800		Uganda, UBC Radio	4975do		
0700	0800		UK, BBC World Service	5790eu	6190af	
			9860af	11760me	11765af	13830af
			15400af	15575as	17790as	17830af
0700	0800	Sat/Sun	UK, BBC World Service	15420af		
0700	0800	Sat	UK, Bible Voice Broadcasting Network	5945eu		
0700	0800		Ukraine, Radio Ukraine International	11620eu		
0700	0800		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0700	0800		USA, EWTN/WEWN Irondale, AL	11520af		
0700	0800		USA, FBN/WTJC Newport NC	9370na		
0700	0800	Sun	USA, WHRI Cypress Creek SC	11565pa		
0700	0800		USA, WTWW Lebanon TN	5755va		
0700	0800		USA, WWCR Nashville TN	3215na	4840na	
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		USA, WYFR/Family Radio Worldwide	5950na		
			5985na	6875na	9385af	9505ca
0700	0800		Zambia, 1 Africa-CVC Africa	13590af		
0700	0800	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
0715	0750	Sat	Germany, TWR Europe	6105eu		
0715	0750	Sat	Monaco, TWR Europe	9800eu		
0730	0800		Australia, HCJB Global Australia	11750as		
0730	0800		Bulgaria, Radio Bulgaria	5900eu	7400eu	
0730	0800		Clandestine, Cotton Tree News	15220af		
0759	0800	DRM	New Zealand, Radio NZ International	9870pa		

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

0800	0815	Sat	UK, Bible Voice Broadcasting Network	5945eu		
0800	0820	Sun	Germany, TWR Europe	6105eu		
0800	0830		Australia, ABC NT Alice Springs	4835do		
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek	4910do		
0800	0830		Myanmar, Myanmar Radio	9730do		
0800	0845		USA, WYFR/Family Radio Worldwide	5950na		
			5985na	9385af		
0800	0900		Anguilla, Worldwide Univ Network	6090am		
0800	0900		Australia, HCJB Global Australia	11750pa		
0800	0900		Australia, Radio Australia	5995pa	9475as	
			9580pa	9590pa	9710pa	11945pa
			12080pa	13630as		
0800	0900		Bahrain, Radio Bahrain	6010me		
0800	0900	t/DRM	Belgium, TDP Radio	6015eu		
0800	0900		Bhutan, Bhutan Broadcasting Service	6035as		
0800	0900		Canada, CFRX Toronto ON	6070na		
0800	0900		Canada, CFVP Calgary AB	6030na		
0800	0900		Canada, CKZN St Johns NF	6160na		
0800	0900		Canada, CKZU Vancouver BC	6160na		
0800	0900		China, China Radio International	11620as		
			11895as	13710eu	15350as	15465as
			15625me	17540as		
0800	0900	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
0800	0900	vl	Guyana, Voice of Guyana	3290va		
0800	0900		Liberia, Star Radio	3960do	4025al	
0800	0900		Malaysia, RTM/Traxx FM	7295do		
0800	0900		Malaysia, RTM/Voice of Malaysia	6175as		
			9750as	15295as		
0800	0900		New Zealand, Radio NZ International	9765pa		
0800	0900	DRM	New Zealand, Radio NZ International	9870pa		
0800	0900		Papua New Guinea, Radio Wantok Light			
			7325do			
0800	0900	DRM	Russia, Voice of Russia	12060eu		
0800	0900	Sun	South Africa, Amateur Radio Mirror Intl	7205af		
			17570af			
0800	0900		South Africa, Channel Africa	9625af		
0800	0900		South Korea, KBS World Radio	9570as		
0800	0900		Swaziland, TWR Swaziland	4775af	6120af	
			9500af			
0800	0900		Uganda, UBC Radio	4975do		
0800	0900		UK, BBC World Service	6190af	9860af	
			11760me	15310as	15400af	15575as
			17640af	17790as	17830af	21470af
0800	0900		Ukraine, Radio Ukraine International	11620eu		
0800	0900		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0800	0900		USA, EWTN/WEWN Irondale, AL	11520af		
0800	0900		USA, FBN/WTJC Newport NC	9370na		
0800	0900		USA, KNLS Anchor Point AK	7355as		
0800	0900	smtwhf	USA, WHRI Cypress Creek SC	11565pa		
0800	0900		USA, WTWW Lebanon TN	5755va		
0800	0900		USA, WWCR Nashville TN	3215na	4840na	
0800	0900		USA, WWRB Manchester TN	3185na		
0800	0900		USA, WYFR/Family Radio Worldwide	5985na		
			6875na			
0800	0900		Zambia, 1 Africa-CVC Africa	13590af		
0800	0900	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
0815	0825		Nepal, Radio Nepal	5005as		
0820	0900	smtwhf	Guam, KTWR/TWR	15170as		
0830	0900		Australia, ABC NT Alice Springs	2310do		
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek	2325do		
0830	0900	mtwhfa	Guam, KTWR/TWR	11840pa		
0845	0900	mtwhf	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			

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

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa		
0900	0915	mtwhf	Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
0900	0927		Czech Republic, Radio Prague	17650af		
0900	0930		Australia, HCJB Global Australia	11750pa		
0900	0958		Germany, Deutsche Welle	21780as		
0900	1000		Anguilla, Worldwide Univ Network	6090am		
0900	1000		Australia, ABC NT Alice Springs	2310do		
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek	2325do		
0900	1000		Australia, Radio Australia	9475as	9580pa	
			9590pa	11945pa		
0900	1000		Bahrain, Radio Bahrain	6010me		
0900	1000	w/DRM	Belgium, TDP Radio	6015eu		
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		
0900	1000		Canada, CKZN St Johns NF	6160na		
0900	1000		Canada, CKZU Vancouver BC	6160na		
0900	1000		China, China Radio International	11620as		
			13790pa	15210as	15270eu	15350as
			17490eu	17570eu	17750as	
0900	1000	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
0900	1000	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
0900	1000	2nd Sun	Germany, Blue Star Radio	6140eu		
0900	1000		Germany, Deutsche Welle	17710as		
0900	1000	vl	Guyana, Voice of Guyana	3290va		
0900	1000	Sat	Italy, IRRS/NEXUS 9510va			
0900	1000		Malaysia, RTM/Traxx FM	7295do		
0900	1000		Malaysia, RTM/Voice of Malaysia	6175as		
			9750as	15295as		
0900	1000		New Zealand, Radio NZ International	9765pa		
0900	1000	DRM	New Zealand, Radio NZ International	9870pa		
0900	1000		Nigeria, Voice of Nigeria/External Service			
			9690af			

0900	1000		Papua New Guinea, Radio Wantok Light 7325do			
0900	1000		Russia, Voice of Russia	17495pa		
0900	1000	DRM	Russia, Voice of Russia	12060eu		
0900	1000		Tajikistan, Voice of Tajik/External Service	7245va		
0900	1000		Uganda, UBC Radio	4975do		
0900	1000	DRM	UK, BBC World Service	9610eu	13810eu	
0900	1000		UK, BBC World Service	6190af	6195as	
			9740as	9860af	11760me	15105as
			15285as	15310as	15400af	15575as
			17640as	17760as	17830af	21470af
			21660as			
0900	1000		Ukraine, Radio Ukraine International	11620na		
0900	1000		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
0900	1000		USA, EWTN/WEWN Irondale, AL	9390as		
0900	1000		USA, FBN/WTJC Newport NC	9370na		
0900	1000	Sun	USA, WHRI Cypress Creek SC	11565pa		
0900	1000		USA, WTWW Lebanon TN	5755va		
0900	1000		USA, WWCR Nashville TN	4840na	9985na	
0900	1000		USA, WWRB Manchester TN	3185na		
0900	1000		USA, WYFR/Family Radio Worldwide	5985na		
			6875na	9465as	9755na	
0900	1000		Zambia, 1 Africa-CVC Africa	13590af		
0900	1000	vl	Zambia, Radio Christian Voice/The Voice Africa 6065af			
0930	1000		Saudi Arabia, BSKSA/Saudi Radio	15250af		

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

1000	1030	Sat/Sun/DRM	Bulgaria, Radio Bulgaria/Euranet 11900eu			
1000	1030		Czech Republic, Radio Prague	9955na		
1000	1030		Japan, NHK World/ Radio Japan	9605as		
			9625pa	9825pa	11780as	
1000	1030	fa	Philippines, FEBC	15325as		
1000	1030		Vietnam, Voice of Vietnam	9840as	12020as	
1000	1057		Netherlands, R Netherlands Worldwide	11895as		
			12065as	15110as		
1000	1057		North Korea, Voice of Korea	11710sa	11735sa	
			13650as	15180sa		
1000	1058		New Zealand, Radio NZ International	9765pa		
1000	1100		Anguilla, Worldwide Univ Network	11775am		
1000	1100		Australia, ABC NT Alice Springs	2310do		
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek	2325do		
1000	1100		Australia, Radio Australia	9475as	9580pa	
			9590pa	11945pa		
1000	1100		Bahrain, Radio Bahrain	6010me		
1000	1100	h/DRM	Belgium, TDP Radio	6015eu		
1000	1100		Canada, CFRX Toronto ON	6070na		
1000	1100		Canada, CFVP Calgary AB	6030na		
1000	1100		Canada, CKZN St Johns NF	6160na		
1000	1100		Canada, CKZU Vancouver BC	6160na		
1000	1100		China, China Radio International	6040na		
			11610as	11635eu	13590as	13620as
			13720as	13790pa	15190as	15350as
			17490eu			
1000	1100	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
1000	1100	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1000	1100	3rd Sun	Germany, European Music Radio	6140eu		
1000	1100	4th Sun	Germany, Radio Gloria International	6140eu		
1000	1100		India, All India Radio	7270as	13695pa	
			15020as	15260as	15410pa	17800pa
			17895pa			
1000	1100		Indonesia, Voice of Indonesia	9526va	11785al	
1000	1100		Malaysia, RTM/Traxx FM	7295do		
1000	1100	DRM	New Zealand, Radio NZ International	9870pa		
1000	1100		Nigeria, Voice of Nigeria/External Service 9690af			
1000	1100	mt	Palau, T8WH/WHRI/Sound of Hope Radio	9930as	15725as	
1000	1100	hfa	Palau, T8WH/WHRI/Sound of Hope Radio 9930as			
1000	1100		Papua New Guinea, Radio Wantok Light 7325do			
1000	1100		Saudi Arabia, BSKSA/Saudi Radio	15250af		
			15470af			
1000	1100		Uganda, UBC Radio	4975do		
1000	1100	DRM	UK, BBC World Service	9545eu	13810eu	
1000	1100	Sat/Sun	UK, BBC World Service	15400af	17830af	
1000	1100		UK, BBC World Service	6190af	6195as	
			9545eu	9740as	9860af	11760me
			15285as	15310as	15575as	17640af
			17790as	21470af	21660as	
1000	1100		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1000	1100		USA, EWTN/WEWN Irondale, AL	9390as		
1000	1100		USA, FBN/WTJC Newport NC	9370na		
1000	1100		USA, KNLS Anchor Point AK	7355as		
1000	1100		USA, WINB Red Lion PA	9265ca		
1000	1100		USA, WTWW Lebanon TN	5755va		
1000	1100		USA, WWCR Nashville TN	4840na	9985na	
1000	1100		USA, WWRB Manchester TN	3185na		
1000	1100		USA, WYFR/Family Radio Worldwide	5950na		
			5985na	6875na	9450as	9465as
			9755na			
1000	1100		Zambia, 1 Africa-CVC Africa	13590af		
1000	1100	vl	Zambia, Radio Christian Voice/The Voice Africa 6065af			
1030	1057		Czech Republic, Radio Prague	9880eu		
1030	1100		Iran, VOIRI/IRIB	15600as	17660as	
1030	1100	Sun	Italy, IRRS/NEXUS	9510va		
1030	1100		Mongolia, Voice of Mongolia	12085as		
1059	1100		New Zealand, Radio NZ International	13660pa		

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

1100	1105		Pakistan, PBC/Radio Pakistan	15100as	17720as	
1100	1127		Iran, VOIRI/IRIB	15600as	17660as	
1100	1130	f/DRM	Japan, NHK World/ Radio Japan	9760eu		
1100	1130	Sat/DRM	South Korea, KBS World Radio	9760eu		
1100	1130	mtwhf	UK, BBC World Service	15400af		
1100	1130		Vietnam, Voice of Vietnam	7285as		
1100	1145		USA, WYFR/Family Radio Worldwide	6875na		
			9550sa	9755na		
1100	1158	DRM	New Zealand, Radio NZ International	9870pa		
1100	1200		Anguilla, Worldwide Univ Network	11775am		
1100	1200		Australia, ABC NT Alice Springs	2310do		
1100	1200		Australia, ABC NT Katherine	2485do		
1100	1200		Australia, ABC NT Tennant Creek	2325do		
1100	1200		Australia, Radio Australia	5995pa	6020pa	
			9475as	9580pa	9590pa	9965as
			11945pa			
1100	1200	DRM	Australia, Radio Australia	12080pa		
1100	1200		Bahrain, Radio Bahrain	6010me		
1100	1200	f/DRM	Belgium, TDP Radio	6015eu		
1100	1200	Sat/Sun	Canada, CBC NQ SW Service	9625na		
1100	1200		Canada, CFRX Toronto ON	6070na		
1100	1200		Canada, CFVP Calgary AB	6030na		
1100	1200		Canada, CKZN St Johns NF	6160na		
1100	1200		Canada, CKZU Vancouver BC	6160na		
1100	1200		China, China Radio International	5955as		
			6040na	11650as	11660as	11750na
			11795as	13590as	13645as	13650eu
			13720as	17490eu		
1100	1200	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
1100	1200	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1100	1200	Sun	Italy, IRRS/NEXUS	9510va		
1100	1200		Malaysia, RTM/Traxx FM	7295do		
1100	1200		New Zealand, Radio NZ International	13660pa		
1100	1200		Nigeria, Voice of Nigeria/External Service 9690af			
1100	1200		Papua New Guinea, Radio Wantok Light 7325do			
1100	1200		Saudi Arabia, BSKSA/Saudi Radio	15250af		
			15470af			
1100	1200		Taiwan, Radio Taiwan International	7445as		
			11715as			
1100	1200		Uganda, UBC Radio	4975do		
1100	1200		UK, BBC World Service	6190af	6195as	
			9545eu	9740as	9860af	11760me
			15280as	15310as	15575as	17640af
			17790as	17830af	21470af	
1100	1200		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1100	1200		USA, EWTN/WEWN Irondale, AL	9390as		
1100	1200		USA, FBN/WTJC Newport NC	9370na		
1100	1200		USA, WINB Red Lion PA	9265ca		
1100	1200		USA, WTWW Lebanon TN	5755na		
1100	1200		USA, WWCR Nashville TN	4840na	5890na	
			15825na			
1100	1200		USA, WWRB Manchester TN	3185na		
1100	1200		USA, WYFR/Family Radio Worldwide	5950na		
			5985na	7730sa	9625sa	15560as
1100	1200		Zambia, 1 Africa-CVC Africa	13590af		
1100	1200	vl	Zambia, Radio Christian Voice/The Voice Africa 6065af			

1130	1150	f	Vatican City State, Vatican Radio			15595as
			17765as			
1130	1200	f	Vatican City State, Vatican Radio/Mass			15595me
			17765me			
1130	1200		Vietnam, Voice of Vietnam	9840as		12020as
1145	1200	Sat/Sun	UK, Bible Voice Broadcasting Network			7245as

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

1200	1215		Nepal, Radio Nepal	5005as		
1200	1215	Sat/Sun	UK, Bible Voice Broadcasting Network			7245as
1200	1230	mtwhf	France, Radio France Internationale			21620af
1200	1230		Germany, AWR Europe	15495as		
1200	1230		Japan, NHK World/ Radio Japan			6120na
			9625pa	9695as	9790eu	
1200	1230		Saudi Arabia, BSKSA/Saudi Radio			15250af
			15470af			
1200	1230	mtwhfa	Vatican City State, Vatican Radio			9830am
1200	1245		USA, WYFR/Family Radio Worldwide			5950na
			5985na			
1200	1258		New Zealand, Radio NZ International			13660pa
1200	1259		Poland, Polskie Radio Warsaw			11675eu
			11980eu			
1200	1300		Anguilla, Worldwide Univ Network			11775am
1200	1300		Australia, ABC NT Alice Springs			2310do
1200	1300		Australia, ABC NT Katherine	2485do		
1200	1300		Australia, ABC NT Tennant Creek			2325do
1200	1300		Australia, Radio Australia	6020pa		9475as
			9580pa	9965as	11945pa	
1200	1300	DRM	Australia, Radio Australia	5995pa		
1200	1300		Bahrain, Radio Bahrain	6010me		
1200	1300	a/DRM	Belgium, TDP Radio	6015eu		
1200	1300	Sat/Sun	Canada, CBC NQ SW Service			9625na
1200	1300		Canada, CFRX Toronto ON	6070na		
1200	1300		Canada, CFVP Calgary AB	6030na		
1200	1300		Canada, CKZN St Johns NF	6160na		
1200	1300		Canada, CKZU Vancouver BC			6160na
1200	1300		China, China Radio International			5955as
			9460as	9660as	9730as	9760pa
			11650as	11660as	11690me	11760pa
			11980as	13645as	13650eu	13790eu
			17490eu			
1200	1300	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1200	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service			
			5990do	7110do	9705do	
1200	1300	Sun	Italy, IRRS/NEXUS	9510va		
1200	1300		Malaysia, RTM/Traxx FM	7295do		
1200	1300		Nigeria, Voice of Nigeria/External Service			
			9690af			
1200	1300		Papua New Guinea, Radio Wantok Light			
			7325do			
1200	1300		Romania, Radio Romania International			15480eu
			11970eu	15430af	17760af	
1200	1300		Russia, Voice of Russia	11500as		
1200	1300		South Korea, KBS World Radio			9650na
1200	1300		Uganda, UBC Radio	4975do		
1200	1300		UK, BBC World Service	5875as		6190af
			6195as	9545eu	9740as	9860af
			11750as	11760me	15310as	15575as
			17640af	17790as	17830af	
1200	1300		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1200	1300		USA, EWTN/WEWN Irondale, AL			15610me
1200	1300		USA, FBN/WTJC Newport NC			9370na
1200	1300		USA, KNLS Anchor Point AK	7355as		9655as
1200	1300		USA, Voice of America	7575va		9510va
			9760va	12075va		
1200	1300		USA, WHRI Cypress Creek SC			7315na
1200	1300	Sun	USA, WHRI Cypress Creek SC			9410na
1200	1300		USA, WINB Red Lion PA	9265ca		
1200	1300		USA, WTWW Lebanon TN	5755na		
1200	1300		USA, WWCR Nashville TN	7490af		9980na
			13845na	15825na		
1200	1300		USA, WWRB Manchester TN	3185na		
1200	1300		USA, WYFR/Family Radio Worldwide			17555sa
			17795na			
1200	1300		Zambia, 1 Africa-CVC Africa	13590af		
1200	1300	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1215	1300		Egypt, Radio Cairo	17870as		
1215	1300	mtwhyf	UK, BBC World Service	9410ca		11860ca
1230	1300	smtwhf	Australia, HCJB Global Australia			15400as
1230	1300		Bangladesh, Bangladesh Betar			7250as
1230	1300		Saudi Arabia, BSKSA/Saudi Radio			15470af
1230	1300		Thailand, Radio Thailand World Service			9890va
1230	1300		Turkey, Voice of Turkey	15450eu		15520as
1230	1300		Vietnam, Voice of Vietnam	9840as		12020as

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

1300	1327		Czech Republic, Radio Prague			11600eu
1300	1330		Egypt, Radio Cairo	17870as		
1300	1330		Japan, NHK World/ Radio Japan			11985as
1300	1330		Laos, Lao National Radio	7145as		
1300	1330		Turkey, Voice of Turkey	15450as		15520eu
1300	1330	Sat/Sun	USA, WHRI Cypress Creek SC			9840na
1300	1357		North Korea, Voice of Korea	9335eu		11710na
			13760as	15245eu		
1300	1400		Anguilla, Worldwide Univ Network			11775am
1300	1400		Australia, ABC NT Alice Springs			2310do
1300	1400		Australia, ABC NT Katherine	2485do		
1300	1400		Australia, HCJB Global Australia			15400as
1300	1400		Australia, Radio Australia	6020pa		9580pa
			9590pa			
1300	1400	DRM	Australia, Radio Australia	5995pa		
1300	1400		Bahrain, Radio Bahrain	6010me		
1300	1400	s/DRM	Belgium, TDP Radio	6015na		
1300	1400	Sat/Sun	Canada, CBC NQ SW Service			9625na
1300	1400		Canada, CFRX Toronto ON	6070na		
1300	1400		Canada, CFVP Calgary AB	6030na		
1300	1400		Canada, CKZN St Johns NF	6160na		
1300	1400		Canada, CKZU Vancouver BC			6160na
1300	1400		China, China Radio International			5995as
			9570na	9650na	9730as	9765as
			9870as	11660as	11760me	11980as
			13610eu	13755as	15260na	
1300	1400	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1300	1400		Indonesia, Voice of Indonesia	9526va		11785al
1300	1400		Malaysia, RTM/Traxx FM	7295do		
1300	1400		New Zealand, Radio NZ International			5950pa
1300	1400		Nigeria, Voice of Nigeria/External Service			
			9690af			
1300	1400		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930as			
1300	1400		Papua New Guinea, Radio Wantok Light			
			7325do			
1300	1400		South Korea, KBS World Radio			9770as
1300	1400		Tajikistan, Voice of Tajik/External Service			7245va
1300	1400		Uganda, UBC Radio	4975do		
1300	1400		UK, BBC World Service	5875as		6190af
			6195as	9545eu	9740as	9860af
			11760me	15310as	15420af	15575as
			17640af	17790as	17830af	21470af
1300	1400		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1300	1400		USA, EWTN/WEWN Irondale, AL			15610me
1300	1400		USA, FBN/WTJC Newport NC			9370na
1300	1400		USA, KJES Vado NM	11715na		
1300	1400	Sat/Sun	USA, Voice of America	7575va		9510va
			9760va			
1300	1400		USA, WBCQ Monticello ME	9330am		
1300	1400		USA, WINB Red Lion PA	9265ca		
1300	1400		USA, WTWW Lebanon TN	9479na		
1300	1400		USA, WWCR Nashville TN	7490af		9980na
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	9385na		
1300	1400		USA, WYFR/Family Radio Worldwide			11520as
			11560as	11830na	11910na	12155as
			13820as	17795na		
1300	1400		Zambia, 1 Africa-CVC Africa	13590af		
1300	1400	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1305	1400	Sun	Greece, Voice of Greece	9420va		15630va
1330	1400	st	Guam, KSDA/AWR	11935as		
1330	1400	mtw	Guam, KSDA/AWR	15660as		
1330	1400		India, All India Radio	9690as		11620as
			13710as			
1330	1400		Vietnam, Voice of Vietnam	9840as		12020as

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

1400	1415	Sun	Germany, Pan American Broadcasting			15205as
1400	1425	mh	Guam, KTWR/TWR	9975as		
1400	1430		China, CNR-11/Holy Tibet	6010do		7350do
			9480do			
1400	1430	`	Japan, NHK World/ Radio Japan			11705as
			11985as	21560va		
1400	1430		Thailand, Radio Thailand World Service			9575va
1400	1430	Sun	United Arab Emirates, FEBA Radio			12025as

1400	1435	twfas	Guam, KTWR/TWR	9975as
1400	1500		Anguilla, Worldwide Univ Network	11775am
1400	1500		Australia, ABC NT Alice Springs	2310do
1400	1500		Australia, ABC NT Katherine	2485do
1400	1500		Australia, ABC NT Tennant Creek	2325do
1400	1500		Australia, Radio Australia	6080pa 7240pa 9590pa
1400	1500		Bahrain, Radio Bahrain	6010me
1400	1500	DRM	Belgium, TDP Radio/Disco Palace	6015eu
1400	1500		Bhutan, Bhutan Broadcasting Service	6035as
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na
1400	1500		Canada, CFRX Toronto ON	6070na
1400	1500		Canada, CFVP Calgary AB	6030na
1400	1500		Canada, CKZN St Johns NF	6160na
1400	1500		Canada, CKZU Vancouver BC	6160na
1400	1500		China, China Radio International	5955as 9765as 9870as 11665as 11675as 11765eu 13710as 13740na 13790eu 17630as
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
1400	1500		India, All India Radio	9690as 11620as 13710as
1400	1500		Italy, IRRS/NEXUS	15710va
1400	1500		Libya, LJBC Voice of Africa	17725af 21695af
1400	1500		Malaysia, RTM/Traxx FM	7295do
1400	1500		Netherlands, R Netherlands Worldwide	11835as 15745as
1400	1500		New Zealand, Radio NZ International	5950pa
1400	1500		Nigeria, Voice of Nigeria/External Service	9690af
1400	1500		Palau, T8WH/WHRI/Sound of Hope Radio	9930as
1400	1500		Papua New Guinea, Radio Wantok Light	7325do
1400	1500		Russia, Voice of Russia	4975va 9455as 11500as
1400	1500	DRM	Russia, Voice of Russia	9750eu
1400	1500		South Africa, Channel Africa	9625af
1400	1500		Uganda, UBC Radio	4975do
1400	1500		UK, BBC World Service	5790eu 5875as 6190af 6195as 7230af 9740as 11920as 12095as 15310as 17640af 17830af 21470af
1400	1500	DRM	UK, BBC World Service	9545eu 13590eu
1400	1500	Sat	UK, Bible Voice Broadcasting Network	15265as
1400	1500		United States, Overcomer Ministries	13810me
1400	1500		USA, American Forces Network	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1400	1500		USA, EWTN/WEWN Irondale, AL	15610me
1400	1500		USA, FBN/WTJC Newport NC	9370na
1400	1500		USA, KJES Vado NM	11715am
1400	1500		USA, KNLS Anchor Point AK	7355as
1400	1500		USA, Voice of America	6080af 12080af 13570af 15530af 15580af 17585af 17740af
1400	1500	mtwhf	USA, Voice of America	7540va 7575va 9760va
1400	1500		USA, WBCQ Monticello ME	9330am
1400	1500	Sat	USA, WBCQ Monticello ME	15420am
1400	1500	Sat	USA, WHRI Cypress Creek SC	9840na
1400	1500		USA, WINB Red Lion PA	9265ca
1400	1500		USA, WJHR International Milton FL	15550na
1400	1500		USA, WTWW Lebanon TN	9479na
1400	1500		USA, WWCR Nashville TN	7490af 9980na 13845na 15825na
1400	1500		USA, WWRB Manchester TN	9385na
1400	1500		USA, WYFR/Family Radio Worldwide	9365as 9615as 9865as 11560as 11725as 11830na 11910na 13695na 17795na
1400	1500		Zambia, 1 Africa-CVC Africa	13590af
1400	1500	vl	Zambia, Radio Christian Voice/The Voice Africa	6065af
1415	1430		Germany, Pan American Broadcasting	15205as
1415	1430		Nepal, Radio Nepal	5005as
1425	1455	mtwhf	Swaziland, TWR Swaziland	6065af
1430	1445	Sun	Germany, Pan American Broadcasting	15205as
1430	1459		China, CNR-2/Business Radio	6055do 6155do 7245as 7315as 7335as 7375as 9820as
1430	1500		Australia, Radio Australia	9475as 11660as
1430	1500		China, China Radio International	7325as 11695as 12110as
1430	1500	Sat	UK, Bible Voice Broadcasting Network	15265as
1445	1500	Sat/Sun	Australia, HCJB Global Australia	15340as

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi	5015eu
1500	1515	Sun	UK, Bible Voice Broadcasting Network	13740as
1500	1530	Sun	China, Voice of the Strait	4940do 9505do
1500	1530		Clandestine, Sudan Radio Service/ SRS	17745af
1500	1530		Guam, KSDA/AWR	12025as
1500	1530		UK, BBC World Service	7405af 11860af 15420af
1500	1530		Vietnam, Voice of Vietnam	7285as 9840as 12020as
1500	1545		USA, WYFR/Family Radio Worldwide	15770sa
1500	1550		New Zealand, Radio NZ International	5950pa
1500	1557		Canada, Radio Canada International	11675as 15125as
1500	1557		Libya, LJBC Voice of Africa	17725af 21695af
1500	1557		Netherlands, R Netherlands Worldwide	11835as 15745as
1500	1557		North Korea, Voice of Korea	9335eu 11710na 13760na 15245eu
1500	1600		Anguilla, Worldwide Univ Network	11775am
1500	1600		Australia, ABC NT Alice Springs	2310do
1500	1600		Australia, ABC NT Katherine	2485do
1500	1600		Australia, Radio Australia	5995pa 6080pa 7240pa 9475as 9590pa 11660as
1500	1600		Bahrain, Radio Bahrain	6010me
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na
1500	1600		Canada, CFRX Toronto ON	6070na
1500	1600		Canada, CFVP Calgary AB	6030na
1500	1600		Canada, CKZN St Johns NF	6160na
1500	1600		Canada, CKZU Vancouver BC	6160na
1500	1600		China, China Radio International	5955as 6095me 7325as 7410as 9720me 9870as 9800as 11965eu 13640eu 13740na 17630as
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
1500	1600		Italy, IRRS/NEXUS	15710va
1500	1600		Malaysia, RTM/Traxx FM	7295do
1500	1600		Myanmar, Myanmar Radio	5985as
1500	1600		Nigeria, Voice of Nigeria/External Service	15120af
1500	1600		Papua New Guinea, Radio Wantok Light	7325do
1500	1600		Russia, Voice of Russia	4975va 9455as 9735me 11985va 12040eu 13855af 11985af
1500	1600		South Africa, Channel Africa	9625af
1500	1600	vl	Uganda, Dunamis Shortwave	4750af
1500	1600		Uganda, UBC Radio	4975do
1500	1600		UK, BBC World Service	5790eu 5875as 6575as 6190af 6195as 7230af 9740as 11920as 12095eu 15310as 15400af 17640af 17830af 21470af
1500	1600	DRM	UK, BBC World Service	5790eu 13590eu
1500	1600		USA, American Forces Network	4319usb 5446usb 5765usb 7812usb 12133usb 12759usb 13362usb
1500	1600		USA, EWTN/WEWN Irondale, AL	15610me
1500	1600		USA, FBN/WTJC Newport NC	9370na
1500	1600		USA, Voice of America	4930af 7540va 7575va 12080af 12150va 13750va 15530va 15580af 17895af
1500	1600		USA, Voice of America/Special English	6140va 7520va 9485va 9760va
1500	1600		USA, WBCQ Monticello ME	9330am
1500	1600	Sat	USA, WBCQ Monticello ME	15420am
1500	1600	Sat	USA, WHRI Cypress Creek SC	17510af
1500	1600	Sun	USA, WHRI Cypress Creek SC	9840na 15195eu
1500	1600	smtwhf	USA, WINB Red Lion PA	13570ca
1500	1600	Sat	USA, WINB Red Lion PA	9265ca
1500	1600		USA, WJHR International Milton FL	15550na
1500	1600		USA, WTWW Lebanon TN	9479na
1500	1600		USA, WWCR Nashville TN	7490af 9980na 13845na 15825na
1500	1600		USA, WWRB Manchester TN	9385na
1500	1600		USA, WYFR/Family Radio Worldwide	6280as 11605as 11830na 11910na 15520na 17580af 17795na
1500	1600		Zambia, 1 Africa-CVC Africa	13590af
1500	1600	vl	Zambia, Radio Christian Voice/The Voice Africa	6065af
1505	1600	DRM	Canada, Radio Canada International	9800na
1505	1600		Canada, Radio Canada International	9515as
1515	1530		Vatican City State, Vatican Radio	11850as 13765as 15235as

1515	1545	Sat	UK, Bible Voice Broadcasting Network			13740as
1515	1600		Australia, HCJB Global Australia			15340as
1525	1600	Sat/Sun	Swaziland, TWR Swaziland	6025af		
1530	1545		India, All India Radio	7255do		9820do
			9910do			
1530	1558	Sat	Vatican City State, Vatican Radio			11850as
			13765as	15235as		
1530	1600	mtwhfa	Albania, Radio Tirana	13640na		
1530	1600		China, Xizang PBS/Holy Tibet	4905do		4920do
			5240do	6110do	6130do	6200do
			7255do	7385do		
1530	1600		Germany, AWR Europe	11675as		
1530	1600		Iran, VOIRI/IRIB	7305as	9600as	
1530	1600		Mongolia, Voice of Mongolia	9665as		12085as
1530	1600	h	UK, Bible Voice Broadcasting Network			13740as
1530	1600	Sun	UK, Bible Voice Broadcasting Network			13590me
1545	1600	mtwha	UK, Bible Voice Broadcasting Network			13590me
1551	1600		New Zealand, Radio NZ International			5950pa
1551	1600	DRM	New Zealand, Radio NZ International			9890pa

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

1600	1605	Sun	Croatia, Croatian Radio	6165eu		
1600	1615	mtwhfa	Croatia, Croatian Radio	6165eu		
1600	1615		Pakistan, PBC/Radio Pakistan	7530me		11565af
			11585va			
1600	1615	f	UK, Bible Voice Broadcasting Network			13590me
1600	1620	t	UK, Bible Voice Broadcasting Network			13590me
1600	1625	Sat/Sun	Swaziland, TWR Swaziland	6025af		
1600	1627		Czech Republic, Radio Prague			9740eu
1600	1627		Iran, VOIRI/IRIB	7305as	9600as	
1600	1630		Guam, KSDA/AWR		9585as	11690as
1600	1630		Myanmar, Myanmar Radio	9730do		
1600	1630		Vietnam, Voice of Vietnam	7220me		7280eu
			9550me	9730eu		
1600	1645	h	UK, Bible Voice Broadcasting Network			13590me
1600	1645		USA, WYFR/Family Radio Worldwide			11830na
			11865na			
1600	1650	DRM	New Zealand, Radio NZ International			9890pa
1600	1650		New Zealand, Radio NZ International			5950pa
1600	1657		North Korea, Voice of Korea	9990na		11545va
1600	1658		Germany, Deutsche Welle	5965as		9560as
1600	1700		Anguilla, Worldwide Univ Network			11775am
1600	1700		Australia, ABC NT Alice Springs			2310do
1600	1700		Australia, ABC NT Katherine	2485do		
1600	1700		Australia, Radio Australia	5995pa	6080pa	
			7240pa	9465as	9710pa	11660as
1600	1700		Bahrain, Radio Bahrain	6010me		
1600	1700	Sat	Canada, CBC NQ SW Service			9625na
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St Johns NF	6160na		
1600	1700		Canada, CKZU Vancouver BC			6160na
1600	1700		Canada, Radio Canada International			9515as
1600	1700	DRM	Canada, Radio Canada International			9800na
1600	1700		China, China Radio International			6060as
			7235as	7420af	9570af	11900af
			11940eu	11965eu	13760eu	
1600	1700		Egypt, Radio Cairo	12170af		
1600	1700		Ethiopia, Radio Ethiopia/External Service			
			7165va	9560af		
1600	1700	mtwhf	France, Radio France Internationale			15605af
			17605af			
1600	1700		Malaysia, RTM/Traxx FM	7295do		
1600	1700		Papua New Guinea, Radio Wantok Light			
			7325do			
1600	1700		Russia, Voice of Russia	4975va		11985va
			11985af	12040eu	13855af	
1600	1700		South Korea, KBS World Radio			9515eu
1600	1700		Taiwan, Radio Taiwan International			11550as
			12055as			
1600	1700	vl	Uganda, Dunamis Shortwave	4750af		
1600	1700		Uganda, UBC Radio	4975do		
1600	1700		UK, BBC World Service	3255af		5790eu
			5850as	5975as	6190af	9695as
			12095eu	15400af	17640af	17795af
			17830af	21470af		
1600	1700	DRM	UK, BBC World Service	3995eu		5790eu
1600	1700	Sat/Sun	UK, Bible Voice Broadcasting Network			13590me
1600	1700		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1600	1700		USA, EWTN/WEWN Irondale, AL			15610me
1600	1700		USA, FBN/WTJC Newport NC			9370na
1600	1700		USA, Voice of America	4930af		6080af
			15580af			
1600	1700		USA, Voice of America/Special English			11890va
			12080va	13570va		
1600	1700		USA, WBCQ Monticello ME	9330am		
1600	1700	Sat	USA, WBCQ Monticello ME	15420am		
1600	1700	Sun	USA, WHRI Cypress Creek SC			9840na
1600	1700	has	USA, WHRI Cypress Creek SC			17520af
1600	1700	smtwhf	USA, WINB Red Lion PA	13570ca		
1600	1700	Sat	USA, WINB Red Lion PA	9265ca		
1600	1700		USA, WJHR International Milton FL			15550na
1600	1700		USA, WTWW Lebanon TN	9479na		
1600	1700		USA, WWCR Nashville TN	9980na		12160af
			13845na	15825na		
1600	1700		USA, WWRB Manchester TN	9385na		
1600	1700		USA, WYFR/Family Radio Worldwide			6010af
			6085ca	7270af	11850as	13695na
			17545af	17795na	18980va	21485eu
			21525af			
1600	1700		Zambia, 1 Africa-CVC Africa	13590af		
1600	1700	vl	Zambia, Radio Christian Voice/The Voice Africa			
			6065af			
1615	1630	mtwhf	Swaziland, TWR Swaziland	6130af		
1615	1630		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu	15595eu	
1615	1700	Sun	UK, BBC World Service	7405af		11860af
			15420af			
1630	1700		Guam, KSDA/AWR	9790as		
1630	1700		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1630	1700		Slovakia, Radio Slovakia International			5920eu
			6055eu			
1630	1700	Sat/Sun	Swaziland, TWR Swaziland	6130af		
1630	1700	Sat	UK, BBC World Service	11860af		
1630	1700	mtwhf	UK, BBC World Service	15420af		
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi			4930eu
1651	1700	twhfas	New Zealand, Radio NZ International			9765pa
1651	1700	DRM/twhfas	New Zealand, Radio NZ International			9890pa
1658	1700	Sat	New Zealand, Radio NZ International			9765pa
1658	1700	DRM/Sat	New Zealand, Radio NZ International			9890pa

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

1700	1705		Canada, Radio Canada International			9515as
1700	1705	DRM	Canada, Radio Canada International			9800na
1700	1715	mtwhf	Moldova, (Transnistria) Radio PMR			6240eu
1700	1715	t	UK, Bible Voice Broadcasting Network			13590me
1700	1725		Vietnam, Voice of Vietnam	9725eu		
1700	1727		Czech Republic, Radio Prague			9740eu
1700	1730	Sat	UK, Bible Voice Broadcasting Network			13590me
1700	1730		USA, Voice of America	6080af		12015af
			15580af	17895af		
1700	1746		UK, BBC World Service	6005af		9410af
1700	1750	twhfas	New Zealand, Radio NZ International			9765pa
1700	1750	DRM/twhfas	New Zealand, Radio NZ International			9890pa
1700	1759		Canada, Radio Canada International			5850na
1700	1759		Poland, Polskie Radio Warsaw			9770eu
1700	1800		Anguilla, Worldwide Univ Network			11775am
1700	1800		Australia, ABC NT Alice Springs			2310do
1700	1800		Australia, ABC NT Katherine	2485do		
1700	1800		Australia, Radio Australia	5995pa	6080pa	
			9475as	9510pa	9710pa	11880pa
1700	1800		Bahrain, Radio Bahrain	6010me		
1700	1800	Sat	Canada, CBC NQ SW Service			9625na
1700	1800		Canada, CFRX Toronto ON	6070na		
1700	1800		Canada, CFVP Calgary AB	6030na		
1700	1800		Canada, CKZN St Johns NF	6160na		
1700	1800		Canada, CKZU Vancouver BC			6160na
1700	1800		China, China Radio International			6090as
			6140as	6145eu	6165me	7235as
			7265af	7410as	7420as	9570af
			9695eu	11900af	13760eu	
1700	1800		Egypt, Radio Cairo	12170af		
1700	1800		Equatorial Guinea, Radio Africa			7190af
			15190af			
1700	1800		Malaysia, RTM/Traxx FM	7295do		
1700	1800		Nigeria, Voice of Nigeria/External Service			
			15120af			
1700	1800		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1700	1800		Papua New Guinea, Radio Wantok Light			
			7325do			
1700	1800	DRM	Poland, Polskie Radio Warsaw			7265eu
1700	1800		Russia, Voice of Russia	4975va		11985va
			12040eu	13855af		
1700	1800		South Africa, Channel Africa	9675af		
1700	1800		Swaziland, TWR Swaziland	3200af		9500af
1700	1800		Taiwan, Radio Taiwan International			11850af

1700	1800		Tajikistan, Voice of Tajik/External Service	7245va		
1700	1800	vl	Uganda, Dunamis Shortwave	4750af		
1700	1800		Uganda, UBC Radio	4975do		
1700	1800		UK, BBC World Service	3255af	5790eu	
			5850as	5875eu	5975as	6190af
			7405af	9810as	12095af	13675eu
			15400af	17795af	17830af	
1700	1800	DRM	UK, BBC World Service	3995eu		
1700	1800	Sat	UK, Bible Voice Broadcasting Network	9645me		
1700	1800	Sat/Sun	UK, Bible Voice Broadcasting Network	13590me		
1700	1800		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1700	1800		USA, EWTN/WEWN Irondale, AL	15610me		
1700	1800		USA, FBN/WTJC Newport NC	9370na		
1700	1800		USA, WBCQ Monticello ME	9330am	15420am	
1700	1800	smtwhf	USA, WINB Red Lion PA	13570ca		
1700	1800	Sat	USA, WINB Red Lion PA	9265ca		
1700	1800		USA, WJHR International Milton FL	15550na		
1700	1800		USA, WTWW Lebanon TN	9479na		
1700	1800		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1700	1800		USA, WWRB Manchester TN	9385na		
1700	1800		USA, WYFR/Family Radio Worldwide	7395af		
			7560af	11760as	11810af	13690na
			17545af	17795na	18980va	21485eu
1700	1800		Zambia, 1 Africa-CVC Africa	13590af		
1720	1740	Sat/Sun	USA, Voice of America/Studio 7	4930af		
			11605af	15775af		
1730	1740		USA, Voice of America	4930af	11605af	
			15775af			
1730	1800		Clandestine, Sudan Radio Service/ SRS	9590af		
1730	1800		USA, Voice of America	12015af	15580af	
			17895af			
1730	1800	mtwhf	USA, Voice of America/Studio 7	4930af		
			11605af	15775af		
1730	1800		Vatican City State, Vatican Radio	11625af		
			13765af	15570af		
1745	1800		Bangladesh, Bangladesh Betar	7250as		
1745	1800	DRM	India, All India Radio	9950eu		
1745	1800		India, All India Radio	6120eu	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	9940eu	11935af	
1745	1800	mtwhf	Moldova, (Transnistria) Radio PMR	6240na		
1751	1800	twhfas	New Zealand, Radio NZ International	11725pa		
1751	1800	DRM/twhfas	New Zealand, Radio NZ International	11675pa		
1758	1800	Sat	New Zealand, Radio NZ International	11725pa		
1758	1800	DRM/twhfas	New Zealand, Radio NZ International	11675pa		

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

1800	1800	Sat	USA, WINB Red Lion PA	9265ca		
1800	1815	Sun	UK, Bible Voice Broadcasting Network	13590me		
1800	1815	1st Sun	UK, Bible Voice Broadcasting Network	9430me		
1800	1830	w	Austria, AWR Europe	9515af		
1800	1830	DRM	Romania, Radio Romania International	5895eu		
1800	1830		South Africa, AWR Africa	3215af	3345af	
1800	1830		UK, BBC World Service	5875as	5975as	
1800	1830	Sun	UK, Bible Voice Broadcasting Network	9430me		
1800	1830		USA, Voice of America	6080af	9850af	
			12015af	15580af		
1800	1830	Sat/Sun	USA, Voice of America	4930af		
1800	1845	Sat	UK, Bible Voice Broadcasting Network	6130eu		
1800	1850	DRM/twhfas	New Zealand, Radio NZ International	11675pa		
1800	1857		Netherlands, R Netherlands Worldwide	6020af		
1800	1857		North Korea, Voice of Korea	13760af	15245eu	
1800	1859		Canada, Radio Canada International	9530af		
			11765af	17735af	17810af	
1800	1900		Anguilla, Worldwide Univ Network	11775am		
1800	1900	mtwhf	Argentina, Radio Nacional RAE	9690eu		
			15345eu			
1800	1900		Australia, ABC NT Alice Springs	2310do		
1800	1900		Australia, ABC NT Katherine	2485do		
1800	1900		Australia, Radio Australia	6080pa	7240pa	
			9475as	9510pa	9710pa	11880pa
1800	1900		Bahrain, Radio Bahrain	6010me		
1800	1900		Bangladesh, Bangladesh Betar	7250eu		
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St Johns NF	6160na		
1800	1900		Canada, CKZU Vancouver BC	6160na		
1800	1900		China, China Radio International	9600eu		
			13760eu			
1800	1900		Equatorial Guinea, Radio Africa	7190af		
			15190af			
1800	1900	DRM	India, All India Radio	9950eu		
1800	1900		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1800	1900		Kuwait, Radio Kuwait	15540va		
1800	1900		Liberia, Star Radio	3960do	4025al	
1800	1900		Malaysia, RTM/Traxx FM	7295do		
1800	1900		Netherlands, R Netherlands Worldwide	12045af		
			15535af			
1800	1900	twhfas	New Zealand, Radio NZ International	11725pa		
1800	1900		Nigeria, Voice of Nigeria/External Service			
			15120af			
1800	1900		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va	9955as		
1800	1900		Papua New Guinea, Radio Wantok Light			
			7325do			
1800	1900	DRM	Romania, Radio Romania International	6065eu		
			7415eu			
1800	1900		Russia, Voice of Russia	4975va	12040eu	
1800	1900		South Korea, KBS World Radio	7275eu		
1800	1900		Taiwan, Radio Taiwan International	3965eu		
1800	1900	vl	Uganda, Dunamis Shortwave	4750af		
1800	1900		Uganda, UBC Radio	4975do		
1800	1900		UK, BBC World Service	3255af	5790eu	
			5875eu	5950as	6190af	7405af
			11810af	12095af	13675af	15400af
			17795af			
1800	1900	Sat	UK, Bible Voice Broadcasting Network	9430me		
1800	1900	Sun	UK, Bible Voice Broadcasting Network	6130eu		
1800	1900		United States, Overcomer Ministries	9895me		
1800	1900		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1800	1900		USA, EWTN/WEWN Irondale, AL	15610me		
1800	1900		USA, FBN/WTJC Newport NC	9370na		
1800	1900		USA, KJES Vado NM	15385pa		
1800	1900		USA, WBCQ Monticello ME	7415am	9330am	
			15420am			
1800	1900	Sun	USA, WHRI Cypress Creek SC	17520af		
1800	1900	hfas	USA, WHRI Cypress Creek SC	9840na		
1800	1900	smtwhf	USA, WINB Red Lion PA	13570ca		
1800	1900		USA, WJHR International Milton FL	15550na		
1800	1900		USA, WTWW Lebanon TN	9479na		
1800	1900		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385na		
1800	1900		USA, WYFR/Family Radio Worldwide	6180af		
			7395af	9600af	9770af	9830me
			9925af	11785af	13615na	13690na
			13750af	17795na	17845af	18980va
1800	1900		Yemen, Republic of Yemen Radio/Radio Sana'a			
			6005me	9780me		
1800	1900		Zambia, 1 Africa-CVC Africa	13590af		
1805	1810	Sat	Croatia, Croatian Radio	6165eu		
1805	1815	mtwhf	Croatia, Croatian Radio	6165eu		
1810	1820	f	USA, Voice of America	4930af	11605af	
			15775af			
1815	1845	Sun	UK, Bible Voice Broadcasting Network	9430me		
1815	1845	Sat	UK, Bible Voice Broadcasting Network	6130eu		
1830	1845		Rwanda, Radio Rwanda	6055do		
1830	1900		Bulgaria, Radio Bulgaria	6200eu	7400eu	
1830	1900	DRM	Bulgaria, Radio Bulgaria	9700eu		
1830	1900		Serbia, International Radio of Serbia	6100eu		
1830	1900		Slovakia, Radio Slovakia International	5920eu		
			6055eu			
1830	1900		South Africa, AWR Africa	11830af		
1830	1900		Turkey, Voice of Turkey	9785eu		
1830	1900		UK, BBC World Service	5875as	6005af	
			9410af			
1830	1900		USA, Voice of America	4930af	6080af	
			9850af	12015af	15580af	
1845	1900	Sun	UK, Bible Voice Broadcasting Network	11830af		
1851	1900	DRM/twhfas	New Zealand, Radio NZ International	15720pa		
1858	1900	DRM/Sat	New Zealand, Radio NZ International	15720pa		
1859	1900		Netherlands, R Netherlands Worldwide	7425af		
			11610af	11970af		

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

1900	1902	vl	Uganda, Dunamis Shortwave	4750af		
1900	1915	Sun	UK, Bible Voice Broadcasting Network	11830af		
1900	1928		Germany, Deutsche Welle	15275af		
1900	1930		Germany, Deutsche Welle	9735af	13780af	
1900	1930		Turkey, Voice of Turkey	9785eu		
1900	1930		Vietnam, Voice of Vietnam	7280eu	9730eu	
1900	1945	DRM	India, All India Radio	9950eu		

1900	1945		India, All India Radio	6120af	6280eu	
			7400af	7410af	7550eu	9415af
			9445af	11935af		
1900	1945	mtwh	USA, WBCQ Monticello ME	7415am		
1900	1945		USA, WYFR/Family Radio Worldwide	6085ca		
1900	1955		Netherlands, R Netherlands Worldwide	7425af		
			12045af	15535af		
1900	1957		North Korea, Voice of Korea	7100eu	9975af	
			11535va	11910af		
1900	2000		Anguilla, Worldwide Univ Network	11775am		
1900	2000		Australia, ABC NT Alice Springs	2310do		
1900	2000		Australia, ABC NT Katherine	2485do		
1900	2000		Australia, Radio Australia	6080pa	7240pa	
			9500as	9510pa	9710pa	11880pa
1900	2000		Bahrain, Radio Bahrain	6010me		
1900	2000	DRM	Belgium, TDP Radio	15755na		
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St Johns NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000		China, China Radio International	7295af		
			9435af			
1900	2000		Egypt, Radio Cairo	11510af		
1900	2000		Equatorial Guinea, Radio Africa	7190af		
			15190af			
1900	2000		Italy, IRRS/NEXUS 7290va			
1900	2000		Kuwait, Radio Kuwait	15540va	17550va	
1900	2000		Liberia, Star Radio	3960do	4025al	
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		Netherlands, R Netherlands Worldwide	11610af		
			11970af			
1900	2000	twhfas	New Zealand, Radio NZ International	11725pa		
1900	2000	DRM/twhfas	New Zealand, Radio NZ International	15720pa		
1900	2000		Nigeria, Voice of Nigeria/External Service			
			9690af	7255al		
1900	2000		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
1900	2000		Papua New Guinea, Radio Wantok Light			
			7325do			
1900	2000		Russia, Voice of Russia	12040eu		
1900	2000	mtwhf	Spain, Radio Exterior de Espana	9665af		
			11620eu			
1900	2000		Thailand, Radio Thailand World Service	7570eu		
1900	2000		Uganda, UBC Radio	4975do		
1900	2000		UK, BBC World Service	3255af	3995eu	
			5875eu	5950as	6005af	6155as
			6190af	9410af	11810af	12095af
			15400af	17795af		
1900	2000		Ukraine, Radio Ukraine International	7440na		
1900	2000		United States, Overcomer Ministries	6155eu		
1900	2000		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
1900	2000		USA, EWTN/WEWN Irondale, AL	15610af		
1900	2000		USA, FBN/WTJC Newport NC	9370na		
1900	2000		USA, Voice of America	4930af	4940af	
			6080af	9850af	15580af	17895af
1900	2000		USA, Voice of America/Special English	7485va		
			9630va			
1900	2000	fas	USA, WBCQ Monticello ME	7415am		
1900	2000		USA, WBCQ Monticello ME	9330am	15420am	
1900	2000	mtwhfa	USA, WHRI Cypress Creek SC	9840na		
1900	2000	Sun	USA, WHRI Cypress Creek SC	15665af		
1900	2000	smtwhf	USA, WINB Red Lion PA	13570ca		
1900	2000	Sat	USA, WINB Red Lion PA	9265ca		
1900	2000		USA, WJHR International Milton FL	15550na		
1900	2000		USA, WTWW Lebanon TN	9479na		
1900	2000		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385na		
1900	2000		USA, WYFR/Family Radio Worldwide	3230af		
			6020af	7270af	7395af	9550af
			9610af	9775af	9830me	13615af
			13690na	17795na	17845af	18930va
			18980va			
1900	2000		Zambia, 1 Africa-CVC Africa	9540af		
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1905	2000	m	South Africa, Amateur Radio Mirror Intl	3215af		
1930	2000	Sun	Germany, Pan American Broadcasting	6175af		
1930	2000		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
1930	2000		South Africa, RTE Radio Worldwide	6225af		
1945	2000	mwhas	Albania, Radio Tirana	7465eu	9895na	
1945	2000	DRM	Vatican City State, Vatican Radio	9800am		
1950	2000		Vatican City State, Vatican Radio	4005eu		
			5885eu	7250eu	9645eu	

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

2000	2005	m	South Africa, Amateur Radio Mirror Intl	3215af		
2000	2015	Sun	Germany, Pan American Broadcasting	6175af		
2000	2020		Vatican City State, Vatican Radio	4005eu		
			5885eu	7250eu	9645eu	
2000	2027		Czech Republic, Radio Prague	5930eu		
2000	2027		Iran, VOIRI/IRIB	5940eu	6205eu	7205eu
			7215af	9800af		
2000	2030		Egypt, Radio Cairo	11510af		
2000	2030	Sat	Germany, Pan American Broadcasting	6175af		
2000	2030		South Africa, RTE Radio Worldwide	6225af		
2000	2030		Swaziland, TWR Swaziland	3200af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	15580af		
2000	2030		Vatican City State, Vatican Radio	7365af		
			9755af	11625af		
2000	2030	DRM	Vatican City State, Vatican Radio	9800am		
2000	2045		USA, WYFR/Family Radio Worldwide	17750eu		
2000	2057		Germany, Deutsche Welle	9735af	13780af	
			15275af			
2000	2057		Netherlands, R Netherlands Worldwide	7425af		
			11610af	11970af		
2000	2059		Canada, Radio Canada International	15235af		
			17735af			
2000	2059		Germany, Deutsche Welle	9690af		
2000	2100		Anguilla, Worldwide Univ Network	11775am		
2000	2100		Australia, ABC NT Alice Springs	2310do		
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek	2325do		
2000	2100		Australia, Radio Australia	6080pa	11650pa	
			11660pa	11880pa		
2000	2100	Sat/Sun	Australia, Radio Australia	6080pa	7240pa	
			12080pa			
2000	2100		Bahrain, Radio Bahrain	6010me		
2000	2100		Belarus, Radio Belarus	7255eu	7360eu	
			7390eu			
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St Johns NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		China, China Radio International	5960eu		
			5985af	7285eu	7295af	7415eu
			9440af	9600eu		
2000	2100		Cuba, Radio Havana Cuba	11760am		
2000	2100		Equatorial Guinea, Radio Africa	7190af		
			15190af			
2000	2100		Indonesia, Voice of Indonesia	9526va	11785al	
2000	2100		Italy, IRRS/NEXUS 7290va			
2000	2100		Kuwait, Radio Kuwait	15540va	17550va	
2000	2100		Liberia, Star Radio	3960do	4025al	
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100	twhfas	New Zealand, Radio NZ International	11725pa		
2000	2100	DRM/twhfas	New Zealand, Radio NZ International	15720pa		
2000	2100		Nigeria, Voice of Nigeria/External Service			
			15120af			
2000	2100		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2000	2100		Syria, Radio Damascus	9330eu	12085as	
2000	2100		Uganda, UBC Radio	4975do		
2000	2100		Uganda, UBC Radio	4975do		
2000	2100		UK, BBC World Service	3255af	5875eu	
			6005af	6190af	9410af	11810af
			12095af	13820af	15400af	
2000	2100		USA, American Forces Network	4319usb		
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2000	2100		USA, EWTN/WEWN Irondale, AL	15610af		
2000	2100		USA, FBN/WTJC Newport NC	9370na		
2000	2100		USA, WBCQ Monticello ME	7415am	9330am	
			15420am			
2000	2100	Sat	USA, WHRI Cypress Creek SC	15665af		
2000	2100	Sun	USA, WHRI Cypress Creek SC	13660af		
2000	2100	smtwhf	USA, WINB Red Lion PA	13570ca		
2000	2100	Sat	USA, WINB Red Lion PA	9265ca		
2000	2100		USA, WJHR International Milton FL	15550na		
2000	2100		USA, WTWW Lebanon TN	9479na		
2000	2100		USA, WWCR Nashville TN	9980na	12160af	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385na		
2000	2100		USA, WYFR/Family Radio Worldwide	5975af		
			7430eu	9450af	9510af	9610af
			9740af	11690af	12055af	13615sa
			17725af	17795va	17845va	18980va
2000	2100		Zambia, 1 Africa-CVC Africa	9540af		
2030	2045		Thailand, Radio Thailand World Service	9680eu		

2030	2100		Laos, Lao National Radio	7145as		
2030	2100		Turkey, Voice of Turkey	7205va		
2030	2100		USA, Voice of America	4930af	6080af	
			7355af	7555af	15580af	
2030	2100	Sat/Sun	USA, Voice of America	4940af		
2030	2100		Vietnam, Voice of Vietnam	7280eu	9550me	
2045	2100		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2045	2100	DRM	India, All India Radio	9950eu		

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

2100	2130	mwhfa	Albania, Radio Tirana	7530eu	9895na	
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	9830af		
2100	2130	Sat	Canada, CBC NQ SW Service		9625na	
2100	2130		Serbia, International Radio of Serbia		6100eu	
2100	2130		South Korea, KBS World Radio		3955eu	
2100	2130		Turkey, Voice of Turkey	7205va		
2100	2145		USA, WYFR/Family Radio Worldwide		13615na	
			13690na	17795na	18980va	
2100	2150	twhfas	New Zealand, Radio NZ International		11725pa	
2100	2150	DRM/twhfas	New Zealand, Radio NZ International		15720pa	
2100	2157		Germany, Deutsche Welle	11865af	13780af	
2100	2157		North Korea, Voice of Korea	13760va	15245eu	
2100	2159		Germany, Deutsche Welle	7280af	9545af	
2100	2200		Anguilla, Worldwide Univ Network		11775am	
2100	2200		Australia, Radio Australia	9500as	9660pa	
			11650pa	11660pa	11695as	12080pa
			13630pa	15515pa		
2100	2200		Bahrain, Radio Bahrain	6010me		
2100	2200		Belarus, Radio Belarus	7255eu	7360as	
			7390eu			
2100	2200	DRM	Belgium, TDP Radio/Disco Palace		6015eu	
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St Johns NF	6160na		
2100	2200		Canada, CKZU Vancouver BC		6160na	
2100	2200	DRM	Canada, Radio Canada International		9800na	
2100	2200		China, China Radio International		5960eu	
			7205af	7285eu	7325af	7415eu
			9600eu			
2100	2200		Equatorial Guinea, Radio Africa		7190af	
			15190af			
2100	2200		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2100	2200	DRM	India, All India Radio	9950eu		
2100	2200		Malaysia, RTM/Traxx FM	7295do		
2100	2200		Palau, T8WH/WHRI/Sound of Hope Radio			
			9930va			
2100	2200	Sat/Sun	Spain, Radio Exterior de Espana		9650eu	
2100	2200		Syria, Radio Damascus	9330va	12085va	
2100	2200		Uganda, UBC Radio	4975do		
2100	2200	DRM	UK, BBC World Service	3995eu		
2100	2200		UK, BBC World Service	3255af	3915as	
			5790eu	5875as	5905as	6005af
			6190af	6195as	7405af	9915af
			12095af			
2100	2200		Ukraine, Radio Ukraine International		6145na	
2100	2200		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2100	2200		USA, EWTN/WEWN Irondale, AL		15610af	
2100	2200		USA, FBN/WTJC Newport NC		9370na	
2100	2200		USA, Voice of America	6080af	7555af	
			15580af			
2100	2200		USA, WBCQ Monticello ME	7415am	9330am	
2100	2200	Sun	USA, WHRI Cypress Creek SC		9690na	
2100	2200	Sat	USA, WHRI Cypress Creek SC		13660af	
2100	2200		USA, WINB Red Lion PA	9265ca		
2100	2200		USA, WJHR International Milton FL		15550na	
2100	2200		USA, WTWW Lebanon TN	9479na		
2100	2200		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2100	2200		USA, WWRB Manchester TN	3215na	6890va	
2100	2200		USA, WYFR/Family Radio Worldwide		5975af	
			7425af	9450eu	9715af	9740af
			12055af	17845af		
2100	2200		Zambia, 1 Africa-CVC Africa	9540af		
2115	2145		Egypt, Radio Cairo	6270eu		
2130	2157		Czech Republic, Radio Prague		9410af	
2130	2200		Australia, ABC NT Alice Springs		4835do	
2130	2200		Australia, ABC NT Katherine	5025do		
2130	2200	mtwhfa	Canada, CBC NQ SW Service		9625na	
2130	2200		China, China Radio International		7365eu	
2130	2200		Netherlands, R Netherlands Worldwide		7460af	
2130	2200		Romania, Radio Romania International		6115na	
			7310na	7380eu		
2130	2200	DRM	Romania, Radio Romania International		6030eu	
2151	2200	twhfas	New Zealand, Radio NZ International		15720pa	
2151	2200	DRM/twhfas	New Zealand, Radio NZ International		17675pa	
2158	2200	Sat	New Zealand, Radio NZ International		15720pa	
2158	2200	DRM/Sat	New Zealand, Radio NZ International		17675pa	

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

2200	2210		Uganda, UBC Radio	4975do		
2200	2230		India, All India Radio	6280eu	7550eu	
			9445eu	9910pa	11620pa	11715pa
2200	2230	DRM	India, All India Radio	9950eu		
2200	2245		Egypt, Radio Cairo	6270eu		
2200	2245		USA, WYFR/Family Radio Worldwide		15770af	
2200	2300		Anguilla, Worldwide Univ Network		6090am	
2200	2300		Australia, ABC NT Alice Springs		4835do	
2200	2300		Australia, ABC NT Katherine	5025do		
2200	2300		Australia, Radio Australia	9660pa	11695as	
			11875as	12080pa	13630pa	15230pa
			15240as	15415as	15515pa	15560pa
2200	2300		Bahrain, Radio Bahrain	6010me		
2200	2300		Bulgaria, Radio Bulgaria	6200eu	7400eu	
2200	2300	smtwhf	Canada, CBC NQ SW Service		9625na	
2200	2300		Canada, CFRX Toronto ON	6070na		
2200	2300		Canada, CFVP Calgary AB	6030na		
2200	2300		Canada, CKZN St Johns NF	6160na		
2200	2300		Canada, CKZU Vancouver BC		6160na	
2200	2300		China, China Radio International		9590as	
2200	2300		Equatorial Guinea, Radio Africa		7190af	
			15190af			
2200	2300		Malaysia, RTM/Traxx FM	7295do		
2200	2300	twhfas	New Zealand, Radio NZ International		15720pa	
2200	2300	DRM/twhfas	New Zealand, Radio NZ International		17675pa	
2200	2300		Russia, Voice of Russia	5900na		
2200	2300		Syria, Radio Damascus	9330va	12085va	
2200	2300		Turkey, Voice of Turkey	9830va		
2200	2300		UK, BBC World Service	3915as	5905as	
			5935af	6195as	7490as	9440as
			9740as	9915af	12095af	
2200	2300	DRM	UK, BBC World Service	3995eu		
2200	2300		USA, American Forces Network		4319usb	
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2200	2300		USA, EWTN/WEWN Irondale, AL		15610af	
2200	2300		USA, FBN/WTJC Newport NC		9370na	
2200	2300	mtwhf	USA, Voice of America	5895va	5915va	
			7460va	7575va	11955va	
2200	2300		USA, Voice of America	7555af		
2200	2300	Sat/Sun	USA, WBCQ Monticello ME	5110am		
2200	2300		USA, WBCQ Monticello ME	7415am	9330am	
2200	2300	f	USA, WHRI Cypress Creek SC		11785na	
2200	2300	Sun	USA, WHRI Cypress Creek SC		9785af	
2200	2300		USA, WINB Red Lion PA	9265ca		
2200	2300		USA, WJHR International Milton FL		15550na	
2200	2300		USA, WTWW Lebanon TN	9479na		
2200	2300		USA, WWCR Nashville TN	7465na	9350na	
			9980na	13845na		
2200	2300		USA, WWRB Manchester TN	3215na	6890va	
2200	2300		USA, WYFR/Family Radio Worldwide		5950na	
			11740na	15440na		
2215	2230		Croatia, Croatian Radio	3985eu	7375ca	
2230	2257		Czech Republic, Radio Prague		9440na	
2230	2300		China, Xizang PBS/Holy Tibet	4905do	4920do	
			5240do	6110do	6130do	6200do
			7255do	7385do		
2230	2300		Guam, KSDA/AWR	15320as		
2230	2300		USA, Voice of America	11840as		
2230	2300		USA, Voice of America/Special English		9570va	
			11840va	15145va		
2245	2300		India, All India Radio	6055as	7305as	
			9705as	9950as	11645as	13605as

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

2300	0000		Anguilla, Worldwide Univ Network		6090am	
2300	0000		Australia, ABC NT Alice Springs		4835do	
2300	0000		Australia, ABC NT Katherine	5025do		
2300	0000		Australia, Radio Australia	9660pa	11875as	
			12080pa	13690pa	15560pa	17750as
2300	0000		Bahrain, Radio Bahrain	6010me		
2300	0000	smtwhf	Canada, CBC NQ SW Service		9625na	
2300	0000		Canada, CFRX Toronto ON	6070na		
2300	0000		Canada, CFVP Calgary AB	6030na		
2300	0000		Canada, CKZN St Johns NF	6160na		
2300	0000		Canada, CKZU Vancouver BC		6160na	

2300	0000		China, China Radio International			5915as
			5990ca	6145na	7350eu	7410as
			9610as	11690pa	11790as	11840na
2300	0000		Cuba, Radio Havana Cuba		5040am	
2300	0000		Egypt, Radio Cairo		11590na	
2300	0000	vl	Guyana, Voice of Guyana		3290va	
2300	0000		India, All India Radio		6055as	7305as
			9705as	9950as	11645as	13605as
2300	0000		Malaysia, RTM/Traxx FM		7295do	
2300	0000	twhfas	New Zealand, Radio NZ International			15720pa
2300	0000	DRM/twhfas	New Zealand, Radio NZ International			17675pa
2300	0000		Romania, Radio Romania International			6015va
			7220eu	7300as		
2300	0000		Russia, Voice of Russia		5900na	9665na
2300	0000		UK, BBC World Service		3915as	6195as
			7490as	9740as	9890as	11850as
			12010as			
2300	0000		USA, American Forces Network			4319usb
			5446usb	5765usb	7812usb	12133usb
			12759usb	13362usb		
2300	0000		USA, EWTN/WEWN Irondale, AL			15610af
2300	0000		USA, FBN/WTJC Newport NC			9370na
2300	0000		USA, Voice of America		5895va	5915va
			7575va	11955va	13805as	
2300	0000	Sat/Sun	USA, WBCQ Monticello ME		5110am	
2300	0000		USA, WBCQ Monticello ME		7415am	9330am
2300	0000	smtwhf	USA, WHRI Cypress Creek SC			5920ca
2300	0000	Sat	USA, WHRI Cypress Creek SC			9690na
2300	0000		USA, WINB Red Lion PA		9265ca	
2300	0000		USA, WTWW Lebanon TN		5755na	
2300	0000		USA, WWCR Nashville TN		7465na	9350na
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN		3215na	6890va
2300	0000		USA, WYFR/Family Radio Worldwide			5950na
			11580sa	15655sa	15440na	
2300	2330		Australia, Radio Australia		11695as	15240as
			17795pa			
2300	2330		USA, Voice of America/Special English			9570as
			13805va	15145va		
2300	2330	DRM	Vatican City State, Vatican Radio			9755am
2300	2345		USA, WYFR/Family Radio Worldwide			11740na
2305	0000		Canada, Radio Canada International			6100na
2330	0000		UK, BBC World Service		9580as	
2330	0000		USA, Voice of America/Special English			7460as
			9570va	13805va	15145va	15340va
2330	0000		Vietnam, Voice of Vietnam		9840as	12020as

MT SHORTWAVE STATION RESOURCE GUIDE

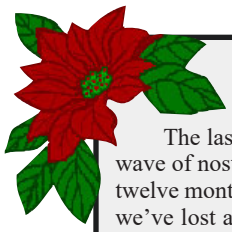
Albania, Radio Tirana ..... **http://rtsh.sil.at/**
Anguilla, Worldwide Univ Network ..... **www.worldwideuniversitynetwork.com/**
Argentina, Radio Nacional RAE..... **www.radionacional.com.ar/**
Australia, ABC NT Alice Springs..... **www.abc.net.au/radio/**
Australia, ABC NT Katherine..... **www.abc.net.au/radio/**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

SHORTWAVE GUIDE

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com



QSLing the Close of 2010

The last column of the year results in a wave of nostalgia for me as I review the last twelve months in the radio hobby. This year, we've lost a few well-known and respected hobbyists. Favorite stations have said goodbye to shortwave, while others, despite the odds, are going strong. During this most blessed of seasons, take some time to enjoy the sounds of shortwave around the world. Fred Waterer, MT's *Programming Spotlight* columnist, will keep you up to date from his column and website at **www.doghousecharlie.com**

On the heels of Radio East Sepik's reactivation, this month you can add another to your Papua New Guinea list. Following a six month absence, the elusive Radio Manus has returned to the air on 3315 kHz. Best time to log is from 0900-1200 UTC. Send English program details with return mint postage to: P.O. Box 505, Lorengau, Papua New Guinea. If you're tracking countries by the *NASWA Country List*, this one counts as Admiralty Islands.

Lao National Radio from Vientiane, has returned to 7145 kHz. Winter DX conditions present an excellent opportunity to log their English service at 1300-1330 and 2030-2100 UTC. Additional language services are included in *MT Express*. December 2 would be an ideal introduction to Laos as they celebrate their *Republic Day*.

FRCN Abuja in Nigeria has reactivated on 7275 kHz. Listed schedules are 0430-2305 UTC. Send details and return mint postage to: Broadcasting House, Gwangwalada, P.M.B. 71, Abuja, Federal Capital Territory, Nigeria.

Veri-signer Update

Thanks to columnist Sam Barto of NASWA for providing the following verification signers from recent QSLs.

Radyo Pilipinas DZRP. G. Lorenzo, Audience Relations Officer. Address: Phiippine Broadcasting Service, Radio Pilipinas Overseas, 4/F Pia Building, Visayas Avenue, Quezon City, Philippines.

Clandestine, Rediyo Y'Abaganda/Baganda Radio. Alex Kalazani Kigongo, Email: *abaka.com@gmail.com*

MV Baltic Radio. Ronald Rohde. Email: *info@mvbalticradio.de*

Radio Nacional de Venezuela via Havana, Cuba. Cesar Ali Mendez Martinez. Address: Final Calle Los Morias, El Pedregal de Chapellin, Caracus, La Florida Zona Postal 1050, Venezuela. Email: *aviacionaldia@hotmail.com* (or) *mv@rvn.gov*

BBC Indian Ocean Relay Station, Seychelles. Herve Cherry, Senior Transmitter Engineer. Email: *cherry@vtgroup.sc*

Radio Tawantinsuyo. Teresa Lopez, Administradora. Email:*terelopezdela@hotmail.com* Address: Avenida El Sol 806, Cusco, Peru.

Bill Wilkins reminds readers that IRCs are now available online at the *USPS Postal Store* website at **https://shop.usps.com** Click on the *Mailing/Shipping* portion of the toolbar, followed by the *International* link from the drop-down menu. The current *Nairobi* version is $2.10 and expires December 31, 2013. Thanks, Bill.

The holidays present an added bonus for QSLing. Preserve your favorites from a variety of programs featuring comedy skits, classical music, nostalgia, religious services and pure zaniness from the pirate crowd.

Thank you for your emails, column contributions and kind support for my *Shortwave Central* blog. See you in a month when we begin QSLing in the *Year of the Rabbit*.

AMATEUR RADIO

Bahamas-C6ANX, 50 MHz SSB. Full data Bahama carnival card signed by Michael P. Thompson. Received in 60 days for report to veri signer: Queen's Rd., P.O. N-669, Nassau, Bahamas (Larry Van Horn, NC).

Chile-CE2LS, 21 MHz SSB. Full data color *Radio Club La Serena Station* card, unsigned. Received in 45 days via ARRL (Van Horn).

St. Lucia-J6/WOSA, 14 MHz SSB. Full data tri-color ARO call-card, signed by Peter Cross, M.D. Received in 35 days for report to veri signer: P.O. Box 8396, Rochester, MN 55903 USA (Van Horn).

CANADA

Voice of Vietnam relay via Sackville, 6175 kHz. Full data studio photo with site notation. Received in 25 days for an English report. Station address: Voice of Vietnam, 58 Quan Su Street, Hanoi, Vietnam (Frank Hillton, Charleston, SC). ^ **www. vov.org.vn** Email: *englishsection@vov.org.vn*

KUWAIT

Radio Free Asia relay, 7505 kHz. Full data e-QSL. Received in three weeks for email report to *qsl@rfa.org* Postal address: Reception Reports, Radio Free Asia, 2025 M. Street NW, Suite 300, Washington, DC 20036 USA (Artur Fernandez Llorella/playdx).

MOLDOVA

Deutsche Welle relay, 6225 kHz via Grigoriopol. Full data *DRM Antenna Tower* card with site notation, signed by Horst Scholz-Transmission Management, plus package of decals and schedule booklet. Received in 78 days for a postal follow-up report. Station address: D-53110 Bonn, Germany (Edward Kusalik, Alberta, Canada). Website: streaming/on-demand audio and podcast **www.dw-world.de** Email: *info@dw-world.de*

PIRATE

Outhouse Radio, 6930 kHz. Email photo of radio Icom IC-718 used for the test broadcast. Included an attached audio clip of *Soulful Strut* tune by Young Holt used at program sign-off. Received in one hour for report to *outhouseradio@gmail.com* (Kusalik).

SAIPAN

Radio Free Asia relay, 9805 kHz. Full data *Burmese Harp* QSL from the *Musical Instrument* card series. Card unsigned with site notation. Received in seven days for an email report to *qsl@rfa.org* (Kusalik). Streaming audio/on-demand and podcast at **www.rfa.org**

ST. HELENA

Radio St. Helena, 11092.5 kHz USB. Full data QSL card # 169, for Nov. 14, 2009 broadcast, signed by G.G. Walters-Station Manager. Received for $2.00US and postcard. Station address: P.O. Box 93, Jamestown, Saint Helena Island, South Atlantic Ocean STHL 1ZZ (Victor J. Latavish, Naples, FL). Website: **www.sthelena.se/** Email: *radio.sthelena@helenta.sh*

USA

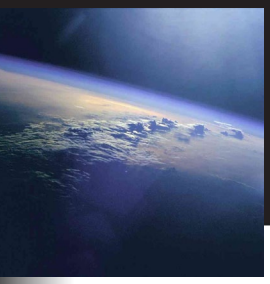
WJHR, 15550 kHz. Email verification featuring photo of transmitter. Received in two days for email report to *wjhr@usa.com* Station address: 5920 Oak Manor Dr., Milton, FL 32570 USA (D.F. Myers, Rogers, AR).

UTILITY

KFS, 12695.5 kHz CW. Partial data *RCA Radiogram*, signed by D.A. Stoops. Received in 43 days for a utility report, $1.00US and SASE (used for reply). Station address: 381, Bolinas, CA 94924-0381 (Bill Wilkins, Springfield, MO).

KKUI, *SS American Victory Mariners Museum Ship*, 8368 kHz CW. Two full data ship cards, signed by Dan Berger, plus decals and ship data sheet. Received in 18 days for a utility report, $1.00US and a SASE (used for reply). QSL address: KKUI, c/o American Victory Mariners Memorial Museum, 705 Channelside Dr., Tampa, FL 33602 USA (Wilkins).

Shannon Volmet, 3413 kHz USB. Full data QSL card signed by Officer in Charge, plus brochure, and apology for delay. Received in five months after several attempts to *qsl@iaa.ie* Station address: Shannon Volmet, Ballygireen, Newmarket-on-Fergus, Co. Claire, Ireland (Alvaro López Osuna, Spain/playdx).



MTXtra
Shortwave Broadcast Guide

PORTUGUESE / GERMAN

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.

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

2100	2145		USA, WYFR/Family Radio Worldwide		15695eu
2100	2200		Angola, Radio Nacional de Angola		4950do
2100	2200		Brazil, Jornal A Critica	5055do	
2100	2200		Brazil, Novas de Paz	6080do	9515do
			11725do		
2100	2200		Brazil, Radio Alvorada/Londrina		4865do
2100	2200		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
2100	2200		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
2100	2200		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
2100	2200		Brazil, Radio Brasil	4785do	
2100	2200		Brazil, Radio Brasil Central	4985do	11815do
2100	2200		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
2100	2200		Brazil, Radio Capixaba	4935do	
2100	2200		Brazil, Radio Clube do Para	4885do	
2100	2200		Brazil, Radio Congonhas	4775do	
2100	2200		Brazil, Radio Cultura do Para	5045do	
2100	2200		Brazil, Radio Cultura Ondas Tropicais		4845do
2100	2200		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
2100	2200		Brazil, Radio Cultura/Araraquara		3365do
2100	2200		Brazil, Radio Daqui	4915do	11830do
2100	2200		Brazil, Radio Difusora Acerana		4885do
2100	2200		Brazil, Radio Difusora Caceres		5055do
2100	2200		Brazil, Radio Difusora de Macapa		4915do
2100	2200		Brazil, Radio Difusora do Amazonas		4805do
2100	2200		Brazil, Radio Difusora Roraima		4875do
2100	2200		Brazil, Radio Difusora/Londrina		4815do
2100	2200		Brazil, Radio Educadora	2380do	
2100	2200		Brazil, Radio Gaucha	6020do	11915do
2100	2200		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
2100	2200		Brazil, Radio Globo	6120do	9585do
2100	2200		Brazil, Radio Guaiba	6000do	11785do
2100	2200		Brazil, Radio Imaculada Conceicao		4755do
2100	2200		Brazil, Radio Inconfidencia	6010do	15190do
2100	2200		Brazil, Radio Itatiaia	5970do	
2100	2200		Brazil, Radio Maria	4885do	
2100	2200		Brazil, Radio Marumby	9665do	11750do
2100	2200		Brazil, Radio Minicipal	3375do	
2100	2200		Brazil, Radio Missoes da Amazonia		4865do
2100	2200		Brazil, Radio Mundial	3325do	
2100	2200		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
2100	2200		Brazil, Radio Nossa Voz	4975do	
2100	2200		Brazil, Radio Nove de Julho	9820do	
2100	2200		Brazil, Radio Novo Tempo	4895do	
2100	2200		Brazil, Radio Record	6150do	9505do
2100	2200		Brazil, Radio Rio Mar	6160do	9695do
2100	2200		Brazil, Radio Rural	4765do	
2100	2200	mtwhf	Brazil, Radio Senado	5990do	
2100	2200		Brazil, Radio Verdes Florestas	4865do	
2100	2200		Brazil, Radio Voz Missionaria	5940do	
2100	2200		Brazil, SRDA/Super Radio Deus e Amour		
			6060do	9565do	11765do 11805do
2100	2200		Brazil, Super Rede Boa Vontade		4860do
			9550do	11895do	
2100	2200		Brazil, Voz Missionaria	5940do	
2100	2200	fas	Canada, Radio Canada International		15455na
			17860na		
2100	2200	mtwhf	Portugal, RDP Internacional	9820eu	11945va
			13755am	15295va	
2100	2200	Sat/Sun	Portugal, RDP Internacional	13755am	15295va
2100	2200		Russia, Voice of Russia	5920eu	7440eu
2100	2200	mtwhf	Spain, Radio Exterior de Espana		17595sa
2100	2200		USA, WYFR/Family Radio Worldwide		15770af

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

2200	2300		Brazil, Jornal A Critica	5055do	
2200	2300		Brazil, Novas de Paz	6080do	9515do
			11725do		
2200	2300		Brazil, Radio Alvorada/Londrina		4865do
2200	2300		Brazil, Radio Alvorada/Parintins		4865do
2200	2300		Brazil, Radio Aparecida	5035do	6135al
			9630al	11855al	
2200	2300		Brazil, Radio Bandeirantes	6090do	9645do
			11925do		
2200	2300		Brazil, Radio Boa Vontade	6160do	9550do
			11895do		
2200	2300		Brazil, Radio Brasil	4785do	
2200	2300		Brazil, Radio Brasil Central	4985do	11815do
2200	2300		Brazil, Radio Cancao Nova	4825do	6105do
			9675do		
2200	2300		Brazil, Radio Capixaba	4935do	
2200	2300		Brazil, Radio Clube do Para	4885do	
2200	2300		Brazil, Radio Congonhas	4775do	
2200	2300		Brazil, Radio Cultura do Para	5045do	
2200	2300		Brazil, Radio Cultura Ondas Tropicais		4845do
2200	2300		Brazil, Radio Cultura Sao Paulo		9615do
			17815do		
2200	2300		Brazil, Radio Cultura/Araraquara		3365do
2200	2300		Brazil, Radio Daqui	4915do	
2200	2300		Brazil, Radio Difusora Acerana		4885do
2200	2300		Brazil, Radio Difusora Caceres		5055do
2200	2300		Brazil, Radio Difusora de Macapa		4915do
2200	2300		Brazil, Radio Difusora do Amazonas		4805do
2200	2300		Brazil, Radio Difusora Roraima		4875do
2200	2300		Brazil, Radio Difusora/Londrina		4815do
2200	2300		Brazil, Radio Educadora	2380do	
2200	2300		Brazil, Radio Educadora 6 de Agosto		3255do
2200	2300		Brazil, Radio Gaucha	6020do	11915do
2200	2300		Brazil, Radio Gazeta Universitaria		5955do
			9685do	15325al	
2200	2300		Brazil, Radio Globo	6120do	9585do
2200	2300		Brazil, Radio Guaiba	6000do	11785do
2200	2300		Brazil, Radio Imaculada Conceicao		4755do
2200	2300		Brazil, Radio Inconfidencia	6010do	15190do
2200	2300		Brazil, Radio Itatiaia	5970do	
2200	2300		Brazil, Radio Marumby	6080do	9665do
			11750do		
2200	2300		Brazil, Radio Minicipal	3375do	
2200	2300		Brazil, Radio Missoes da Amazonia		4865do
2200	2300		Brazil, Radio Mundial	3325do	
2200	2300		Brazil, Radio Nacional da Amazonia		6185do
			11780do		
2200	2300		Brazil, Radio Nossa Voz	4975do	
2200	2300		Brazil, Radio Nove de Julho	9820do	
2200	2300		Brazil, Radio Novo Tempo	4895do	
2200	2300		Brazil, Radio Record	6150do	9505do
2200	2300		Brazil, Radio Rio Mar	6160do	9695do
2200	2300		Brazil, Radio Rural	4765do	
2200	2300		Brazil, Radio Verdes Florestas	4865do	
2200	2300		Brazil, Radio Voz Missionaria	5940do	
2200	2300		Brazil, SRDA/Super Radio Deus e Amour		
			6060do	9565do	11765do 11805do
2200	2300		Brazil, Super Rede Boa Vontade		4860do
			9550do	11895do	
2200	2300		Brazil, Voz Missionaria	5940do	
2200	2300	fas	Canada, Radio Canada International		17860sa
2200	2300		China, China Radio International		6175eu
			7260eu	9410eu	9685eu
2200	2300		Portugal, RDP Internacional	9820eu	11945af
			13755am	15295va	
2200	2300		Russia, Voice of Russia	9965eu	11510sa
			11605sa		
2200	2300		USA, WYFR/Family Radio Worldwide		7360sa
			15190sa	17725sa	
2215	2300		Egypt, Radio Cairo	9360sa	

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

2300 0000 Angola, Radio Nacional de Angola 4950do
2300 0000 Brazil, Jornal A Critica 5055do
2300 0000 Brazil, Novas de Paz 6080do 9515do 11725do
2300 0000 Brazil, Radio Alvorada/Londrina 4865do
2300 0000 Brazil, Radio Alvorada/Parintins 4865do
2300 0000 Brazil, Radio Aparecida 5035do 6135al 9630al 11855al
2300 0000 Brazil, Radio Bandeirantes 6090do 9645do 11925do
2300 0000 Brazil, Radio Boa Vontade 6160do 9550do 11895do
2300 0000 Brazil, Radio Brasil 4785do
2300 0000 Brazil, Radio Brasil Central 4985do 11815do
2300 0000 Brazil, Radio Cancao Nova 4825do 6105do 9675do
2300 0000 Brazil, Radio Capixaba 4935do
2300 0000 Brazil, Radio Clube do Para 4885do
2300 0000 Brazil, Radio Congonhas 4775do
2300 0000 Brazil, Radio Cultura do Para 5045do
2300 0000 Brazil, Radio Cultura Ondas Tropicais 4845do
2300 0000 Brazil, Radio Cultura Sao Paulo 9615do 17815do
2300 0000 Brazil, Radio Cultura/Araraquara 3365do
2300 0000 Brazil, Radio Daqui 4915do
2300 0000 Brazil, Radio Difusora Acerana 4885do
2300 0000 Brazil, Radio Difusora Caceres 5055do
2300 0000 Brazil, Radio Difusora de Macapa 4915do
2300 0000 Brazil, Radio Difusora do Amazonas 4805do
2300 0000 Brazil, Radio Difusora Roraima 4875do
2300 0000 Brazil, Radio Difusora/Londrina 4815do
2300 0000 Brazil, Radio Educadora 2380do
2300 0000 Brazil, Radio Educadora 6 de Agosto 3255do
2300 0000 Brazil, Radio Gaucha 6020do 11915do
2300 0000 Brazil, Radio Gazeta Universitaria 5955do 9685do 15325al
2300 0000 Brazil, Radio Globo 6120do 9585do
2300 0000 Brazil, Radio Guaiba 6000do 11785do
2300 0000 Brazil, Radio Imaculada Conceicao 4755do
2300 0000 Brazil, Radio Inconfidencia 6010do 15190do
2300 0000 Brazil, Radio Itatiaia 5970do
2300 0000 Brazil, Radio Marumby 6080do 9665do 11750do
2300 0000 Brazil, Radio Minicipal 3375do
2300 0000 Brazil, Radio Missoes da Amazonia 4865do
2300 0000 Brazil, Radio Mundial 3325do
2300 0000 Brazil, Radio Nacional da Amazonia 6185do 11780do
2300 0000 Brazil, Radio Nossa Voz 4975do
2300 0000 Brazil, Radio Nove de Julho 9820do
2300 0000 Brazil, Radio Novo Tempo 4895do
2300 0000 Brazil, Radio Record 6150do 9505do
2300 0000 Brazil, Radio Rural 4765do
2300 0000 Brazil, Radio Verdes Florestas 4865do
2300 0000 Brazil, Radio Voz Missionaria 5940do
2300 0000 Brazil, SRDA/Super Radio Deus e Amour 6060do 9565do 11765do 11805do
2300 0000 Brazil, Super Rede Boa Vontade 4860do 9550do 11895do
2300 0000 Brazil, Voz Missionaria 5940do
2300 0000 China, China Radio International 9560eu 13650sa
2300 0000 Cuba, Radio Havana Cuba 15380sa
2300 0000 Ecuador, HCJB Global 11920sa
2300 0000 mtwhf Portugal, RDP Internacional 9715am 11630sa 11940sa
2300 0000 USA, WYFR/Family Radio Worldwide 7360sa 7520sa 15190sa
2300 2330 fas Canada, Radio Canada International 13710sa
2300 2330 Egypt, Radio Cairo 9360sa
2330 0000 Cuba, Radio Havana Cuba 17705sa

MT Shortwave German Broadcast Guide

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

0000 0100 mtwhfa Austria, Radio O1 International 9820na
0000 0100 Germany, Deutsche Welle 6075eu 6225as 7285as 7395as 9655ca 11665ca 12025af
0000 0100 Germany, Deutschlandfunk 6190eu
0030 0045 mtwhf Moldova, (Transnistria) Radio PMR 9665eu

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

0100 0115 sm Austria, Radio O1 International 9820eu
0100 0130 twhfa Austria, Radio O1 International 9820sa
0100 0158 Germany, Deutsche Welle 7285as
0100 0159 Germany, Deutsche Welle 11665ca
0100 0200 Germany, Deutsche Welle 6075eu 6225as 7395as 9655ca 12025ca
0100 0200 Germany, Deutschlandfunk 6190eu
0115 0130 mtwhf Moldova, (Transnistria) Radio PMR 9665eu

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

0200 0300 Germany, Deutsche Welle 6075va
0200 0300 Germany, Deutschlandfunk 6190eu

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

0300 0359 Germany, Deutsche Welle 6075me
0300 0400 Germany, Deutsche Welle 6075eu
0300 0400 Germany, Deutschlandfunk 6190eu

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

0400 0430 mtwhf Swaziland, TWR Swaziland 3200af 4775af
0400 0500 Germany, Deutsche Welle 6075va 13780af 17800af
0400 0500 Germany, Deutschlandfunk 6190eu
0400 0500 Sat/Sun Swaziland, TWR Swaziland 3200af 4775af
0420 0440 Vatican City State, Vatican Radio 4005eu 5965eu 7250eu

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

0500 0559 Germany, Deutsche Welle 6075va
0500 0600 Austria, Radio O1 International 6155va
0500 0600 China, China Radio International 15245eu 17720eu
0500 0600 Germany, Deutsche Welle 3995eu 6075eu 13780af 13780af 17800af
0500 0600 Germany, Deutschlandfunk 6190eu
0500 0600 USA, WYFR/Family Radio Worldwide 7730eu

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

0600 0659 Germany, Deutsche Welle 7410af
0600 0700 China, China Radio International 15245eu 17720eu
0600 0700 Germany, Deutsche Welle 3995eu 6075eu 9545eu 12005af 15275af
0600 0700 Germany, Deutschlandfunk 6190eu
0600 0700 DRM Luxembourg, RTL Radio 6095eu
0630 0657 Czech Republic, Radio Prague 5930eu
0630 0700 Bulgaria, Radio Bulgaria 5900eu 7400eu

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

0700 0730 Romania, Radio Romania International 7210eu
0700 0730 DRM Romania, Radio Romania International 9450eu
0700 0745 USA, WYFR/Family Radio Worldwide 11580eu
0700 0759 Germany, Deutsche Welle 9545va
0700 0800 Germany, Deutsche Welle 3995eu 6075eu 12005af 15275af
0700 0800 Germany, Deutschlandfunk 6190eu
0700 0800 Germany, Radio 700 6005eu
0700 0800 DRM Luxembourg, RTL Radio 6095eu
0730 0745 DRM Germany, Freundes-Dienst International 6095eu
0730 0800 Iran, VOIRI/IRIB 15085eu 15430va

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

0800 0827 Iran, VOIRI/IRIB 15085eu 15430va
0800 0830 Slovakia, Radio Slovakia International 5920eu 6055eu
0800 0900 Germany, Deutsche Welle 6075eu 9450pa 9545va 13780va 17520va
0800 0900 Germany, Deutschlandfunk 6190eu

0800	0900		Germany, Radio 700	6005eu	
0800	0900	DRM	Luxembourg, RTL Radio	6095eu	

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

0900	0930		Greece, Voice of Greece	11645eu	
0900	0955		Germany, Deutsche Welle	9545eu	6075eu
			9450va	13780va	17520va
0900	1000		Germany, Deutschlandfunk	6190eu	
0900	1000		Germany, Radio 700	6005eu	
0900	1000		Russia, Voice of Russia	11655eu	
0900	1000		Ukraine, Radio Ukraine International		11655eu
0930	1000	DRM	Luxembourg, RTL Radio	6095eu	

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

1000	1027		Czech Republic, Radio Prague		6055eu
1000	1100		Germany, Deutsche Welle	5905ca	6075eu
			9865ca	13780va	17520va 21780as
1000	1100		Germany, Deutschlandfunk	6190eu	
1000	1100		Germany, Hamburger Lokalradio		5980eu
1000	1100	1st Sun	Germany, Hamburger Lokalradio		6045eu
1000	1100	1st Sun	Germany, MV Baltic Radio	6140eu	
1000	1100		Germany, Radio 700	6005eu	
1000	1100	DRM	Luxembourg, RTL Radio	6095eu	
1000	1100		Russia, Voice of Russia	9850eu	
1030	1100	Sat/Sun	Germany, Evangelische Missions-Gemeiden		
			6055eu		

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

1100	1115	Sun	Germany, Missionswerke Arche Stimme Des Trostes		
			5945eu		
1100	1158		Germany, Deutsche Welle	17520va	21780as
1100	1159		Germany, Deutsche Welle	17770sa	
1100	1200		Germany, Deutsche Welle	5905ca	6075eu
			13780va		
1100	1200		Germany, Deutschlandfunk	6190eu	
1100	1200		Germany, Radio 700	6005eu	
1100	1200	DRM	Luxembourg, RTL Radio	6095eu	
1100	1200	DRM	Russia, Voice of Russia	9850eu	
1130	1159		Poland, Polskie Radio Warsaw		9435eu
			9610eu		
1130	1200		Turkey, Voice of Turkey	13760eu	

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

1200	1227		Czech Republic, Radio Prague		6055eu
1200	1230		Turkey, Voice of Turkey	13760eu	
1200	1300		Germany, Deutsche Welle	6075eu	13780va
			15640as	21780as	
1200	1300		Germany, Deutschlandfunk	6190eu	
1200	1300		Germany, Radio 700	6005eu	
1200	1300	DRM	Luxembourg, RTL Radio	6095eu	

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

1300	1358		Germany, Deutsche Welle	15640as	
1300	1359		Germany, Deutsche Welle	13780va	21780as
1300	1400		Germany, Deutsche Welle	6075eu	
1300	1400		Germany, Deutschlandfunk	6190eu	
1300	1400		Germany, Radio 700	6005eu	
1300	1400	Sun	Germany, Radio Traumland	5945eu	
1300	1400	DRM	Luxembourg, RTL Radio	6095eu	
1300	1400		Romania, Radio Romania International		11970eu
			15460eu		
1330	1400		Slovakia, Radio Slovakia International		5920eu
			6055eu		

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

1400	1415		Vatican City State, Vatican Radio		5885eu
			7250eu	7320eu	9645eu
1400	1500		Germany, Deutsche Welle	6075eu	13780va
			15275va	17800va	
1400	1500		Germany, Deutschlandfunk	6190eu	
1400	1500		Germany, Radio 700	6005eu	
1400	1500	DRM	Luxembourg, RTL Radio	6095eu	

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

1500	1527		Czech Republic, Radio Prague		5930eu
1500	1555		Germany, Deutsche Welle	15275va	
1500	1557		Germany, Deutsche Welle	17800va	
1500	1558		Germany, Deutsche Welle	13780va	
1500	1559		Germany, Deutsche Welle	6075eu	
1500	1600		Germany, Deutschlandfunk	6190eu	
1500	1600		Germany, Radio 700	6005eu	
1500	1600	DRM	Luxembourg, RTL Radio	6095eu	
1500	1600		Russia, Voice of Russia	12010eu	
1500	1600	DRM	Russia, Voice of Russia	9750eu	
1530	1559		Poland, Polskie Radio Warsaw		9495eu

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

1600	1630		Slovakia, Radio Slovakia International		5920eu
			6055eu		
1600	1657		Germany, Deutsche Welle	12070af	
1600	1657		North Korea, Voice of Korea	9325eu	12015eu
1600	1700		China, China Radio International		5970eu
			7380eu		
1600	1700		Germany, Deutsche Welle	3995eu	6075eu
			9545af	12055af	13780va
1600	1700		Germany, Deutschlandfunk	6190eu	
1600	1700		Germany, Radio 700	6005eu	
1600	1700	DRM	Luxembourg, RTL Radio	6095eu	
1600	1700		Russia, Voice of Russia	12010eu	
1600	1700	DRM	Russia, Voice of Russia	9750eu	

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

1700	1730	DRM	Romania, Radio Romania International		5875eu
1700	1757		Germany, Deutsche Welle	12055af	
1700	1758		Germany, Deutsche Welle	12070af	
1700	1759		Germany, Deutsche Welle	6075eu	9545af
			13780va		
1700	1800		China, China Radio International		5970eu
			7380eu		
1700	1800		Germany, Deutsche Welle	3995eu	
1700	1800		Germany, Deutschlandfunk	6190eu	
1700	1800	Sun	Germany, Radio Santec	12010eu	
1700	1800	DRM	Luxembourg, RTL Radio	6095eu	
1700	1800		Russia, Voice of Russia	12010eu	
1700	1800	DRM	Russia, Voice of Russia	9750eu	
1700	1800		USA, WYFR/Family Radio Worldwide		17750eu
1730	1745	mtwhf	Moldova, (Transnistria) Radio PMR		6240eu
1730	1800		Bulgaria, Radio Bulgaria	6200eu	7400eu
1730	1800	DRM	Bulgaria, Radio Bulgaria	9700eu	
1730	1800		Iran, VOIRI/IRIB 6180eu	9940eu	15085eu
1730	1800		Turkey, Voice of Turkey	11835eu	
1740	1800	w	Germany, Lutheische Stunde	12010eu	
1740	1800	w/DRM	Germany, Lutheische Stunde	9750af	

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

1800	1827		Iran, VOIRI/IRIB 6180eu	9940eu	15085eu
1800	1830		Slovakia, Radio Slovakia International		5920eu
			6055eu		
1800	1830		Turkey, Voice of Turkey	11835eu	
1800	1857		North Korea, Voice of Korea	9325eu	12015eu
1800	1858		Germany, Deutsche Welle	13780af	
1800	1900		Belarus, Radio Belarus	7255eu	7360eu
			7390eu		
1800	1900		China, China Radio International		7395eu
			11650eu	11775eu	
1800	1900		Germany, Deutsche Welle	3995eu	6075eu
			9545af	11725af	12070af 15640af
1800	1900		Germany, Deutschlandfunk	6190eu	
1800	1900		Indonesia, Voice of Indonesia	9526va	
1800	1900		Russia, Voice of Russia	12010eu	
1800	1900		Syria, Radio Damascus	9330eu	12085eu
1800	1900		USA, WYFR/Family Radio Worldwide		7320eu
			21455eu		
1815	1830	mtwhf	Moldova, (Transnistria) Radio PMR		6240eu

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MILCOM
MONITORING MILITARY COMMUNICATIONS

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Monitoring Aerial Refueling

This month I'll cover one aspect of monitoring the military that anyone with a military air capable scanner can do, no matter where they live in the United States. On any given day, military aircraft somewhere are flying overhead and taking on fuel from flying Department of Defense (DoD) gas stations or aerial refueling tankers. This mission is known as aerial refueling or in-flight refueling, in which fuel is transferred from one aircraft to another during flight.

The conduct of aerial refueling (AR) is based on the strict requirement that participating aircraft remain within specifically designated airspace. Aerial refueling operations are normally conducted on *tracks* or in *anchor areas* which are published in various DoD flight information publications (FLIP). Aircraft participating in the mission must operate under instrument flight rules and positive radar control from either an air route traffic control center or military radar unit.

A little over a year ago in this column (November 2009), I presented the latest list of aerial refueling (AR) frequencies used by DoD in North America. The frequencies listed in that column were for established refueling tracks/anchors. But, as you will discover this month, there are more frequencies that are used for aerial refueling that were not on that list.

❖ Rules for Tanking

The U.S. military services have agreed, to the maximum extent possible, that their aerial refueling missions will be conducted on existing published tracks/anchor tracks and in accordance with specific rules and order of commands.

For example, the tanker aircraft is responsible for requesting altitude clearance and routing (if different from flight plan routing) for the receiver and tanker aircraft beyond the AR exit point. Throughout the refueling operation,

heading assignments initiated by flight controllers may not be acted upon without approval of the tanker.

Each aircraft must receive a specific clearance prior to leaving the refueling track or anchor. In the event of no clearance, the tanker(s) and receiver(s) will continue on the tanker's filed route and assigned block altitudes until a clearance to separate the flight can be obtained. Alternatively, the aircraft may request an extension of the aerial refueling track. Aerial refueling operations are terminated at the end of the refueling point unless an extension of the aerial refueling track is received.

❖ Aerial Refueling Terminology

While monitoring aerial refueling communications, it is helpful not only to understand the rules under which the mission operates, but also some of the unfamiliar terminology. I have provided the following list of terms that are commonly heard in refueling radio traffic.

Air Refueling Control Point (ARCP) - The geographical point over which the receiver arrives in the observation/refueling position with respect to the assigned tanker.

Air Refueling Initial Point (ARIP) - The geographical point at which the receiver aircraft enters the refueling track/anchor, initiates radio contact with the tanker, and begins maneuver to rendezvous. Descent to refueling altitude will be made between ARIP and ARCP.

Anchor Area - A defined area encompassing both a racetrack shape aerial refueling track and its protected airspace.

Anchor Pattern - A left-hand race track pattern with legs separated by a minimum of 20 nautical miles and a minimum leg length of 50 nautical miles.

Anchor Point - A designed reference point upon which an anchor refueling track is oriented.

Air Refueling Control Point (ARCP) - The location where the tanker and receiver rendezvous is completed prior to refueling. Tankers orbit at this point.

As Fragged - Unit or element will be performing exactly as stated by the air tasking order (ATO).

ATC Assigned Airspace (ATCAA) - Airspace of defined vertical/lateral limits, assigned by Air Traffic Control, for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic.

Bingo - Fuel state needed for recovery.

Breakaway - Tanker or receiver directive call indicating immediate vertical and nose/tail separation between tanker and receiver is required.

Dual-role Tanker - Dual-role tankers carry support personnel, supplies, and equipment for the deploying force while escorting and/or refueling combat aircraft to the area of responsibility. Dual-role tankers can minimize the total lift requirement while providing critical cargo and personnel at the combat aircraft's time of arrival.

Entry Points - These are designated points where tanker aircraft may enter the anchor area without the assistance of radar. When either FAA Center Radar or Ground Tactical Radar is operative, a tanker may proceed to the anchor point without crossing an entry point.

Exit Points - These are designated points which denotes the end of a particular route of flight; i.e., MTR, air refueling track, etc. Once reaching this point tanker and receiver aircraft may depart the anchor area after refueling is completed.

Feet Wet/Dry - Flying over water/land.

Go Active - Go to briefed Have Quick net.

Go Secure - Use encrypted voice communications.

Home Plate - Home airfield or carrier.

Joker - Fuel state above bingo (see above) at which separation/bugout/event termination should begin.

Knock It Off - Directive to cease air combat maneuvers/attacks/activities.

Mickey - Have Quick Time-of-Day (TOD) signal.

Multi-point Refueling System - A limited number of KC-135 aircraft can be equipped with external wing-mounted pods to conduct drogue air refueling, while still maintaining boom air refueling capability on the same mission. This dual refueling capability makes KC-135s with multi-point refueling systems ideal for use as ground alert aircraft. Also called MPRS.

Navigation Checkpoints - These are designated where required to provide a means for adequate navigation for refueling aircraft and for departure from the track subsequent to refueling.

Push (Channel) - Go to designated frequency. No acknowledgment required.

Refueling Level/Altitudes - A block of consecutive altitudes/flight levels from ARIP to exit point within which entry into the refueling track, maneuvering to rendezvous, and transfer of fuel will be accomplished.

Squirt - In air-to-air refueling, a means of providing visual detection of a nearby aircraft. In practice this is achieved by the donor aircraft dumping fuel and/or the receiver aircraft selecting afterburners, if so equipped.

Tanker Orbit Point - A geographical location along the planned refueling track where the tanker may hold, prior to effecting rendezvous with the receiver aircraft.

❖ Random Aerial Refueling Frequencies

When published tracks/anchors are inadequate for special missions or sorties due to mission requirements or operational considerations, a special track/anchor may be established by the Defense Department. Special tracks/anchors are not published in the DoD FLIP planning documents, but may be described in letters of agreement with other agencies such as the FAA. Special tracks/anchors may also be established for one time use by direct coordination with the appropriate ATC facility.

Although these refueling missions are not assigned to any specific track or anchors, they are identified with specific large geographic areas around the world and are known as random aerial refueling tracks/anchors.

Table One is a list of the known random aerial refueling plans: Continental United States (CONUS), the Atlantic Region, and Canada.

Continental United States (CONUS) Random AR Frequencies

364.275/283.075	Alpha Primary/Secondary
247.025/234.525	Bravo Primary/Secondary
378.200/375.650	Charlie Primary/Secondary
373.550 /371.150	Delta Primary/Secondary
314.100/297.900	Echo Primary/Secondary
298.325/289.700	Foxtrot Primary/Secondary
285.150/276.100	Golf Primary/Secondary
266.500/275.950	Hotel Primary/Secondary
254.600/255.750	India Primary/Secondary
236.750/228.600	Juliet Primary/Secondary
343.100/322.850	Kilo Primary/Secondary
352.100/368.950	Lima Primary/Secondary

Atlantic Region Random AR Frequencies

279.200/305.200	Alpha Primary/Secondary
285.200/289.400	Bravo Primary/Secondary
268.400/259.000	Charlie Primary/Secondary
270.400/289.600	Delta Primary/Secondary
318.000/278.676	Echo Primary/Secondary
355.000/291.900	Foxtrot Primary/Secondary
294.625/261.050	Golf Primary/Secondary
317.375/270.050	Hotel Primary/Secondary
360.250/274.425	India Primary/Secondary
308.800/271.475	Juliet Primary/Secondary
319.175/320.625	Kilo Primary/Secondary

Canadian Region Random AR Frequencies

242.050/243.450	Alpha Primary/Secondary
282.000/289.950	Bravo Primary/Secondary
288.950/305.125	Charlie Primary/Secondary
268.200/270.550	Delta Primary/Secondary
258.100/289.100	Echo Primary/Secondary

One of the monitoring tips I recommend to radio hobbyists is that, if they have free memories available, they program all of the established track/anchors (from the November 2009 issue) and all of the random aerial refueling boom frequencies above into one bank/group in their scanner, *even if a particular route or random plan is not within radio range*. We have observed that these frequencies are sometimes used off the aerial route as an air-to-air channel by receivers and tankers. You might hear some interesting communications that would otherwise be missed if you don't have all the AR frequencies mentioned above programmed into your scanner.

We know additional random aerial refueling plans exist in other areas of the world, and I will continue to correspond with other Milcom monitors to compile that information. If you want to help, you can reach me at the email address in the masthead.

❖ Monitoring NAS Fallon, Nevada

Naval Air Station Fallon, Nevada, is one of the most active areas of the United States for military activity – and one of my favorite places to monitor. NAS Fallon (KNFL) is the Navy's premier air-to-air and air-to-ground training facility. It is located southeast of the city of Fallon in western Nevada.

Since 1996, it has been home to the Naval Fighter Weapons School (TOPGUN), and the surrounding area contains 84,000 acres of bombing and electronic warfare ranges. It is also home to the Naval Strike and Air Warfare Center (NSAWC), which includes TOPGUN, the Carrier Airborne Early Warning Weapons School (TOPDOME) and the Navy Rotary Wing Weapons School. Navy SEAL Combat Search and Rescue (CSAR) training also takes place here.

The base is named Van Voorhis Field in honor of Lieutenant Bruce Van Voorhis (1908-1943) who was awarded a posthumous Medal of Honor.

The Navy relocated its Navy Fighter Weapons School, or TOPGUN, from NAS Miramar to NAS Fallon in 1996, following the transfer of NAS Miramar to the Marine Corps and its redesignation as MCAS Miramar. This move resulted in the construction of a new ramp, hangars, and academic buildings.

A new command, the Naval Strike and Air Warfare Center (NSAWC), was established on July 11, 1996, and was a unification of TOPGUN, Strike University (Strike U), the Naval Strike Warfare Center, and TOPDOME, the Carrier Airborne Early Warning Weapons School.

In addition to transferring the NSAWC squadron, a Navy Reserve adversary squadron, Fighter Squadron Composite 13 (VFC-13), the "Saints," was also permanently relocated from its former base at NAS Miramar to NAS Fallon. As a result, VFC-13 replaced the disestablished VFA-127 in the fighter adversary role.

Associated bombing ranges checker the surrounding Lahontan Valley and Dixie Valley, which is the next valley to the east. Dixie Valley also contains a simulated air defense network, including approximately 20 operational radar installations. Many demilitarized armored vehicles, including some exotics, have been scattered throughout the area, presumably for ambiance. Most of this area is publicly accessible, with the exception of areas immediately surrounding the radar installations.

Monitoring radio activity at NAS Fallon can be exciting and intense. Table Two is a list of currently known frequencies used on the base and in the surrounding areas and ranges.

I want to wish each of you and your family a happy holiday season and look forward to hearing from you in 2011. Until next time,73 and good hunting.

NAS Fallon Frequencies (MHz)

FM Repeater Frequencies

140.700	All Ranges Simplex <Channel 1>
140.700/142.650	Ranges B-16/17/20 <Channel 2>
140.900/138.750	Range B-17 Operations <Channel 3>
139.525/143.550	Ranges B-16/19 <Channel 4>

Range Frequencies (AM mode)

233.700	Mustang Control (TACTS)/Admin
259.500	Range B-20 South Side
267.400	Range B-17 West
271.400	Range B-17 East
281.200	EW Control Primary
323.900	Range B-19
328.300	EQ Control Secondary
341.900	Range B-16
364.300	Range B-20 North Side

NSAWC Airspace/Mission Frequencies (AM mode)

249.800	Edwards Primary/NSAWC 1 Secondary
265.800	Cortez
267.400	CAS TACC Primary
270.900	Kingston/Primary/NSAWC 2 Secondary
271.400	CAS FAC and FAC (A)
282.800	CSAR
283.450	Edwards Secondary
289.750	Berlin Primary/NSAWC 2 Primary
291.200	CAS Admin/Callaghan Secondary
299.700	Dixie Secondary
305.800	Bogey Primary
318.500	Callaghan Primary
323.800	CAS FAC and FAC (A)
326.600	Lone Rock
336.700	CAS DASC Primary
363.400	Dixie Primary/NSAWC 1 Primary
365.300	ICS/Purple
379.000	Berlin Secondary

Ground Training Operations

250.525 268.800 282.075

ATC/General Frequencies

226.800	Have Quick Time of Day (TOD) Beacon
251.150	Fallon Ground Control
255.400	Reno Flight Service Station
263.000	Desert Control
267.700	Strike Rescue Training Frequency
282.800	SAR Common
285.500	Oakland Center (ZOA)
297.800	Strike Rescue Training Frequency
322.350	Desert Control
340.200	Fallon Tower
353.550	Clearance Delivery
360.200	Fallon Approach Control

BROADCAST BANDSCAN

THE WORLD OF DOMESTIC BROADCASTING

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On the Tube

Let's start this week with a bit of television news... Two items have come up before the FCC that will affect our TV-DX targets – and indirectly, our FM targets.

❖ New Jersey & Delaware on VHF

As you may remember, a firm called PMCM believes a law passed in the 1970s requires the FCC to allow the moves of two TV stations from Nevada and Wyoming to New Jersey and Delaware. Under the law, the FCC is required to renew the license of any VHF station that agrees to move to a state having no such stations. The law was intended to preserve the license of a New York City station that had gotten into serious trouble with the Commission; the station moved to New Jersey and got to keep its license.

The FCC doesn't agree that it's required to allow PMCM to move its stations, but it does agree that it's required to assign at least one VHF channel to every state if it's technically feasible to do so. With channels 2-6 nearly empty, it is now technically feasible. They have assigned channel 4 to Atlantic City, New Jersey and channel 5 to Seaford, Delaware.

Auctions have now been scheduled for these channels. How much money they'll raise is a good question. PMCM wished to move the stations to Wilmington, Delaware and Middletown Township, New Jersey, possibly even locating the transmitters in Philadelphia and New York City.

However, the cities selected by the Commission are considerably further from NYC and Philadelphia. Neither channel will put a useful signal across New York, and while it may be theoretically possible for the Atlantic City channel to provide some signal to Philadelphia, it won't be competitive. Time will tell.

❖ Analog Drop-Dead Date?

The other TV item is probably bigger news: a proceeding has been opened to set a "drop-dead date" for analog low-power stations. Again, as you remember, all full-power analog TV in the United States was shut down last July. Low-power stations, however, were allowed to continue in analog mode.

These stations have always faced eventual digital conversion. The FCC never made it a secret they would be required to convert eventually. A proceeding released in late September now proposes to finalize this date. It is, however a notice of proposed rulemaking and as such, is rather vague... After all the talk about setting a date, the Notice of Proposed Rulemaking says simply sometime in 2012... They're asking for comments as to when in 2012. On the selected date, all analog low-power stations, Class A stations, and translators would be required to switch to digital operation or go off the air.

They do propose a more solid date for stations operating above channel 51. The proposal calls for these stations to be required to apply for a new channel below channel 52 by the end of June of next year, and to complete the move by the end of 2011.

Obviously, this means there will be no more analog TV signals at all by the end of 2012. What it also means... is that the "FrankenFMs" operating on 87.7 MHz will go away. New York's Pulse 87 (WNYZ-LP) is probably the most famous of these operations. The sound of a channel 6 analog TV station can be received on an FM radio, a fact a number of low-power TV stations have exploited by operating as radio stations. When these stations are required to convert to digital, their audio will no longer be receivable on FM radios. Stations like WNYZ, Chicago's WLFM, and Lubbock's KFMP will have to switch to a business plan that calls for operating as the TV stations they actually are!

❖ Unique AM Station to Close

Last time, I lamented the disappearance of numerous AM stations in recent years. Most of these stations saw little notice. There was nothing unusual about their programming; let's face it, having one fewer country music station is not going to shatter the radio world. This month, however, we have a unique AM operation going by the wayside.

WDCR-1340 in Hanover, New Hampshire has surrendered its license for cancellation. This station was operated as a commercial eclectic music station by students at Dartmouth College. In a press release, the station's General Manager Pavel Sotskov wrote:

"An evaluation of the costs of maintaining the AM transmitter and a recognition that Dartmouth students listen to their student-DJ friends' WDCR broadcasts online led us to choose to make this change,..."

WDCR will continue to operate as an Internet-only station. Dartmouth students will also continue to operate the campus's more traditional modern rock station WFRD-FM 99.3.

❖ "Un-disappearing" Station

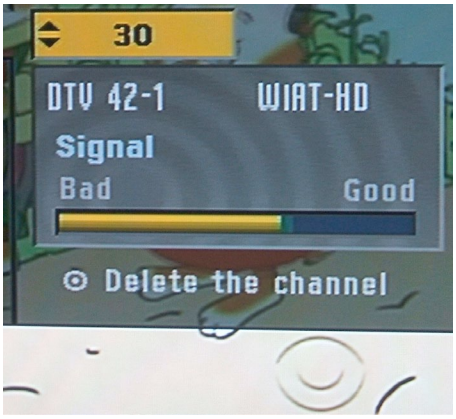
Last time, I reported CHSC-1220 St. Catharines, Ontario was gone. The Canadian Radio-Television and Telecommunications Commission found the station had violated numerous regulations and decided not to renew the CHSC license. CHSC has appealed the decision, and the court has ruled CHSC will be allowed to continue broadcasting while the appeal is in progress.

❖ Letters

I've heard from a number of readers this month. Don, NF7R writes from Southern Nevada, reporting a rather unusual logging just outside the AM band. He's hearing KNAK-540, Delta, Utah. That wouldn't be that unusual; Nevada and Utah are not that far apart. Thing is, Don is hearing them on 520, not 540 – and in FM mode. Another ham in Don's area is hearing this as well, and I've seen at least one report on the National Radio Club's mailing list.

The 520 signal is only present at night, when KNAK is supposed to reduce power to 13 watts. During the day, Don is hearing them just fine, on 540 where they're supposed to be, and in AM mode in which they're supposed to be operating.

I can't explain this. If I had to guess, I'd say there was a spurious resonant circuit formed in the transmitter's power amplifier, causing it to act as an oscillator on 520. Since the power amplifier is being modulated with the KNAK program material, its frequency would also be modulated. But that's only a



guess.

I've also heard from Mario Filippi, N2HUN of western New Jersey. Mario shares a situation with many viewers: tired of high costs for satellite (or cable) and poor programming, he unhooked the dish and bought two Radio Shack omnidirectional "saucer" antennas. They're mounted on his chimney.

Mario assumed TV DX ended with the digital conversion. Then, he read Danny Oglethorpe's article in the August issue of MT. Mario is having his best success around 7-9am, especially in foggy weather. When he receives a signal, he freezes the screen and takes a digital photo.

He forwarded some of his digital photos. They include WGNT (Norfolk, Virginia, his best DX so far); WMCN (Atlantic City); WPMT (York, Pennsylvania); WRNN (Kingston, New York); and WTNH (New Haven, Connecticut).

"Thanks to digital TV, IDs can be easily captured, unlike the analog signals of bygone days." As Mario's photos show, most stations display their call letters when punched up on a digital receiver. We weren't that lucky in the analog days!

❖ Strange ID

Well, I've never IDed a station this way before...

I was listening on 1000 kHz on the car radio on the way home from work. Two stations were fighting for control of the channel. One turned out to be WMVP, Chicago. I was hoping the other one would be something interesting.

While WMVP was identifying themselves at 7:00, on the other station I heard the letters "...48BK" in Morse Code. This had me puzzled for a few miles. Then, the little light bulb went off over my head. I got home, and looked up "W248BK" in the FCC FM database.

It turns out W248BK is located in Paris, Tennessee – and so is WMUF-AM, 1000 kHz. Apparently, W248BK relays WMUF. FM translators are allowed to identify in Morse. However, the technical means they use to do so should be inaudible on an ordinary FM radio. FM translator Morse IDs are occasionally audible when there's interference present. I wonder if, rather than W248BK relaying WMUF, it was the other way around – WMUF was relaying W248BK, and another station was interfering with reception of the translator at the AM transmitter site?

Whatever it was that was going on, the moral of the story is that it can be quite useful to know Morse Code!

❖ New DX Publications

The new annual edition of the NRC AM Radio Log is out. See pages 72 and 73 of the October issue of Monitoring Times for more information. This is really a necessary reference for the AM DXer, and well worth the $25.95 cost. Write "NRC Publications, P.O. Box 473251, Aurora CO 80047-3251" for more information, or visit the NRC website listed at the end of the column.

Also new, after several years, is the 21st Edition of the FM Atlas. You'll find information on this valuable reference on page 72 of the October Monitoring Times. With the explosion of FM translators, the 21st Edition is noticeably larger than the previous version! The FM Atlas is $22 from "FM Atlas, Box 336, Esko MN 55733-0336." Or, again, see the URL at the end of the column.

❖ 'Til Next Month

Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to dougsmith@monitoringtimes.com. Good DX!

URLS IN THIS MONTH'S COLUMN

http://americanbandscan.blogspot.com
My DX blog.

www.nrcdxas.org/catalog/books/index1.html
NRC AM Radio Log ordering information. You can find ordering information for the FM Atlas on this site as well.

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-172A1.pdf
FCC release on the shutdown of low-power analog TV stations in 2012.

www.877chicagosmoothjazz.com/
Chicago's WLFM-LP will have to become a TV station after the 2012 low-power digital changeover...

www.webdcr.com/
The title on WDCR's webpage still mentions "AM 1340" but it's now a Web-only station.

www.knakradio.com/
KNAK-540 is also being heard on 520 – in FM mode!

BANDSCAN STATION REPORT

NEW:

Applications filed for new stations:

Prescott, Arizona	1240	1,000/1,000 ND
Terre Haute, Indiana	640	250/250 DA-N
Summersville, W. Va.	1230	1,000/1,000 ND

Applications for new stations disimssed:

Kotzebue, Alaska	1230, 1260	(applicant amended application to change frequency, then asked the FCC to dismiss the application)
South Hills, Nevada	1090	

Permits granted for new stations:

Santa Maria, California	1360	2,000/2,000 DA-2
Kihei, Hawaii	740	5,000/5,000 ND
Mesquite, Nevada	1250	5,000/480 DA-2
Flora Vista, New Mexico	1450	250/250 ND
Merrill, Oregon	1240	1,000/1,000 ND
Green River, Utah	1240	250/250 ND

Stations deleted:

Hanover, New Hampshire	1340	WDCR
Oil City, Pennsylvania	1340	WOYL

CHANGES:

Frequency & location change requests amended:

University City, Missouri	1530	WQQW	from 1510 Highland, Illinois; supercedes proposal to move to Belleville, Illinois

Frequency & location changes granted:

Grande Cache, Alberta	93.3	CFXG	from AM 1230
Fort Smith, Arkansas	1450	KENA	from Mena, Arkansas

Callsign changes:

Charlotte Amalie, V.I.	1690	WIGT	(new station)
Piedmont, California	1510	KSFN	from KPIG
Riverside, California	1440	KFNY	from KDIF
Garapan, CNMI*	1440	KKMP	(new station)
Fort Myers, Florida	1240	WFSX	from WINK
Milton, Florida	1490	WTKE	from WECM
Pine Island Center, Fla.	1200	WINK	from WPTK
Honolulu, Hawaii	990	KIKI	from KHBZ
Billings, Montana	730	KYYA	from KURL
Ashland, Oregon	580	KTMT	from KGAY
Mount Angel, Oregon	1130	KPWX	from KTRP
Corry, Pennsylvania	1370	WHYP	from WWCB

*"CNMI" is the Commonwealth of the Northern Mariana Islands – just north of Guam. Garapan is on the island of Saipan.
ND: non-directional
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

BOATS, PLANES, AND TRAINS

TRAINS

Ernest Robl
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What a difference a year makes!

There's an old Chinese curse that goes something along the lines, "May you live in interesting times."

American railroads are living in interesting times, and the news, certainly, is not by any means entirely bad. But at the same time, these railroads are facing a large number of unresolved issues, many of which will cost considerable money and effort, regardless of how these issues are addressed.

First, the Good News

In September, I rode an Operation Lifesaver, Inc., safety promotion train in far eastern North Carolina between Goldsboro and Havelock – and back. Operation Lifesaver is an international non-profit organization that tries to educate the public and government officials about safety issues related to railroads, particularly those involving grade crossings and trespassing. I've written about this organization in past columns.

It's always interesting to see lines from the railroad's point of view, especially since this particular line has no scheduled passenger train service. Having ridden this line about a year before, I observed several interesting changes. On that earlier trip, I noticed many of the sidings along the line filled with idle freight cars – mostly boxcars – which were simply being stored until they were needed again. This year, all those stored cars were gone.

I had seen stories in trade publications and on industry Web sites that, due to increased traffic, railroads had taken thousands of cars out of storage. But seeing the difference from a year ago really brought this home.

Not only that, the line operated by Norfolk Southern (NS) was noticeably busier. Though our safety promotion train was hosted by and operated with equipment owned by NS, it was operating on a loose schedule, and freight trains had priority. At several locations, we had to wait for those substantial freight trains to clear the single-track main line.

At New Bern, NC (an interesting historic town worth visiting for its own sake), the entire town is within "yard limit" designations. Yard limits designate areas where trains and engines can operate on sight at low speeds without having to get specific movement authority from the dispatcher. So, as we departed the New Bern yard, headed east, we were followed by less than half a mile by a light (pulling no cars) engine that was headed to a nearby industry to switch and pick up cars there.

On both the inbound and outbound trips, we passed two major railroad construction projects, each costing many millions of dollars. Both were close to Kinston, NC, a town of moderate size in a largely rural part of the state, that has been working hard to attract jobs.

The first project, nearly completed, involves several miles of tracks serving a huge feed mill and feed storage complex for poultry distributor Sanderson Farms. Given the amount of tracks within this complex, I would guess that this facility will probably end up with its own dedicated switch engine or engines. It is designed to handle inbound "unit trains" of grain, in which the entire train consists of one cargo.

The back platform of a Norfolk Southern business car on the back of an Operation Lifesaver safety promotion train as it departs New Bern, NC.

The second project, just getting underway, is a ten-mile spur to the Kinston regional airport, where an aircraft component manufacturer is building a large new plant. This plant will produce subassemblies for large passenger and freight aircraft. And, of course, the only way to ship out these large pieces is by rail. Track alignment in downtown Kinston has even been changed to make sure there is adequate clearance when these large loads begin moving through town.

Overall, freight railroads are reporting positive trends, particularly in the intermodal sector, with the busy holiday shipping season just starting as this is being written. Railroad freight traffic is generally seen as leading indicator, meaning that stronger rail freight traffic bodes well for the economy in general.

Regulatory Issues

On the other hand, railroads are also struggling with multiple regulatory issues and government mandates. The biggest of these is the 2008 mandate to install positive train control (PTC) by 2015 on lines with passenger service or where hazardous products are transported. This mandate is, of course, largely a response to the fatal California crash earlier in 2008, which was attributed to a passenger train engineer (apparently distracted by texting on a phone) running a red signal.

As with many well-intentioned Congressional mandates, the devil is in the details. As equipment moves freely between railroads and passenger trains – both Amtrak and commuter trains – operating on the tracks of multiple railroads, any PTC implementation has to follow a national standard.

As I've discussed in previous columns in which the Chatsworth, CA, accident was discussed in more detail, there are many possible ways of implementing some type of enforcement of signal indications and a train's operating authority.

Most European railroads have long had a system based on trackside equipment, where trains passing a restrictive signal without acknowledgement would undergo a "penalty" brake application and be forced to stop. As noted in an earlier column, the important point is that the enforcement is at the restrictive signals leading up to the stop signal, not at the stop signal itself, as trains take a long distance to stop. A penalty application at the point that a train passes a stop signal is usually too late, as the train would then exceed its authorized operating limits and likely still collide with a conflicting movement.

Though basically effective, these European systems are relatively low-tech by today's standards.

What is envisioned by those talking about PTC for American railroads is a system based on global positioning satellite (GPS) signals and a complex computer system. In the computer, every foot of mainline track would be mapped, along with its operating characteristics, such as speed limits for passenger and freight trains.

When a dispatcher grants a train operating authority on a particular segment of track, the computer would know the limits of that author-

ity, as well as the track characteristics.

The computer would not only need to be in continuous communication with each train, but each train would need to be able to continuously receive GPS signals, so that it can inform the central computer where it is and how fast it is moving. Under this PTC system, the automated aspects would go well beyond simply enforcing signal indications. The system would also monitor train speed, particularly as it relates to the train being able to stop short of the limits of its operating authority. Aspects of such a system have been successfully demonstrated in tests.

But, there are big differences between demonstrating theory and reality.

❖ Reality

On the same Operation Lifesaver train mentioned at the beginning of this column, I was able to talk with a Norfolk Southern technical specialist who has been involved in testing GPS equipment for railroad applications. He noted that getting consistent GPS signals in narrow mountain valleys was often problematic – not to mention the lack of reception in tunnels. Many important railroad lines have multiple long tunnels.

And then there's the expense of such a system. Railroads are a very harsh environment with lots of vibrations and dust. While modern diesel locomotives have on-board computers that help manage their operations, adding GPS equipment and more computer processing power is not as simple as buying off-the-shelf equipment and mounting it in the locomotive cab.

Some long railroad tunnels are equipped with repeater antennas to maintain continuous voice communications between trains and dispatchers. While such systems could also be used to maintain communications between locomotive computers and dispatching centers, they still would not help with reception of GPS location signals.

But railroads would need an entirely new system to ensure continuous communication between onboard engine computers and the dispatching center computers. Whether such a system uses wayside stations or goes directly via satellite, both options have their problems.

The Association of American Railroads (AAR), the major trade association of North America's largest railroads, has estimated that national implementation of a GPS/computer-based PTC system would cost in the billions of dollars. And, of course, those would end up being billions that the railroads would not be able to spend on other things, such a track improvements and new rolling stock.

(The congressional mandate for PTC did not allocate any money for implementing such a system.)

While Congress may have thought that seven years was plenty of time for railroads to implement PTC, seven years is a very short time for such a complex industry with a wide range of operating conditions, especially when dealing with a largely untested technology. At this point, I think it's very likely that the 2015 deadline will need to be pushed further out at some point.

❖ Speaking of the AAR

Meanwhile, in its newsletters and official pronouncements, the AAR has been taking a somewhat strange two-sided stance on the growing interest in passenger trains, particularly federal efforts to increase passenger train speeds. On the one hand, AAR says it is in favor of passenger trains; on the other hand, it often cautions that these efforts could interfere with efficient movements of freight trains.

Most of the recently awarded federal grants are targeted at improving infrastructure on freight rail corridors – specifically to increase passenger train speeds. But, of course, in almost all cases, these infrastructure improvements also benefit freight trains operating on those lines.

An initial heavy-handed proposal for penalizing freight railroads that took such federal grants but then did not make sufficient efforts to ensure that passenger trains operated perfectly on their new faster schedules has been mostly withdrawn by the Federal Railway Administration (FRA), in part due to efforts of the AAR. Even independent observers pointed out that there were simply too many variables in operating a mix of freight and passenger trains to make drastic penalties for late passenger trains logical.

For a while, there was a serious question whether freight railroads would accept federal funds if such drastic conditions were attached.

❖ Elections

Even the 2010 national elections, which will be in the past by the time you read this, pose a level of uncertainly for major railroads. At least three Republican gubernatorial candidates actively campaigned against federally funded passenger rail projects in their states, some of which had already received substantial federal grants.

And, of course, the makeup of the next Congress will affect how willing the federal government will be to spend money on a variety of freight and passenger rail projects. The U.S. is still unique in the world in that its major railroads are privately owned and these railroads are responsible for almost all of their infrastructure and operating costs.

In most other countries around the world, the national governments see railroad infrastructure as an important asset and a means of countering congestion on highways – and these governments see nothing wrong with investing this infrastructure. In many other countries, the major railroads are either directly or indirectly owned by the government, though privately owned railroads also exist.

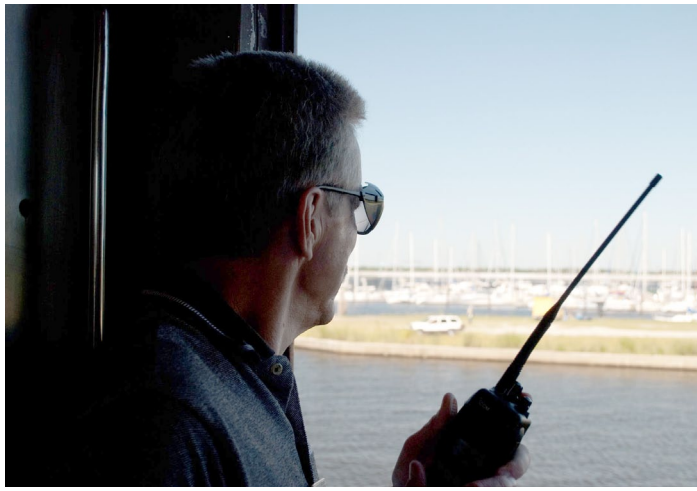
Historic New Bern, NC: "Street running," where train tracks are set into a street like trolley tracks, is extremely rare outside of industrial areas. Yet, this is the main line of the North Carolina Railroad Co. (under long-term lease to Norfolk Southern) between Goldsboro and Morehead City, NC.

❖ Back to Basics

While it's exciting to see railroads gain additional national attention and to see increased interest focused on technology associated with railroads, you can also sometimes get a reminder of how important the basics, such as simple radio voice communications, are to day-to-day railroad operations.

During the week that I was working on this column, I was in my car listening to the scanner when I heard the dispatcher ask a train to stop because a railroad bridge on its line had been struck by a truck and needed to be inspected for possible damage. All it took was one quick message to the train and a few more calls to nearby employees to incite me head to the scene.

Though I currently do a good percentage of my "train watching" by watching the progress of trains on ATCS Monitor computer screens, there's still no substitute to either being trackside or aboard a train and listening in to train crews and dispatchers on a basic scanner. That's still where you get most of the important insights into the complexities of railroad operations.



On the return trip, crossing the Trent River in New Bern, NC, a crew member of the Operation Lifesaver train checks in with the engineer by hand-held radio. Listening in to these conversations still provides some of the best insights into day-to-day railroad operations.

GLOBALNET

Exploring the World of Internet Radio and Television

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Broadcasters Battle the Digital Devil

In recent months, I have been keeping you up to date with the battle between broadcasters and the recording industry regarding performance royalties. This month, I hope you won't mind if I share some of my personal reactions to this evolving dispute.

As both a musician and a former broadcaster, I have been admittedly torn on the issue, but I had been leaning towards favoring the broadcasters, as I felt the recording industry was just looking for a band-aid to stop the bleeding caused by plummeting CD sales due to online downloading.

…Ah yes, the evil Internet, the proverbial thorn in the side of the recording industry. Musicians slave over a hot mixing console for six months to produce a new album, and within hours of its release, selfish little punks are stealing it by downloading it from file sharing websites. But, rather than embrace new technology and come up with new innovations to increase revenue, the Recording Industry Association of America (RIAA) decided to bully broadcasters for their lunch money.

However, broadcasters, it would seem, also have it out for the Internet, based on their most recent proposal.

They, too, are having to deal with the digital devil. Every day, an increasing number of users listen to content from streaming services such as Pandora and Slacker over their mobile phones, instead of through their FM and AM radios. Broadcasters worry this will one day doom traditional radios to the same category as 8-track and Betamax.

Ah, but the broadcasters, crafty geniuses that they are, have come up with a plan that just has to work. All of the doom and gloom talk about Internet radio one day replacing broadcasts will have to stop if the National Association of Broadcasters (NAB) gets their way.

Their plan? A government mandate for all cell phones to include an FM receiver.

Really? That's the best you can come up with? A radio in my phone?

Just like the recording industry, rather than embrace new technology and innovation to stay relevant, broadcasters are siding with their aging format of old fashioned, over-the-air broadcasts.

Their hope, I am deducing, is that broadcasters will appear to be more hip and cool if users can tune in broadcasts on their iPhone without using any of their data allotment.

Part of this plan is directed toward striking a deal with the RIAA and ending the performance royalty debate before Congress ends it for them.

In addition to an FM-in-cell-phone mandate, the NAB is also calling for royalty payments for all radio stations. While they would still take a hit to the wallet, it would be a much lighter one than what the RIAA originally wanted.

Another argument in favor of in-phone radios, according to the NAB, is to provide news and information during emergencies, when cell towers and power goes down. The NAB pointed to the terrorist attacks of 9/11 as an example of when a radio in a cell phone would have been the answer to disseminate information. (But it ignores the fact that many New York radio station transmitting towers were located on top of the World Trade Center, taking them off the air as well.)

Critics have pointed to a few other obvious issues with mandating an FM receiver in cell phones. One, battery usage, puts a pretty big hole in the "emergency use" reasoning of the NAB. Another issue is that there isn't a whole lot of interest in FM receivers in cell phones in the U.S.

Astoundingly, the President and CEO of the NAB, Gordon Smith, called these concerns "myths" at the joint NAB-Radio Advertising Bureau Radio Show. His counterpoint to the lack of interest was that nearly half of all cell phone users in Latin America and Asia name radio as one of their top three choices when choosing a phone.

What does all of this mean for streaming enthusiasts? Well, for one, your enthusiasm for streaming technology has broadcasters running scared. As listeners sign up in droves to listen to Pandora, local station streams, and even streaming satellite radio, broadcasters are scrambling to try to catch up.

I predict we can expect to see even more streaming content, not only from online services like Pandora, but also from the broadcasters themselves. The mandated FM receiver in cell phones is a desperate attempt by broadcasters to stay relevant, but any true gains in audience are going to have to be done online.

Radio's last bastion is also dwindling as we see automakers rushing to include Internet radio and other online apps in their vehicles (more on that later). Soon, whether the NAB is successful in its bid or not, it won't affect online streaming in a negative way. On the contrary, we are only going to see even more options in content and equipment, more advances in technology, and an even stronger push for Internet mobility.

Either way, this is an exciting time to be an Internet radio hobbyist!

❖ An FM Radio Coming to iPhone?

Ironically, there are rumors floating on the Internet that Apple will soon be activating their dormant FM radio receiver, enabling users to tune in local radio stations on their phone.

Apple already has turned on FM receiving capabilities in their iPod Nano, but the app-driven iPhone and iTouch has yet to include the feature. This, despite there being an FM receiver already built in to each iPhone and iTouch. The receiver is currently used for the Nike+ feature that syncs a transmitter in specially designed shoes with software on the devices to aid in workouts!

The Apple-centric blog 9to5mac announced the rumors, which resurface with each new iPhone release. An FM receiver in the popular iPhone would be one less hurdle for the NAB to overcome in their goal of mandated receivers in cell phones.

❖ Is Drive-time Going Online?

In the not too distant future, your morning and afternoon commute listening may be online. It is this kind of news that has broadcasters shaking in their boots. It may not be happening right now in significant numbers, and it may not be widespread for a few more years, but a recent poll suggests that nearly a third of the public wants it to happen eventually.

Mark Ramsey Media and VIP Research recently finished a study that found that, when given the option of listening to traditional radio through an iPod or listening to Internet radio through the dash, 58 percent of respondents said they would choose the in-dash option. What is troubling for traditional broadcasters is that 34 percent of those surveyed said they would listen to less radio if they had an Internet option in their vehicles.

It is an idea that has already gotten the attention of automakers. As I have reported in earlier editions of GlobalNet, automakers are already pushing to incorporate Internet radio into their vehicles.

Audi recently released their Audi Quattro concept car, which would include an Internet radio option. We have seen Ford make similar moves with expansion of their current "Sync" technology to incorporate an Internet radio option, as well as other popular apps (Facebook, Twitter, etc.). Volkswagen has also announced

their intention to put Internet radio in their vehicles.

Much of the attention is centered around services such as Pandora and Last.fm. However, many automakers are also including in their packages apps that allow streaming of broadcast stations that are on the Internet.

The above survey isn't the only indicator of the writing on the wall. A survey by Vision Critical asked drivers in the U.S., Britain and Canada, what they were currently using for entertainment in their vehicles. While Internet radio was on the bottom of the list, with nine percent of U.S. respondents saying they currently streamed online in their cars, more than half of those surveyed in all three countries said they were interested in doing just that.

The results might be a bit skewed in favor of Internet radio interest, since it was an online survey. Tech-savvy drivers, of course, would be interested in an Internet radio option. Still, all of the recently released data is pointing towards a future where drivers are streaming radio stations more, and tuning into traditional radio less.

If, that is, they are tuning in at all.

❖ Advertisers Embrace Internet Radio, too

The Interactive Advertising Bureau (IAB) recently gathered for a conference in New York City. During that time, more bad news was handed to traditional broadcasters.

The IAB released a white paper that essentially defined the options available for advertisers looking to get into digital audio advertising. The IAB has long been a champion of Internet advertising, but this is the first time they are embracing digital audio advertising as a viable format.

The paper includes research from Nielsen and Arbitron, and was pulled together from the IAB's digital audio committee. This committee includes representatives from, interestingly, radio powerhouses Cox and Clear Channel.

During my time as a radio salesperson for one of the "big gun" radio companies, there was a push to include radio advertising as an extra giveaway in traditional advertising packages. The problem was, there was no data at the time to support charging tangible rates just for streaming ads. Personally, I thought this only served to cheapen the Internet ads, thereby acknowledging to the clients their limited value.

But with the success of Pandora and the sharp rise in Internet radio listening, the data is finally there to support Internet radio as a viable advertising medium. The IAB white paper is just more validation of that.

All points to one thing: if broadcasters are going to survive, they are going to have to embrace new technology, not attempt to hold on so dearly to the past.

❖ Marantz Receiver Adds AirPlay

One of the new goodies that users of the redesigned Apple TV are excited about is

AirPlay. This application will allow users of Apple's iTunes to stream audio and video files through AirPlay enabled devices.

One of the first manufacturers to jump on the AirPlay bandwagon is audio specialist Marantz. Its newest release, the Marantz Melody Media "all-in-one" really does do it all. In addition to being one of the first units on the market to be AirPlay compatible, it also allows for streaming of Internet radio stations, has 120 total watts of audio power, and a sleek-modern feeling cabinet.

The unit will first be released in Europe for about $800 U.S. A bit pricey, yes, but Marantz has a long tradition of high quality audio products for the stingiest of audiophiles. No word yet on a U.S. release date, but I will keep you up to date with any word I hear about it.

❖ Keep Your Streams with Streamwriter

If you are looking for a simple, yet powerful stream recording software, Streamwriter might just be the ticket. The best part is that Streamwriter is an Open Source program, which means it is free!

Most of the stations you will find in the program's list are Internet only stations. If you are looking for broadcasting station streams on Streamwriter's interface, they are few and far between. There is a way you can add a URL stream, but I had a horrific time trying to find the actual streaming URLs for my favorite stations.

Beyond that, the interface for recording streams, accessing them later, and trimming them down to the bits you want is really very easy. This is a great way to record new music, as you can record multiple streams at once.

After doing a little searching, I actually found some Web sites online that give you good tips on how to access the actual streaming address of what you are trying to listen to. This helped me to add a few stations I was looking for. I am going to include a link to one of those Web sites in my GlobalNet links at the conclusion of this column.

While there are several stream recorders available, the ease of operation and the fact that it is free definitely makes Streamwriter an option that you should check out.

That should do it for this month. For my more tech-savvy readers, you can now follow me on Twitter: @GlobalnetMT. You can also email me directly at globalnetmt@gmail.com if you have questions, comments or submissions for the column!

Till next time, 73s!

GLOBALNET LINKS

FM Radio Coming to iPhone?
www.pcworld.com/article/173632/An_iPhone_With_FM_Radio_Yes_Please.html?tk=rss
IAB touts digital audio advertising:
www.rbr.com/features/ideas-working-now/28048.html
Ramsey/VIP Drive-time study:
www.mediapost.com/publications/?fa=Articles.showArticle&art_aid=136022
Vision Critical Study:
www.thecarconnection.com/marty-blog/1049823_study-over-half-of-drivers-interested-in-internet-radio
Ford Envisions Apps on Wheels:
http://reviews.cnet.com/8301-13746_7-20019121-48.html
Audi Quattro to include Internet Radio:
http://crave.cnet.co.uk/cartech/audi-quattro-concept-has-internet-radio-anger-issues-50001017/
Marantz Receiver to include Internet Radio and AirPlay:
www.macvideo.tv/encoding/news/index.cfm?newsId=3243449&pagType=samechandate
More on the Marantz Melody Media:
www.obsessable.com/home-audio/marantz-melody-media/
Streamwriter :
www.ghacks.net/2010/10/04/record-multiple-internet-radio-stations-with-streamwriter/
Streamwriter download:
http://streamwriter.org/en/downloads/
How to find stream URLs:
http://all-streaming-media.com/faq/recording-media-stream/faq-get-media-stream-URL.htm

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
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Loggings Galore!

Welcome to another issue of *Below 500 kHz*! We have a large number of loggings to share this month, as well as news from *MT* readers.

First, I wanted to give an update on my broadband loop antenna (see June through Nov. 2010 issues for details). The antenna continues to be a hot performer, but I already have plans for improving it. In chatting with Steve McDonald (VE7SL), the loop's designer, and noted LF antenna experimenter Steve Ratzlaff (AA7U), I've learned that increasing the diameter of the loop should boost the sensitivity of the antenna considerably.

I chose a loop size of 1-meter (39.37 inches), mainly for convenience and to see how well the basic design worked before I got too fancy. It turns out that this is about the *minimum* size for this type of antenna. A loop diameter of 6 or even 8 feet would likely bring even better results.

In theory, the larger the loop, the better the sensitivity, but a diameter much larger than 8 feet may become unwieldy, physically speaking, so there is a tradeoff to be considered. I now know what my spring antenna project will be!

First 2200 Meter JA-VE QSO

The ARRL Letter for September 30, 2010 reported that Kunikazu Togashi, JA7NI, in Daisen, Akita, Japan, and Scott Tilley, VE7TIL, of Vancouver, British Columbia, completed a transpacific QSO on 2200 meters (137 kHz) on September 28. Tilley called this a first between Canada and Japan.

The distance between CN89dk (VE7TIL) and QM09fl (JA7NI) is 7162 km. While not the DX record for 2200 meters, Tilley told the ARRL that the QSO comes in second to the distance achieved in 2004 by operators at the Wellington Amateur Radio Club Quartz Hill User Group, ZM2E, in New Zealand and Vladimir Burakov, UA0LE, in Vladivostok, Russia.

Further information about the QSO and other LF tests by the operators can be viewed at **www3.telus.net/sthed/argo/** and **http://ja7ni.web.fc2.com/**.

New Signals Heard

A new type of signal has been heard on 454 and 458 kHz: These signals are known as HA-DGPS, an acronym for High Accuracy Differential Global Positioning System. They are reportedly quite different from the standard DGPS "warbling" heard so commonly between 285 and 325 kHz. Described as *cosine MSK* (minimum shift keying), this is a spectrally-efficient form of MSK with a data rate of 1000 bps.

The Federal Highway Administration (FWHA) is running tests on sending these signals over longwave. One such station is located in Hagerstown, MD on 454 kHz. Another has been reported at Pueblo, CO on 458 kHz. HA-DGPS is designed to provide 10-20 cm accuracy, compared with 1 to 2 meters afforded by standard DGPS.

My thanks to Todd Brown, AB2MS (NY) and Kriss Larson, KR6ISS (CA) for reporting these signals. Kriss adds that ARRL efforts to acquire a ham allocation between 400 and 530 kHz at the WARC 2012 conference could be hampered by the appearance of more HA-DGPS stations in this part of the band.

Loggings

I can always tell when LW conditions have picked up for the season, as the loggings start to pile up. This month I received more loggings than I ever have in a single month. There was not room for all of them, but I did include some from each contributor.

Loggings this month are courtesy of Russ Hill (MI), Tom Root (MI), John Collins (NH), Richard Palmer (AZ), Bill Marvin (MN), and Don Smith (OR).

kHz	ID	ST/PR/ITU*	CITY	BY
206	IIB	IA	Independence	B.M. (MN)
209	CYT	AK	Yakataga	R.P. (AZ)
209	HCD	MN	Hutchinson	B.M. (MN)
209	MJ	NH	Manchester	J.C. (NH)
212	BY	SK	Beechy	R.P. (AZ)
212	MPZ	IA	Mount Pleasant	B.M. (MN)
214	XA	JPN	Oshima	R.P. (AZ)
216	CLB	NC	Carolina Beach	T.R. (MI)
216	CO	NH	Concord	J.C. (NH)
222	CUW	MEX	Chihuahua	R.P. (AZ)
230	RDK	IA	Red Oak	B.M. (MN)
230	VG	AB	Vermilion	R.P. (AZ)
233	ALJ	AK	Johnstone Point	R.P. (AZ)
233	BR	MB	Brandon	B.M. (MN)
233	BWP	ND	Wahpeton-Brec	B.M. (MN)
233	GAK	IA	Sioux City	B.M. (MN)
236	DEH	IA	Decorah	B.M. (MN)
236	WZA	BC	Ashcroft	D.S. (OR)
242	XC	BC	Cranbrook	D.S. (OR)
242	ZT	BC	Port Hardy	D.S. (OR)
245	CB	NU	Cambridge Bay	J.C. (NH)
245	HE	BC	Hope	D.S. (OR)
260	ESG	NH	Rollinsford	J.C. (NH)
260	YAT	ON	Attawapiskat	T.R. (MI)
269	UDE	MB	Delta Station	R.H. (MI)
274	RG	MN	Red Wing	B.M. (MN)
276	LAH	NH	Lebanon	J.C. (NH)
276	YEL	ON	Elliot Lake	T.R. (MI)
278	ADG	MI	Adrian	T.R. (MI)
283	PT	ON	Pelee Island	T.R. (MI)
305	YQ	MB	Churchill	J.C. (NH)
326	MA	TX	Midland	J.C. (NH)
328	LC	NH	Laconia	J.C. (NH)
329	YEK	NU	Arviat	J.C. (NH)
332	FIS	FL	Key West	J.C. (NH)
335	YLD	ON	Chapleau	T.R. (MI)
340	BOG	CLM	Bogota	J.C. (NH)
347	AIG	WI	Antigo	R.H. (MI)
353	IN	MN	International Falls	R.H. (MI)
353	LI	AR	Little Rock	R.H. (MI)
354	RNT	WA	Renton	D.S. (OR)
356	ON	BC	Penticton	D.S. (OR)
357	MEF	OR	Medford	D.S. (OR)
359	BO	ID	Boise	D.S. (OR)
359	YQZ	BC	Quesnel	D.S. (OR)
362	BCK	WI	Black River Falls	R.H. (MI)
362	SB	ON	Sudbury	T.R. (MI)
365	AA	ND	Fargo	R.H. (MI)
366	PNI	FSM	Ponape, Caroline Is.	R.P. (AZ)
366	YMW	QC	Maniwaki	T.R. (MI)
370	GR	QC	Iles de la Madeleine	R.H. (MI)
377.5	MO	OCE	Moorea, Society Is.	R.P. (AZ)
379	ZEG	AB	Edmonton	R.P. (AZ)
385	EHM	AK	Cape Newenham	R.P. (AZ)
385	QV	SK	Yorkton	R.H. (MI)
386	D8	QC	Dolbeau	R.H. (MI)
387	SPP	CLM	San Andres Island	R.P. (AZ)
388	CDX	KY	Somerset	R.H. (MI)
395	YL	MB	Lynn Lake	R.H. (MI)
400	XW	KY	Flemingsburg	T.R. (MI)
417	HHG	IN	Huntington	T.R. (MI)
419	RYS	MI	Grosse Isle	T.R. (MI)

* A complete list of ITU codes is available at: www.wordiq.com/definition/ITU_letter_codes

Mailbag

Don Smith (OR) wrote: "Kevin, thanks very much for the stimulating articles and interest in longwave. This part of the spectrum has some very interesting qualities. Everywhere else in the spectrum it seems you need a PhD in electrical engineering and lots of money and time. Hunting NDBs is more like the radio I understand and enjoy. Your articles and book *Listening to Longwave* have proved invaluable.

"At first I thought the longer the antenna wire the better. Indeed, as I made my antenna longer and longer it did pick up more signals. But the noise floor continued to rise as well, to the point where most signals cannot be heard. I then tried an RF Systems folded dipole antenna. This one is said to work on the magnetic aspect (not electrical) but is not rated below 3 MHz.

"The difference was night and day. No

noise meant I could hear those signals even though they were incredibly weak. It required careful listening, of course, but I could hear many more signals. Obviously the loop antennas are the way to go. I am building the broadband loop you have been writing about and now I am especially enthused.

"My receivers are the Ten-Tec RX340 and the Icom R75. Antennas are one longwire, 225 feet at about 40 feet high, and the aforementioned RF T2FD. You will notice from my logs that everything comes from the north or northeast. This is true no matter how I orient the antenna. The Pacific Ocean is to the west, so no NDBs there. To the south is a high power electrical transmission line about 1/2 mile from our house. It seems to soak up everything coming from that direction. Any ideas?"

Thanks for writing Don, and also for your loggings. We don't get many logs from the Northwestern US, so these are especially appreciated.

Many factors come into play when evaluating reception patterns, including your antenna response, ground conductivity, terrain/obstructions, and the conditions at the transmitting site(s), including transmit power level. To rule out local obstructions, you could take a portable receiver some distance south of your location and conduct a mini-DXpedition. You could survey what is heard there vs. what you are able to hear at home. You'd need to use the same (or similar) antenna for the results to be meaningful, of course. Good luck, and let us know what you find.

Steve Ratzlaff (OR) wrote: "Hi Kevin, Got my latest *Monitoring Times* magazine today and read where you've been doing that column for 19 years – congratulations. That's surely a very long time to stick with doing something on a monthly basis. You're probably flooded with comments about GLS/206, but I'll mention it, too. It has been off about one year now, and the official decommission notice was found November 9, 2009."

Hello Steve, and thanks for the kind words. 19 years is a long time, but it is also a labor of love. The longwave band continues to change, and we will be here to cover it as long as the readers are interested!

Indeed, yours was one of several notes we received on GLS/206. Looks like we made a bad choice for our first "featured beacon!" On the bright side, nobody reported actually hearing it, which would really concern me!

We are trying again this month with a new longwave signal: **Radio France International** on **162 kHz**. Although not a beacon, the season is here for hearing trans-Atlantic signals, so I invite all readers to try for it. It might be a tough haul from the West Coast, but it's possible when there is a path of darkness between the transmitting and receiving sites.

Don DeCaria, NF7R (NV), sent a helpful hint that may help verify whether or not you are hearing France. Try listening to their internet stream at **http://players.tv-radio.com/radiofrance/playerfranceinter.php**. There may be a slight time difference to what you hear on your radio, but this could be a powerful tool for identifying the station.

This Aqua-Guide Radio Direction Finder (RDF) was found at a local swapmeet. Anyone know where a manual/schematic might be found for it?

❖ Grimeton Radio/SAQ Transmission

Following an annual tradition, there will be a transmission from the Swedish Alexanderson Alternator on 17.2 kHz on Christmas Eve (morning), Dec. 24th, at 08:00 UTC with tune-up from 07:30 UTC.

Merry Christmas and happy holidays to all readers. See you next month!

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
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A First Look Inside The Majestic

Not long after I had sent off last month's column, in which I introduced the Majestic 5A410 Bakelite table model, my copy of the September-October issue of *Antique Radio Classified* magazine arrived. It featured a corporate history of the Grigsby-Grunow Company – originators of the "Majestic" brand. And it occurred to me that it would be quite appropriate to present something like that to our readers.

❖ Majestic History

Now corporate histories of radio companies – interesting though they are – are not in my area of expertise. However, I know where to find the information: In Alan Douglas' wonderful three-volume encyclopedia *Radio Manufacturers of the 1920s*, © 1989 by Alan Douglas, Sonoran Publishing, Chandler, AZ. The information that follows is abstracted from his much longer article in Volume 2.

Incorporated in 1921, the Grigsby-Grunow-Hinds Company advertised its first radio products in 1924. These were horn speakers with bells made from the same celluloid material used in the automotive sun visors that were earlier Company products. The first "Majestic" branded product, introduced in 1925, was a plug-in battery eliminator designed to replace the automobile storage "A" battery and dry "B" batteries that usually powered the family radios of the era.

The sales of the battery eliminator products were substantial, but the plug-in radio models being introduced in the late 1920s soon made them obsolete. Accordingly, Grigsby-Grunow (minus partner Hinds) began to produce Majestic radios in 1928. These were very popular because they incorporated, at competitive prices, powerful dynamic speakers at a time when most radios were using the weaker magnetic models.

Sales slumped during the Depression, however, and partner Grunow left to start his own company in 1931. The original firm continued on, diversifying by expanding into refrigeration and purchasing the Columbia Phonograph Company. However, the company went into receivership in 1933.

The Majestic brand was revived in 1937, but the new firm – which produced our 5A410 in 1946 – had no connection with the original one. In 1950, the firm became part of the Wilcox-Gay Company, which manufactured Majestic brand sets until 1955. At that time, production was discontinued in favor of a new "Grundig-Majestic" line.

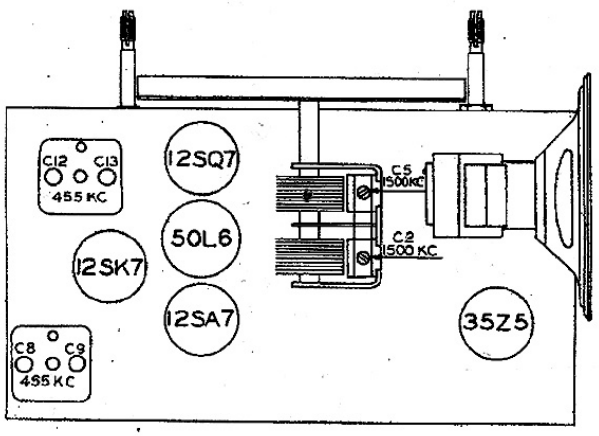


Fig. 1. Chassis layout of the Majestic 5A410 is somewhat unusual due to center-mounted tuning capacitor and dial.

❖ A First Look Inside

Access to the "innards" of our 5A410 was a simple matter of removing the two knobs and one felt washer (one was missing), plus the four screws securing the chassis apron and the top of the loop to the cabinet. The chassis then slid out backwards with the bottom of the loop still secured to it.

This is the cleanest chassis I've been privileged to work on in recent memory. Not a trace of corrosion on top or underneath! Nor is there any sign of the clumsy repairs one often encounters in these old sets. The only obvious problem is that the tuning shaft seems virtually frozen. It's not clear why, but I imagine a squirt of WD40 should take care of the problem.

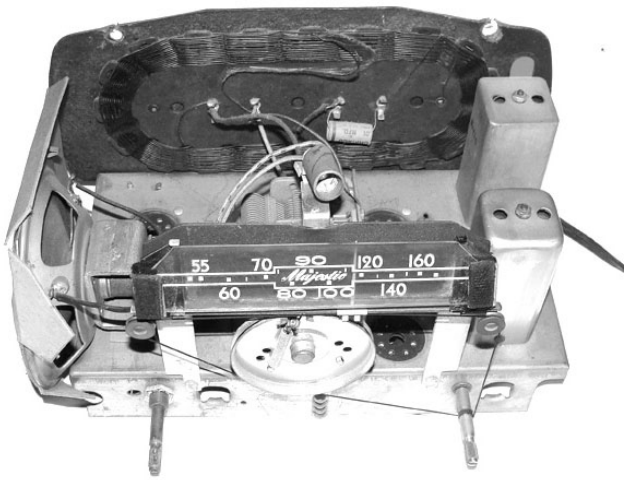
The parts arrangement in this little radio differs somewhat from the norm. In many "All American Five" receivers, the r.f., i.f. and first audio tubes – interspersed with the i.f. transformer – are in a line across the back of the chassis – with the rectifier and power amplifier tubes off to the side at either end. The tuning capacitor and indicator dial are at one end of the front panel and the speaker, facing front, is at the other end.

I've included a diagram of the layout of the top of our chassis (Figure 1) so you can see how this little Majestic differs from the norm. The 12SA7 is the r.f./oscillator tube; the 12SK7 is the i.f. amplifier; the 12SQ7 is the detector/first audio; the 50L6 is the power amplifier; and the 35Z5 is the rectifier. Part of the reason for the eccentric parts placement is the radio's slide rule dial which, for esthetic reasons, really needs to be centered in the front panel.

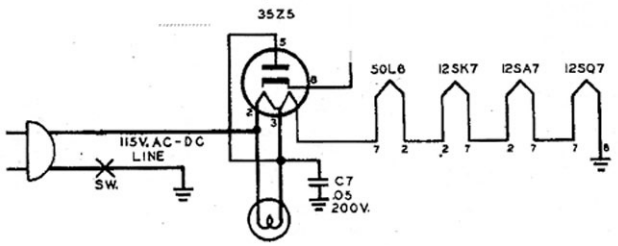
❖ Safety Problem

Figure 2 is a schematic of the radio's heater string which, as is normal for a transformerless set is series-connected across the a.c. line. An important safety issue is that the chassis is used as the common B minus connection – which means it is connected to one side of the line. Depending on how the a.c. plug is inserted, that could be the hot side.

That being the case, while the switch is on, the user who happens to be grounded somehow (say, by standing on a damp concrete floor or touching a water pipe) is in danger of receiving a nasty shock, should he or she also contact a metal part of the chassis (for example, by touching one of the metal screws retaining the bottom of the loop antenna).



The 5A410 after removal from cabinet, with tubes pulled for testing.



The Majestic's heater string. A.C. line is grounded directly to chassis.

One could also get a nasty shock or, at the least, trigger some serious fireworks by connecting the ground lead of a test instrument to the radio chassis. The use of a line isolation transformer when servicing a radio like this is absolutely mandatory!

Some a.c. d.c. radios get around this safety problem by grounding to a bus (a continuous wire or other metallic connection) that is isolated from the chassis. Its only connection to the chassis is via a small capacitor.

❖ Checking Tubes

One by one, I removed the tubes from the set and checked each to make sure it had been installed at the correct position. Everything looked ok, and I was pleased to see that the tubes required only normal force to separate them from their sockets. No sign of corrosion at the pins.

I did notice that the tubes were of several different brands – suggesting that there had been more than one replacement in the history of this radio. But, that is to be expected. A.c.-d.c. sets are notorious for blowing tube heaters. As a matter of fact, while removing the tubes, I noticed that the tube numbers had been crudely scratched on the chassis – obviously as an aid to replacement. This is the only sign to date of any previous service effort.

Moving over to the tube tester, I checked each tube and found all within specs. While I was at it, I made sure that both sides of the center-tapped 35Z5 heater were ok, as was the No. 47 pilot light. As you'll note from Figure 2, the pilot light is shunted across half of the 35Z5 heater. Should the pilot light burn out, too much current would pass through its half of the heater – which would burn out. And vice versa.

All in all, this is a very nicely put together and well designed receiver. I'm going to enjoy working on it and it appears that very little effort will be required to put it back into service.

We'll begin next time with a complete recapping and, if there is time and there are no complications, we'll finish up with a complete realignment.

❖ Chat Room Lore

Treating Asbestos Sheets.

While recently browsing in a radio chat room, I came across a message thread that I think will interest our readers. It began with a discussion of asbestos safety. Many vintage radios contain a glued-in sheet of asbestos to protect the cabinet from heat generated by rectifier or power amplifier tubes. The originator of the thread was concerned about the hazard to lungs possibly posed by loose asbestos fibers that might become separated from the sheet.

One respondent suggested that the fibers be encapsulated by coating the sheet with polyurethane varnish. Another replied that this might just replace one hazard with another since the varnish could easily catch fire when subjected to the heat from the tubes.

Several others suggested the use of sodium silicate (water glass). This chemical is available in liquid form from a variety of sources as identified through Google. For example, one firm (**www.chemicalstore.com**) offers a one-quart bottle at $6.50. However, minimum order is $10.00 and shipping is in the $8.00 range.

After coating the asbestos, the solution dries to a hard glassy surface that is fireproof and nicely encapsulates the fibers.

Wholesale Cap Replacement.

All the talk about coating asbestos to render it harmless stimulated a subtopic relating to what changes can be tolerated if one wishes to preserve the history of a radio. What always comes up for discussion in this regard is the wholesale capacitor replacement that many of us, including me, like to do.

The point of view of the purists – and it's a valid point of view – is that one should try to leave as many original parts as possible in a radio. To do otherwise is to compromise its history. Some even criticize us wholesale replacers as somehow being lazy. Since many faults are the result of leaky or shorted capacitors, replacing every one can solve many problems without requiring much mental effort from the restorer.

Actually, though, that's one "advantage" that I happen to regret. It deprives me of the opportunity to use logic, along with voltage and resistance measurements to pinpoint problems that affect performance. On the other hand, I have few inhibitions about removing a handful of cheap, grimy wax covered capacitors and replacing them with modern ceramic encased units.

New capacitors are readily available and inexpensive. The components that a shorted capacitor can take with it, like i.f. transformers and speaker fields, may be difficult or impossible to replace. My suggestion to those who hesitate to make the changes: place the removed capacitors in a glassine bag, add a note explaining that it is the original set, and tuck it into a corner of the radio where it will not be subjected to heat from the tubes.

❖ The "Discontinued" Philco 38-62 Project

Last month, I informed you very eloquently why I was going to discontinue a project I had just started – a Philco 38-62 household broadcast receiver. It is a sturdy old five-tube superhet with a nice art deco cabinet and an interesting "light beam" tuning dial. Another attraction is that it has an extended range at the high-frequency end – originally for police calls, but useful now as a way to access the extended broadcast band – something few vintage radios can do.

Once I got a look inside I turned off – *hard*. Why? A mouse family had lived inside for some time and the heavy rust from their excretions was disgusting to look at. Underneath, the chassis was really quite clean, but it presented difficulties of a different kind. The circuitry included several of those special Philco capacitor units – Bakelite blocks containing wax-embedded capacitor units brought out to terminal lugs at the top. To recap one involves removing a jungle of wiring from each terminal lug, unscrewing the block from the chassis, and melting out the wax. Modern caps can then be connected inside.

So why on earth am I considering tackling it now? Well, it's been upside down on my bench all this time with the good side in view. And it seems to be calling to me. If I could bring this fine example of vintage engineering back to life, I'd feel pretty good.

One very important reason I had turned off on the radio was that it offers a very poor ratio of labor to what I'll call "story opportunity." In other words, I'd have to work very hard on certain aspects of the restoration (such as removing the rust) that would give me very little to talk about. I might work a whole evening wire-brushing the rust off the chassis and be able only to say that I had removed the rust with a small brass-bristled brush.

But, the set does beckon, making me feel bad for not saving it. So, I'm going to try something I've never done before. I'll carry out the restoration a little at a time and – when I have something to report – I'll take some space from the main project at hand to discuss it.

What I expect to do first is to remove the electrolytic capacitor and i.f. cans from the top of the chassis to clear the way for serious rust removal. I'll probably report on that next time. Let's consider it an experiment. We'll see if you enjoy following an extended project like that or if it goes on too long to hold your interest.

Have a wonderful holiday season – See you next time!

ANTENNA TOPICS

BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Mike Frye
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Military vs. Consumer Vehicle Antenna Performance

When I see a military vehicle on the highway sporting antennas, I can't help wondering about the frequency range of the antenna and what kind of radios might be connected to it. I've always been fascinated with military antennas and marvel at the engineering and technology that allows broad band coverage and rugged use.

In this issue I'll compare the performance of a current model 30-512 MHz military vehicular antenna to a few multi-band mobile scanner antennas. The scanner antennas chosen for the comparison are also rated for 800 MHz reception, but I'll only test to 512 MHz to keep it fair. First let's review a little history on how some military vehicular antennas evolved to cover such a wide frequency range.

In the 1950s, the military tactical FM band spanned 20 MHz to about 58 MHz and vehicular whips were screwed together in sections to cover this range in coarse increments. Between 1960 and 1990, the typical military vehicle combat radio covered 30-76 MHz, and the companion AS-1729/VRC antenna was a center fed coaxial dipole with a tuner at the base. The tuner had 10 preset sub bands to cover the entire frequency range and bands were selected remotely from the radio or manually using a switch at the antenna base.

In 1990, SINCGARS (Single Channel Ground and Airborne Radio System) was deployed with frequency hopping over the 30-90 MHz spectrum. Antennas were developed to cover the entire 30-90 MHz SINCGARS range with instantaneous bandwidth for hopping, and many companies met this challenge with varying degrees of success. The most common antenna for SINCGARS vehicular use is probably the 9ft long fiberglass AS-3900 series manufactured under contract by several companies.

Fast forward to the present, where the typical radio in a military HUMVEE now covers 30 to 512 MHz continuous and may need to frequency hop over much of that range. As you can imagine, military antenna design had to take a giant leap to keep up with radio progress. Most of the new breed 30-512 MHz military vehicular antennas are similar in size to the older AS-3900 series and are compatible with the same vehicle mount used for the last 50 years.

❖ Under the Fiberglass

While gathering information for this article I attended a military electronics trade show and visited all the military antenna vendors, asking what's underneath the fiberglass and what makes their antenna so special over the next guy's design. After a few hours of booth browsing, several vendors gave me some insight on their designs. Shakespeare Military Products Group was especially generous in sharing technical details on their 30-512 MHz products.

From what I have learned, many of these broad band military antennas share a common theme in breaking up the vertical radiator into multiple elements using the equivalent of traps. Amateur operators may be familiar with parallel resonant inductor/capacitor networks used as traps, but Shakespeare uses parallel inductor/resistor networks to progressively shorten the antenna as the frequency increases, which is a more complex solution than the traditional trap. One company at the trade show mentioned they use a short stubby dipole at the antenna base to supplement the upper UHF spectrum, in addition to the longer trapped whip for lower frequencies.

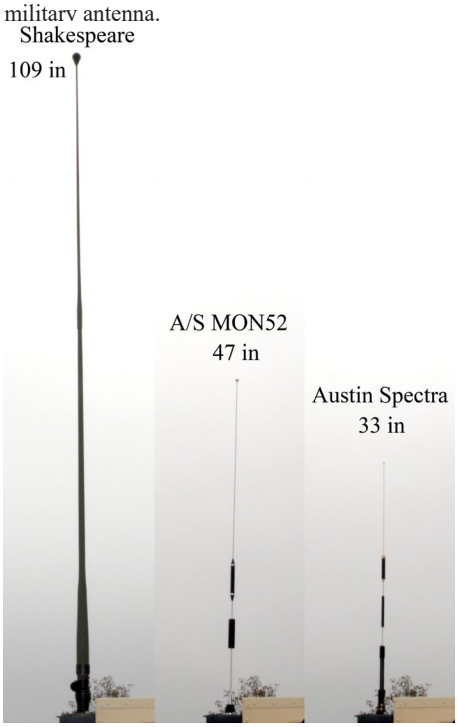
❖ Setting up the Test

Now for a little antenna testing. First I needed a suitable test vehicle with appropriate antenna mount. A good friend came to the rescue and donated his military antenna-equipped H1 HUMMER. To allow using scanner antennas on the military antenna bracket, I fabricated an adaptor plate with NMO mount which has become a standard for mobile scanner antennas.

Next, I needed a modern 30-512 MHz military vehicle antenna. I was lucky to find an otherwise new surplus Shakespeare model SF3512 military antenna, which will be used for the comparison. This antenna came with a diplexer to separate the 30-90 MHz band from the 108-512 MHz band for use with two radios and the diplexer was removed during our testing. Specifications on the Shakespeare SF3512 series can be found at **http://shakespeare-military.com**

I had trouble finding mobile scanner antennas truly designed for VHF lo-band use, which is a major part of the frequency spectrum to be tested. The current production Austin Spectra is rated for 30-50, 150-174, 430-512 and 806-896 MHz. Its 33 inch long tunable whip resonates at 33 MHz from the factory. I also located a new, but out of production Antenna Specialists MON-52, advertised for 25-50, 130-174, 450-512 and 800 MHz. Its 47 inch long whip resonates at 35 MHz on our test vehicle. The A/S MON series was a favorite with scanner enthusiasts for monitoring the California Highway Patrol on VHF lo-band in the 1970s and '80s.

The following picture shows a size comparison of the three antennas on our test vehicle; the obvious difference is the much larger Shakespeare military antenna.



During testing, the same reference feedline was used for all antennas, and a variety of signals were received from 27-510 MHz, ranging from fixed station commercial to amateur radio and public service. Precise signal levels were measured on each antenna using a spectrum analyzer, and

a VHF/UHF receiver was available for positive identification of each signal. In a few cases where there was a surprising change in level between antennas, I substituted the previous antenna to validate the change. The picture above shows the author with test vehicle and equipment setup.

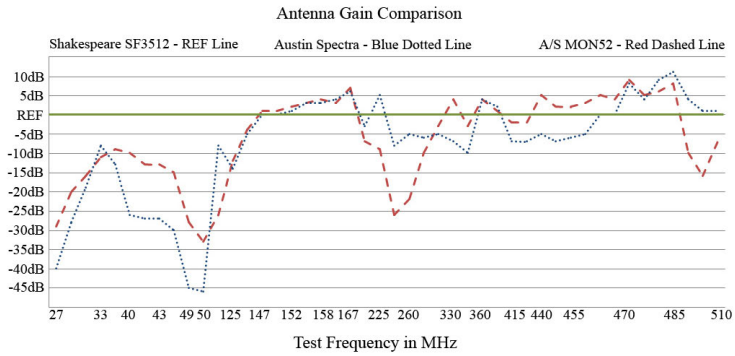
❖ Comparing the Results

The test site was a local park situated on a hill about 500 feet above the Los Angeles Harbor with a clear view of many communities spanning Los Angeles and Orange counties in Southern California. The exact signal levels received on the Shakespeare antenna were subtracted from the other two antennas to leave us with a gain or loss compared to the Shakespeare. The graph below shows the Shakespeare as a solid/green reference line at 0dB with the corresponding gain or loss of the Austin Spectra shown in blue/dotted line and the A/S MON52 in red/dashed line.

The first thing I noticed during testing was the VHF lo-band performance of the scanner antennas compared to the Shakespeare military antenna. The Austin Spectra dropped over 40dB around 50 MHz and the A/S MON52 dropped over 30dB in the same range. The VHF lo-band resonant points of the Spectra and MON52 are obvious at 33 and 35 MHz, respectively, where the performance peaks but is still down about 8dB from the Shakespeare.

Around 147 MHz, both scanner antennas catch up and pass the performance of the Shakespeare for most of the amateur and commercial VHF hi-band. Except for a peak near 225 MHz on the Austin Spectra and 330 MHz on the A/S MON52, the Shakespeare pulls ahead in gain over most of the 225-400 MHz military air band.

Finally, the scanner antennas perk up over most of the UHF commercial band, with the Austin Spectra favoring the upper part of the UHF band, peaking at 485 MHz, and the A/S MON52 favoring the lower end, peaking around 470 MHz, then dropping sharply above 500 MHz. This could be due to the A/S MON52 being designed and marketed when 450-470 MHz was standard issue for UHF and the 490-512 MHz "T" band was sparsely used at that time.



❖ Conclusions

What has been learned from this interesting and fun experiment? 1. For VHF lo-band reception there is no good substitute for antenna length. 2. For best VHF lo-band performance, tune the antenna to your specific frequency. 3. Some military antennas make terrific scanner antennas and can be used for everything from CB through UHF amateur radio and more.

Disclaimer: Many factors will influence antenna reception, including mounting location, available ground plane, and vehicle orientation with respect to the transmitting station. This exercise was a practical look at antenna performance and was not meant to be an absolute standard for gain comparison. Until next time, stay tuned!

❖ Acknowledgements

I would like to extend special thanks to Shakespeare Military Products Group and my good friend "the HUMMER guy" for their contribution to this article.

For further information on military vehicular antennas and specifications, you can check the following web sites:

http://shakespeare-military.com
www.rami.com/military
www.trivec.com
www.hascall-denke.com
www.racalantennas.com
http://valcom-guelph.com
www.comrod.no
www.cobham.com

AOR AR2300 Black Box Receiver

By Bob Grove, W8JHD

We have recently witnessed the release of several computer-hosted receivers from a number of manufacturers, including WiNRADiO®, Icom, and Perseus. While many other receivers have full-function panel hardware as well as computer control capability, the "black boxes" are non-functional without a computer.

Many traditionalists (and that includes me) responded skeptically at first, suspecting that the very presence of the required computer would mean radio frequency interference (RFI) from the host computer's oscillators.

While that was at first true, especially if the antenna was co-located with the computer, better-shielded receivers and computers have improved that – but still, it's best to keep the antenna at a distance!

There are two architectural approaches to receiver design: analog and digitized. Analog receivers utilize traditional double- and triple-conversion (superheterodyne) techniques which preserve the original signal waveforms.

Software defined receiver (SDRs), on the other hand, digitize the spectrum bandwidth and computer-process the desired signal for detection and demodulation.

There is an ongoing debate among manufacturers as to just how much of the receiver's spectral bandwidth must be software defined before the product can legitimately be called a software defined receiver. Some manufacturers digitize the entire RF bandwidth, while others digitize only the IF and lower frequency stages.

❖ The Newest Release

In the September 2010 issue we reviewed the AR5001D, AOR's predecessor to their new AR2300. The 5001D is a stand-alone receiver, while the new 2300 is a computer-hosted, black-box version of the same receiver.

It employs digitization at the third intermediate frequency (45 MHz) for signal processing of bandwidth, spectrum display, and demodulation, and it utilizes direct digital sampling of the first 25 MHz or RF spectrum as well. The oscillator utilizes direct digital synthesis (DDS).

Dual watch (simultaneous reception on two frequencies) and even triple watch can be accommodated within certain frequency limits.

The 2300 will talk to any PC running Windows XP operating system or higher (I used the Windows Vista operating system for this review), and can be controlled remotely through an optional LAN accessory. The default communication speed is 115,200 bps, but alternative choices include 9,600, 19,200, 38,400, and 57,600 bps.

❖ The Box

Measuring 8-1/2"W x 2-3/4"H x 11-1/4"D and weighing a husky 6.6 pounds, the 2300 is roughly the size of a small desktop receiver. But since it has no adjustable controls, it is loaded with access ports for the host computer.

The front panel offers a rocker-style power switch, an LED pilot lamp, a receptacle for a Secure Digital (SD) memory card, a 1/4" headphone jack, an RCA video output connector, and even an internal speaker – a nice touch in which the system does not require the computer's audio card or an external multimedia speaker system.

The LED doubles as a boot-up indicator; when the power switch is first thrown, the LED color is amber, but within roughly two seconds, it turns green indicating the "go" status. Loading the control panel then takes an additional four seconds after you click the mouse on that icon.

The rear panel is clustered with connectors: Two N-style antenna connectors (40 kHz-3.15 GHz and 25 MHz-3.15 GHz, selectable), 45 MHz BNC Intermediate Frequency (IF) output (15 MHz bandwidth), 10 MHz SMA reference oscillator input, 3.5 mm speaker output (2 watts at 8 ohms), 12-13.8 VDC at 1.2 A coaxial power jack, USB 2.0 interface port, 3.5 mm stereo line output, digital I/Q (optional), USB connector, LAN interface DB-style connector, and an 8-pin accessory connector for external audio, GPS, and voltage options.

Accessories packed with the 2300 include the 120 VAC/12 VDC power supply, USB interface cable, owner's manual, driver CD, and a quick-lookup software guide sheet.

❖ Functional Overview

The 2300 features a continuous 40 kHz to 3150 MHz (3.15 GHz) frequency coverage (800 MHz cellular frequencies are blocked on the consumer version) with AM, synchronous AM, FM, WFM, stereo FM, CW, USB, LSB, and ISB mode detection.

Available options include in-phase/quadrature (I/Q) (1 MHz BW, 25-3150 MHz reception only), APCO P25 digital decoding, and voice inversion decoding. The voice inversion decoding option is available to government/military clients only.

IF bandwidths from 200 Hz to 300 kHz are mode dependent, and the unit IF shift function allows a signal to be removed from adjacent-channel interference. Automatic notch filtering as well as noise reduction and noise blanker circuitry further reduces interference.

To compensate for strong-signal overload, or weak signal strengths, both a two-step attenuator (-10/-20 dB) and a preamplifier may be invoked.

Frequency resolution is 1 Hz with a pinpoint 1 ppm readout, which may be further refined to 0.01 ppm with an optional GPS input signal. Frequencies may be stepped in any whole-Hertz interval from 1 Hz to 999.999 kHz.

Up to 2,000 frequencies in 40 banks may be stored and scanned at 100 channels per second. For rapidly searching swaths of spectrum, up to 1,200 discrete frequencies or start/stop ranges may be passed.

Four separate VFOs are available to store 14 receiver settings including frequency, step, memory channel, bank, tone, antenna, attenuator, and seven other selections.

For VHF/UHF signals, an offset function permits the user to enter a second frequency for toggling, such as repeater input/output pairs or two-frequency simplex.

Squelch levels can be set for CTCSS (subaudible tone) and DCS (digital) activation as well as voice activation to avoid hanging on open carriers. Squelch may be momentarily disabled by pressing a MONI (monitor) key. DTMF tones can be decoded and displayed as numbers, letters, and symbols.

Signal contents may be recorded in WAV file format on the SD card; a 1 GHz card capacity can store up to 15 hours of audio.

NTSC and PAL video outputs are available from a rear-panel connector intended to be connected to an external video monitor for detection of wireless surveillance cameras. The IF direction can be reversed as required for reception of some wireless cameras.

❖ The 2300 Specs

Sensitivity is excellent in the critical VHF/UHF spectrum from 25-3150 MHz. It's typically 0.7 microvolts for NFM signals and 0.3 microvolts for SSB. I was able to hear fringe UHF signals very clearly.

Equally important, the dynamic range keeps the products of overload interference to a minimum. Third-order intermodulation is factory specified at a respectable +20 dBm at HF, +12 dBm at VHF, and +7 dBm at UHF.

Digital IF filtering offers a choice of selectivity depending upon the mode chosen. Nominal bandwidths are 200 kHz, 500 kHz, 1

kHz, 3 kHz, 6 kHz, 15 kHz, 30 kHz, 100 kHz, 200 kHz, and 300 kHz.

Digital filtering for single-signal selectivity provides excellent shape factors as shown below for the standard -3 dB / -80 dB rolloff points.

CW (500 Hz)	380 Hz / 500 Hz (1.3:1)
AM (6 kHz)	5.5 kHz / 6.9 kHz (1.25:1)
SSB (3 kHz)	2.7 kHz / 3.1 kHz (1.15:1)
NFM (15 kHz)	14.2 kHz / 15.6 kHz (1.1:1)
WFM (200 kHz)	200 kHz / 250 kHz (1.3:1)

On-Screen Control

A wide variety of functions are accessible by popping up visual control boxes: S meter, mode, AF/RF/Squelch, FFT spectrum display, audio/video options, direct-entry keypad, frequency offset, HF control, and a choice of signal spike or waterfall on the spectrum display.

All of the boxes can be rearranged in place, but only the spectrum display can be resized to fit a custom screen layout.

Spectrum display

For anyone searching for radio signals, a spectrum display is essential. Signals may pop up anywhere, but if you can see it, you can grab it! The 2300 graphic display presents an adjustable span of spectrum from 800 kHz to 10 MHz wide for quick capture of signal spikes.

An adjustable baseline can be set anywhere on the graph for signal-strength reference. Spikes can be automatically numbered from 1-10 in order of relative signal strength. An attenuator / preamplifier bar can be adjusted as desired.

Fourier transform (FFT) sampling is done 15 samples per second, and the display frequency steps may be selected at 5, 6.25, 8.33, 9, 10, 12.5, 20 (default), 25, 30, 50, or 100 kHz.

The waterfall presentation works very well, displaying signal activity over time for all frequencies within up to 10 MHz, or as narrow as 800 kHz, full bandwidth. The color selection and saturation (intensity) can be adjusted as well, changing hues to match signal strengths from -30 to -110 dB. The speed of the waterfall presentation can be slide-bar adjusted from 15 to 90 seconds of visibility before it rolls out of view.

Let's try it out

After some trouble loading the software from the CD provided, our resident computer guru, Bill Grove, found a way to copy it from a website and it loaded flawlessly. We expect this problem to be corrected by the time you read this review.

Sensitivity was excellent, and even the weakest receivable signals showed up as spikes on the spectrum display. Audio recovery in all modes was crisp and clean.

The 2300 has a de-emphasis ability for FM and WFM to reduce attendant noise. Background hiss adds to the noise on wide-bandwidth signals, so broadcasters include treble pre-emphasis which can then be de-emphasized by a suitably-equipped receiver to reduce the screechy highs and hiss as well.

The auto mode setting is quite effective and will probably be utilized during the majority of listening time. This feature automatically sets the appropriate mode, selectivity, and tuning step for any frequency entered. If desired, another choice is just one click away.

The DSP noise reduction function works quite well on SSB signals; it is available in three successive levels of suppression chosen for the least amount of processor-induced distortion.

The auto notch filter instantly acquires the pitch of an offending, single-tone interference source like an off-frequency heterodyne, and does a great job suppressing it. It even works well when the tone is interfering with music! Like the noise reduction function, the notch filter offers three levels of attenuation.

The Bottom Line

The new AOR AR2300 "Black Box" is a versatile receiving station with very wide frequency coverage, fast-scan memory, conventional spike spectrum display, waterfall display, multimode demodulation, and probably 99 percent of nearly anyone's functional requirements.

Software improvements and upgrades are offered on the web as they become available.

The AOR AR2300 receiver is FCC approved and available from Grove Enterprises for $3,299.95 (RCV60-G). For more information or to order go to **www.grove-ent.com** on the internet or call 1-800-438-8155.

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MT REVIEW

The British are coming!
Pure Evoke Flow – A GlobalNet Review

By Loyd Van Horn, W4LVH

In the years before the advent of television, the family radio was the entertainment centerpiece of the home. In many cases, they were not just functional devices for picking up radio stations that carried your favorite program: they were elegant design pieces that enhanced the décor of a room.

We have long since moved past those days in the modern, digital world. Or have we?

There is still a market for elegantly designed radios that accentuate not only their owners' embrace of new technology, but also the desire to have a cool-looking gadget they can show off to their friends. After all, who says you can't have the latest in high-tech gadgetry and look good doing it?

That seems to be the mindset of the makers of the PURE Evoke Flow: to combine technology and style in a radio that is sure to get more than its share of attention.

❖ A Little Background

The U.K.-based PURE has been making DAB, WiFi and other digital-based radios in their home country since 2002. They now claim to be the largest digital radio manufacturer in the world, even though they hadn't tried to market products in the United States until recently. The Evoke Flow marks one of their flagship entries into the competitive, U.S. WiFi radio race.

PURE brings to the table a host of attractively-designed radios that have already found a considerable following in the U.K. and Australia. Units such as the PURE Sensia and the recently released PURE 1-S, which is designed in collaboration with Marshall Amplification to resemble a small Marshall guitar amplifier, have pushed the boundaries of how a digital radio is supposed to look.

Will this British invasion set the WiFi radio industry on its ear? Or will it be a one-hit wonder? Let's take a look at their first salvo, the Evoke Flow.

❖ Out of the Box

The packaging for the Evoke flow is as modern as the radio itself. There are minimal packaging materials inside, following the Earth-friendly trend of many modern technology leaders such as Apple. Usually, the unit itself is packaged inside a plastic bag or wrap and then placed in the box. The Evoke Flow, however, is placed inside an eco-friendly, cloth drawstring bag.

Inside is the unit itself and a "wall-wart" AC power adapter. The unit will also operate via a rechargeable PURE ChargePAK, which is sold separately through the PURE Web site.

The elegance of the Evoke Flow's design is evident the moment you take it from the cloth bag. The cabinet itself is solidly constructed and finished in a high-gloss piano black. Its retro style gives a nod to the old portable transistor radios, with a few noticeable upgrades. While the cabinet is rather boxy, the unit has some stylish curves in the touch-sensitive handle (which is actually the snooze button during alarm use) and in the silver knobs and speaker grille.

Once plugged in, the modern feel of the radio becomes evident. The main display is an OLED display lit in green. Likewise, green is the color for the touch-sensitive power button, as well as other buttons located above the two main-control knobs. These silver, push-button control knobs adjust volume, navigate menus, and are used in character entry.

A large number of WiFi radios are still using single color displays (usually amber, green, or blue), but the trendsetters are going full-color. PURE does have a full-color display option with its Sensia unit, but it would have enhanced the general attractiveness of the Evoke Flow as well.

On the rear of the unit, you will find a telescoping-whip antenna for FM reception, four 1/8-inch jacks: an auxiliary speaker jack (PURE makes an optional matching speaker that can be purchased through their Web site), a headphone jack (it seemed a bit odd this wasn't on the front of the unit), a stereo out, and an auxiliary in. There is also a mini-USB port that can be used for an Ethernet connection.

While most users will have some sort of WiFi option in their homes, it seemed odd that there was no Ethernet port on the Evoke Flow. This seems to be standard on most U.S.-made WiFi radios. The mini-USB option can still provide this functionality, but it requires a USB ethernet adapter, which few users are likely to possess. It seems to me it would have been easier to put an Ethernet port on the unit instead. This isn't a deal breaker, unless of course you prefer a hard-wired connection.

Other accessories not included with the Evoke Flow, but available for purchase through the Web site, are a remote control and an iPod docking station. The lack of a standard docking station is understandable, since only a portion of users would need this. But a remote control seems to be an increasingly common accessory included by manufacturers. It would have been a nice plus.

MT FIRST LOOK RATING

Audio Quality – 4.5 out of 5 stars
Adding the optional speaker would push this to a 5 star rating

Performance – 3 out of 5 stars
The cumbersome interface is the main drawback

Features – 3 out of 5 stars
No included remote and a proprietary battery pack are minuses; the included FM radio tuner and optional docking station are pluses

Design/Appearance – 4 out of 5 stars
A very attractive unit; a full-color display would make this a 5 star rating

Overall Rating – 3 out of 5 stars
It is a strong WiFi radio contender, but comes up short because of its interface and shortage of U.S. stations.

❖ Performance Test

Tuning In

Looks are one thing, but how does the Evoke Flow perform? Is it a dead-serious WiFi radio option, or an elegant, digital knick-knack?

Upon first use, you will need to enter a little bit of information, such as your preferred language and, if using a WiFi network, your network information, including any passwords. I found the internal WiFi antenna to be adequate to reach my wireless-G router from the back room of my apartment. I tried it out with a lower-powered router and it did have some issues, but most Linksys or other major routers should work just fine with this radio.

But, sorry, you aren't ready to start surfing the world's radio stations just yet. In order to tune in Internet radio stations on the Evoke Flow, you must first register at PURE's "The Lounge" interface. This should be a relatively easy experience, right? Ehhhhh...

I use Apple's Safari Web browser. While this doesn't prevent me from using The Lounge Web site, a message does pop up, saying I might be better off using Internet Explorer or Firefox. If this happens to you, don't be alarmed, but you may run into issues when streaming certain stations through The Lounge Web site.

Once at the Web site, you have to register a new account. When I went to do this, I was once again hit with a notification that the Web site doesn't like Safari, even though I earlier checked the box to not receive further notification of this.

To start, you will enter your information to register. Then PURE sends you an activation link to your email. Once you click on the link, you are registered and ready to get started.

The Web site is nice, but it is a bit off-putting for PURE to make it a requirement. Most WiFi radio makers use their Web site portal as an optional way to save favorite stations, browse station lists, etc. The Evoke Flow *requires* you to use their Web site before you can listen to a single stream. While this may not bother every user, to me it felt like an unnecessary extra step, especially when you consider that other WiFi radios on the market such as Logitech's Squeezebox, the Sangean line, and others can begin tuning stations almost instantly out of the box.

To be the company's first entry into the U.S. market, I found the selection of U.S. stations on the PURE Lounge interface to be seriously lacking. WiFi radios that use the RadioTime or Reciva interfaces have a considerable selection of U.S. and worldwide stations to choose from. PURE's proprietary interface does not.

I did a search first for several high-powered and well-known U.S. stations. Large stations such as WBBM in Chicago, KNX in Los Angeles and KMOX in St. Louis were available. Curiously, stations such as WLAC in Nashville, WWL in New Orleans, and others were not.

A search for all U.S. stations showed as of press time, that 3,904 stations were available. However, this includes internet-only radio stations as well as terrestrial broadcasts. While listeners looking for stations in larger markets such as Atlanta, Los Angeles, Chicago and New York should be able find most of their stations, those in secondary or smaller markets are likely out of luck.

In addition, the number of stations from other parts of the globe seemed to be much smaller compared to those of the RadioTime and Reciva units. This might be something that will improve in time as more stations are added. However, when there are units on the market that can immediately tune in more streams, it puts the Evoke Flow behind the rest of the pack.

There is a way to request PURE add a station to their stream list. This can be found under the "Contact Us" portion of the Lounge Web site.

You can search for stations through the radio's interface, but it is much easier to do on The Lounge Web site. I see this as another drawback: The whole point of purchasing a WiFi radio is to enable tuning in Internet radio stations untethered from the computer. When the interface and radio content are more easily accessible through the Web site, Evoke Flow's operation proves more cumbersome compared to other units on the market.

Audio and Operation

Once you are able to start listening to stations on the Evoke Flow, it actually turns out to be quite a nice radio. The audio quality is exceptional, especially considering it is only coming out of a three-inch, seven-watt speaker.

With the volume about halfway up, the audio was more than enough to be clearly heard with the radio about six to seven feet away. Turning the volume up to higher levels didn't result in any distinct distortion and enhanced the lower frequencies even more. I can easily imagine this radio being adequate in an outdoor environment (porch or poolside) for playing music. It would be more than enough for a clock radio or background music/talk in an office environment.

I did quite enjoy the touch-sensitive buttons, and navigating through the menu seemed easy enough. Here's a tip if you get stuck trying to figure out how to search for stations: turn the select knob. This brings up The Lounge menu, where you can access your favorites (which are saved on the Web site), browse stations, browse Podcasts, or select from PURE sounds (an eclectic collection of recorded sounds from nature, environments, and vehicles).

I would stack the audio quality of the Evoke Flow favorably against just about any other WiFi radio I have used, including the Squeezebox and the Grace GDI-IR3020. It may not be better than them, but is certainly as good.

A nice advantage that the Evoke Flow has over other WiFi radios is the inclusion of an FM radio. The RDS-enabled tuner is set to default to a "seek tune" when using the select knob. For those wanting to manually control the frequency to be tuned, you can change this setting under "options/FM settings/FM tuning."

I tuned in a couple of the local Greenville, South Carolina stations and was surprised at the quality of signal reception. They came in crisp and clear, with strong audio. Tuning in more distant stations seemed to be hit or miss. I tried tuning in some of the more commonly heard stations from Charlotte, North Carolina and Atlanta, Georgia in our area, and only one Atlanta station was audible and it was not very strong.

The auxiliary input works perfectly, and for those wanting to run a secondary audio source through the Evoke Flow, they will find rich, full audio coming through the speaker. You can also set the Evoke Flow to stream audio files from your home computer, as other units on the market allow you to do.

❖ Final Words

I really started to appreciate this radio the more I used it. As with any product, there are trade-offs; you just have to decide how important certain things are to you when making your decision.

Visually, the Evoke Flow is an attractive WiFi radio that combines a retro-feel with a modern twist. The audio quality of the Evoke Flow is among the best of any WiFi radio I have tested. The included FM radio is a nice addition that makes the Evoke Flow a go-to radio when the Internet goes down (or if the power is out, if you have the ChargePAK).

The only glaring issue of the Evoke Flow is the interface. The requirement to go through the Web site to get started listening to stations, combined with the low number of stations listed compared to other radios on the market, are two big issues that would make me think twice before I put forward the $229 suggested retail price for the Evoke Flow.

If you are looking for a basic WiFi radio to listen to the large stations in the U.S. as well as a good number of international stations, if you don't mind working through a Web site interface to get started (and in all reality, it is the easier way to do most of your station searching), and you want something with strong audio quality and a built-in FM radio, you should definitely consider the Evoke Flow.

For those used to a RadioTime or Reciva interface, I would suggest you browse The Lounge Web site to see how you like this interface and the selection of stations before making your decision. If you like what you see, then this radio is definitely an option you should consider.

WEB SITES

PURE U.S. Web site: **www.pure.com/us/**
The Lounge: **www.thelounge.com/**

Budget DX Crystal Radio, Part 1

By Dave Schmarder, N2DS

In the Beginning...

Crystal radio sets have been with us since near the beginning of wireless communications. After the coherer was replaced by a mineral detector, this signaled the beginning of the crystal radio era. When radio broadcasting began in late 1921, most listeners used crystal radios. However, after just a couple of years, the use of passive detectors quickly faded in favor of vacuum tube receivers.

Why was the crystal radio's golden era so short? In the twenties, the parts available for crystal sets were mediocre at best. The coils were made with solid insulated wire. The capacitors had a lot of loss because of poor insulating materials. The mineral detectors weren't very sensitive, and most headphones were not too sensitive. The range of a crystal radio was only about 25 miles. Radio stations sometimes operated with powers as low as 5 watts. The first 50kW stations did not appear until 1928.

In the 1950s, a new generation of parents began building crystal sets with their kids because they thought they were neat. And they were. My dad and I built a couple of crystal sets with the famous 1n34a diode. I easily heard two daytime stations.

Moving ahead to the late 1990s; with the help of the Internet, there has been a crystal set renaissance. Those 1950s kids who built the sets have grown up, but still relish the youthful times spent building their radios. But this time, instead of the coils wound with magnet wire on empty oatmeal boxes or toilet paper rolls, builders are using Litz wire on low loss forms. We learned the value of low loss capacitors, audio matching transformers and balanced armature (a.k.a. sound powered) headphones. This is the modern crystal radio.

The radio that I am presenting is the culmination of my 76 previous crystal radio projects, shown at my website, **www.makearadio.com**. The radios run the gamut, from the simple mailing tube sets to exotic DX radios. Some sets are beautiful, but a couple of them are downright ugly. Still, they all work and their designs are representative of many types of crystal radios.

My "Budget DX Set" has some fine features. All the parts are modern and available. Mike Peebles at **http://peeblesoriginals.com** has kindly consented to offer most of the parts from his web store. Other parts can be purchased at your local home improvement store. The cost for the major electronic parts is about $150, with the mechanical parts being extra. The radio is designed to be as easy as possible to build. The coils can also be purchased prewound.

All the components have gone through a cost vs. performance evaluation, with all components rated fairly equal in performance. It makes no sense to put all the money in the coil, leaving the other components starving for performance.

Circuit Description

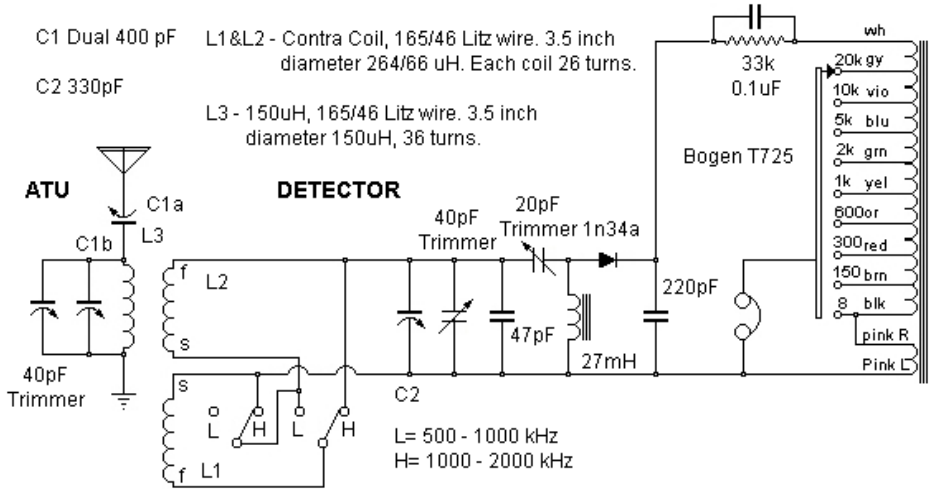
Starting at the left on the schematic, the antenna tuning/coupling unit, or ATU, is the section that connects to the antenna and ground. The tuning capacitor resonates the combination of the coil (L3) added in with the antenna/ground circuit. This provides maximum energy from the antenna to be radiated by the coil to the detector unit.

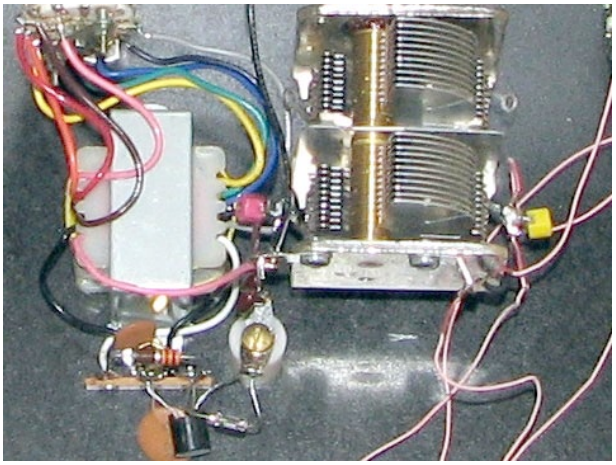
Pre-detector unit selectivity is also obtained in the ATU. The ATU is constructed on a different chassis from the detector unit chassis. This makes it simple to adjust the distance between the two units: thus the coil coupling.

The detector has several interesting twists from the usual crystal radio. The specially wound coil, called the "Contra Coil," is tuned with the main 330pF tuning capacitor. There is also a double pole switch that configures the two contra coil windings in a series or parallel connection. This divides the broadcast band into two sections, around 1000 kHz. The coil, when switched to the high range or parallel switched, tunes the radio to approximately double the frequency as the series switched coil.

The advantages of the contra coil are that on the high range, the number of wire strands is doubled. Also, variable capacitors operate more efficiently when they aren't fully open at the top end of the band. These two factors improve the selectivity, or the ability to separate the stations. Selectivity isn't as big a problem at the bottom of the band as it is at the high end.

Before the diode, there is a 20pF trimmer capacitor and a 27mH inductor. This is a selectivity enhancement circuit that reduces the load of the tuned circuit, which is the contra coil and tuning capacitor. The detector and audio





output circuits tend to place an impedance load across the tuned circuit. The small trimmer in series with the diode reduces this load. It reduces volume somewhat too, but overall it is beneficial.

The 27mH inductor acts to provide a direct current circuit path through the diode and transformer. Without a dc path, the radio will not operate. The usual dc path is accomplished through the main coil, but the trimmer capacitor blocks this path.

Next is the parallel combination of the 33k ohm resistor and 0.1uF capacitor. This is known in the crystal radio community as a "Benny," which is an ac/dc equalizer circuit for the detector.

The audio matching transformer connected to the Benny has a 40,000 ohm impedance but a low dc resistance. This is not a problem with weak station reception, but as stronger stations are received, it can cause audio distortion. By placing a resistance in series with the transformer, the distortion is mitigated. The capacitor allows the audio to flow unencumbered to the transformer.

The transformer is an inexpensive component that was originally designed for speaker matching in public address systems. It was found to be good for matching a crystal radio to high impedance headphones. I added a switch, so that the headphone impedance could be changed according to the headphones in use.

I'm glad to give credit to Ben Tongue for his technical website (**http://bentongue.com**) and his personal advice. The "Contra Coil" and the "Benny" are his innovations. Credit is due to another radio builder, Mike Tuggle. He popularized the antenna tuning and coupling circuit to modern radio builders.

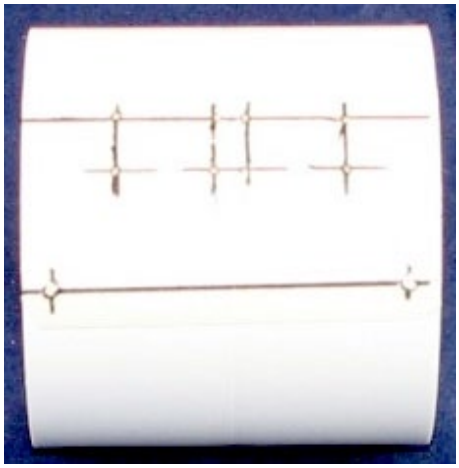
❖ The Contra Coil – and how to wind one

The contra coil has two windings, called L1 & L2 in the schematic. On the coil itself, it doesn't matter which winding you actually call L1 or L2. Each winding has a (s) start and a (f) finish wire. It is important that the start and finish windings are noted when wiring. The coil form is actually a 3-1/2 inch OD styrene pipe coupler made by Genova Products. Try to buy this exact coupler. The part number is S40130.

Here are the steps to make this coil. First place a piece of 2-inch wide masking tape across the cylinder. Place the cylinder on end on a flat surface. Then draw three lines on the tape using a square placed on the same flat surface. The line for the mounting hole placement can be an inch or so from the wire holes. The two wire hole lines can be about a half inch apart. These distances aren't critical.

There are 10 holes required. The two mounting holes are for a #6 thread using a 9/64 inch drill bit. These are in about 1/4-inch from the edge. The other eight holes are marked in four pairs. The drill bit I used is 3/32 inch in diameter.

For the first set of four holes, measure in 3/4 inch from each end of the cylinder. Cross the lines meant for the wire holes with your marker. Then measure in 1-1/2 inches from each end and mark the last four hole positions. There will be nearly a 3/8 inch space between the coils. After drilling, remove the tape and look for any burrs. The entire form is 3-9/32 inches long.



The direction that the wire is wound can be either way, so long as both coils are started in the **same direction**. The wire ends go in one hole and out the other. Each winding has 26 turns.

After winding, you will want to tension the wire. I found a procedure by which you can get a tight coil: After winding the coil, place it horizontally in your freezer for several minutes. The wires will get very loose because the styrene form shrinks. Take up the wire slack in the ends. As the form warms up, the wire will tighten.

Don't make the wires overly tight while the form is very cold. As the form gets nearer to room temperature, place pieces of masking tape on the inside of the coil where the wire is threaded through. The wire will remain tight, unless you subject the coil to cold temperatures.

After the coils are finished, step back and admire how superb they look.

❖ The ATU Coil Construction

The ATU coil has 36 turns of 165/46 Litz wire on the same Genova coil form. A total of six holes are required, two being the mounting holes as described above. Mark the lines the same way as for the contra coil, and measure in 1-1/8 inches from each end to mark the four holes. This single coil may be wound in either direction.

❖ To Be Continued...

Check back next month for the conclusion of this project, as we construct the components and learn how to tune this modern crystal radio.

WEBSITES:

http://makearadio.com Dave Schmarder's Homemade Radios
http://peeblesoriginals.com Crystal Radio Parts and Kits.
Http://bentongue.com Ben Tongue's crystal radio technical site.

What's NEW

Tell them you saw it in Monitoring Times

Larry Van Horn, New Products Editor

CCRadio-EP AM/FM Portable

A Bob Grove What's New Review

While it may seem strange that we would be reviewing anything as plebian as an AM/FM portable radio, there is a method to our madness. For several years, GE offered their "Superadio" to the consumer market; it had good sound, sharp AM selectivity, and external antenna connections. The radio sold in the $50-$60 range, and was very popular with domestic AM broadcast DX-ers. When it was discontinued, we had a surge of inquiries for a replacement, but none was to be found. Will the new CCRadio-EP be the answer?

The radio has decent sound, good AM selectivity, wide/narrow FM selectivity, and external antenna connectors. It has the traditional, analog, slide-rule tuning dial which may be backlit for night viewing.

Its 4-inch, self-contained speaker delivers room-filling sound with notable bass and clean highs with minimal distortion. Separate bass and treble controls invite custom high/low roll-offs to suit the listener's preference. If you have a set of stereo headphones, a stereo output jack provides that listening mode as well. There is also a line-in jack in case you have a personal MP3 or other player that you'd like to hear through a larger speaker.

The radio runs on either four D cells (not included) or a 120 VAC/6 VDC wall adapter (included). A snap-up/snap-down carrying handle facilitates transport.

The CCRadio-EP is simple to operate and should appeal to techie types with its unique "Twin Coil Ferrite" AM fine tuning knob. This is an RF peaking adjustment for the antenna input, depending on the frequency being received. It works with both the internal and external antenna.

It appears that the choice of external antenna is rather critical, and experimenting with optimum length and placement may be necessary to avoid "swamping" that tuning circuit, as well as avoiding common mode (ground loop) hum. I suspect that a shorter outdoor wire antenna would be better than a long one.

The internal ferrite loop antenna remains in service with the external antenna attached. If you were experiencing electrical noise interference, it will still be there, hopefully attenuated somewhat by stronger signal strengths brought in by the outdoor wire. It is advisable to attach a ground wire to that respective terminal as well to avoid AC hum and other electrical line noise. If such interference persists, battery operation and/or relocation of the radio are recommended.

An FM internal/external switch allows selection of an outdoor antenna via a TV-style F connector. The benefits and disadvantages of high sensitivity become immediately apparent when switching between antennas. With the radio's telescoping whip, distances of up to 100 miles are readily received at my location; switching to an external beam, strong signal overload clouds reception of weaker signals.

The AM wide/narrow IF filter selection is appropriately labeled "Music" and"Voice." The wide bandpass allows more highs for increased music fidelity, while the low bandpass restricts the bandwidth to reject the frequencies not required for speech reception. Additionally, the independent bass and treble controls have a profound effect on emphasizing or attenuating the high and low audio frequencies.

The accuracy of the printed frequency dial on our particular sample was excellent for FM, but rather arbitrary for AM. Of course with any analog-dial AM/FM radio, you tune for best reception, not for what the print on the dial says.

The CCrane Radio-EP has good sensitivity and the 4-inch speaker delivers credible sound, enhanced by the separate treble and bass controls. Its AM selectivity switch is very effective for reducing adjacent channel interference. FM sensitivity is excellent, providing distant reception through its telescoping antenna.

With so many off-the-shelf AM/FM radios now readily available from chain stores and at widely disparate prices, it's hard to compare them fairly. Taking the radio at its face value – an AM/FM portable with good sound and sensitivity – the CCrane Radio-EP does its job well.

CCrane Radio-EP lists for $69.95 from C. Crane Company, Inc., 1001 Main Street, Fortuna, CA 95540, (800) 522-8863; http://www.ccrane.com/radios/am-fm-radios/ccradio-ep.aspx

C.Crane FT-007 Stereo FM Transmitter

A Bob Grove What's New Review

One of the handiest accessories for the savvy techie is a remote FM transmitter that broadcasts any source of audio to any convenient FM radio – car, pocket portable, clock radio, multiband portable, or home entertainment system. I can sit in my yard on a sunny afternoon with my inexpensive pocket FM radio providing me with the audio from my indoor scanner or shortwave receiver, or perhaps even my CD player.

The flexible FT-007 can be powered by the 120 VAC wall adapter (included), an external source of 3- to 6-volts, or two internal AA cells (not included). The sound source may be stereo or mono and it will be thus transmitted to your remote FM radio.

A thumbwheel control is used to provide adequate gain from your source of audio, and to prevent overload distortion as well. An 11 inch telescopic whip may be swiveled to any plane for best transmission pattern for your listening location.

The compact 3-1/2 x 3-1/4 x 1-inch housing holds an LCD panel with a transmitting frequency readout; the frequency selection is made by stepping through the FM band in 50 kHz increments (88.30-107.70 MHz) to avoid interference.

The display also shows battery status with the standard icon, and the automatic shutoff, if desired, for 1, 2, 3, 4, or 8 hours.

The unit is affixed with a coil cord terminated in a standard stereo mini plug 1/8 inch, 3.5 mm and a stereo adapter with RCA plugs is included. A red LED announces an audio overload condition so that the thumbwheel can be properly adjusted for best sound.

With the FT-007 plugged into my computer for the audio source, I slipped a musical CD into the tray. After adjusting the sound level to perfection and switching on a little pocket FM radio, I discovered that I could clearly hear the transmission anywhere in the house. Stepping outside, I found that I had adequate reception at least 50-feet or so from my front door.

The C.Crane FT-007 FM transmitter sells for $69.95 from selected *MT* advertisers (see C.Crane contact information above).

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.

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LETTERS

editor@monitoringtimes.com

Rachel Baughn
rachelbaughn@monitoringtimes.com

Farewell to Skip

Skip Arey received this "attaboy" for his October column on preventive maintenance to ham equipment and other fall activities.

"Thanks, Skip! I was having the exact problem you were talking about with the low receive and normal receive volume after keying the mic. I was going to go after the relay in the HF radio, but your tip fixed it! Thanks, you saved me time and wasted effort."

Mark Morgan N8QIK, Cincinnati Oh

"Glad I was able to point you in the right direction, Mark," says Skip. "I'll be listening for you."

This month's *On the Ham Bands* column is the last one for Skip. He has decided to retire from the *MT* writing staff, which he joined in 1988! He started out as our *Beginners Corner* editor, but his love for amateur radio was so evident he was soon offered his current slot.

Skip is an excellent evangelist for the hobby and a very active ham as well. I will always remember with gratitude his volunteerism, especially at Ground Zero after 9/11. Skip models all that's best about amateur radio, we thank him for his long and faithful service at *Monitoring Times*, and we wish him all the best. As Skip points out in his column, "I will still be writing for Canadian International DX Club (CIDX) in their *CIDX Messenger* newsletter at **www.cidx.ca …** and, as always, you can find me on the bottom end of 40 meters."

Improved VR500 Charger

Mort Arditti sent in a refinement to his September *On the Bench* article where he constructed a charger for the Yaesu VR500 receiver.

"This is an improved schematic of the original VR500 charger in the September 2010 issue. In the original configuration, when the power is applied, the LED is on. There is no charge indication, regardless if the VR500 was in the cradle on not. If the scanner was not seated properly in the cradle, there were no indications that the batteries are not charging.

"In this enhanced circuit, the LED is on only when there is charging current through the batteries."

Following is Mort's improved schematic and his description.

Brief improvements description

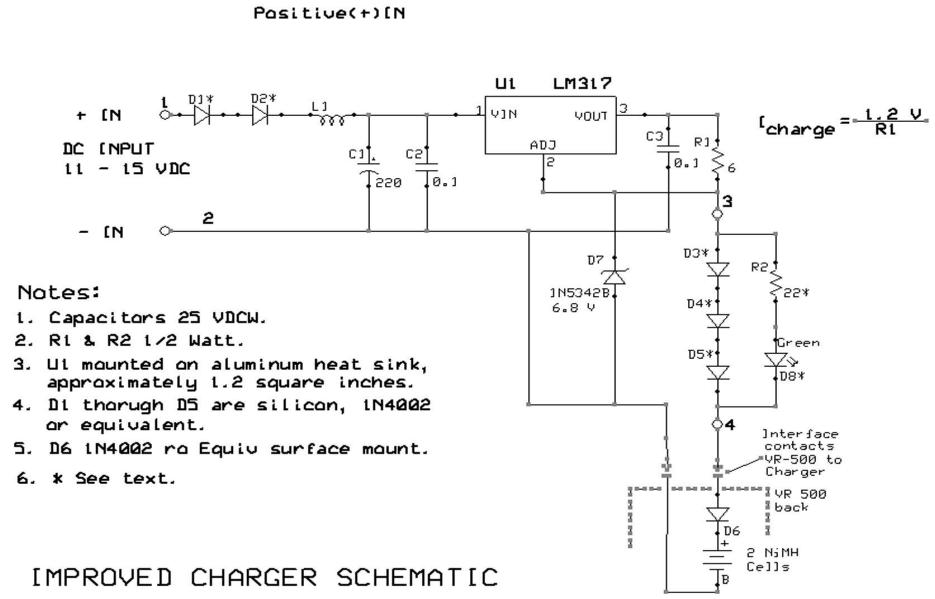
1. The green LED lights up only when there is current flowing through D6 and the batteries in the VR500, indicating actual charging. In this circuit, diodes D3 through D5 in conjunction with R22 and the green LED D8 were configured 'as a unit.' This arrangement maintains nearly constant voltage between points 3 and 4, while the current through the LED (D8) is around 15 mA and current is flowing, charging the batteries. This 'constant voltage' is essential in order to insure that the voltage at point 4 is maintained at a safe level by D7. These component selections applies only for green LEDs which have a forward voltage drop of approximately 2.4 Volt at 15 mA. Therefore, it is highly recommended that D8 be kept green.
2. Another minor upgrade was the addition of diodes D1 and D2 in order to reduce the heat dissipation of U1 by approximately 0.3 Watt, while the input is 12 – 13.5 VDC such as cigarette lighter. If the heat sink is greater than 2.5 square inches with adequate air flow, these diodes can be omitted. 13.2 VDC is the common/preferred power supply voltage for battery operated ham band transceivers.

As before, if for any reason the batteries become open, the internal voltage to the scanner D7 limits the voltage at point 4 to a safe level of approximately 4 VDC. Under these conditions the LED will not light up.

This charger can remain connected to the input source while the VR500 is not in the cradle. Under these conditions D7 will dissipate approximately 1.4 (safe level) and keep the unit warm.

Warning: Do not use this charger if conventional none rechargeable batteries (such as alkaline) have been installed in the VR500.

Mort Arditti



IMPROVED CHARGER SCHEMATIC

Wrong Receiver

"Ken, I enjoyed your *Getting Started* column in the October issue; however, I must point out a mistake with one of the pictures that was shown. In the article a picture was shown which you said was the Sony ICF 2010 radio. In fact, that particular Sony radio model is either the ICF 2001 or 2002 which was introduced in the 1980s or 1990s. The reason I noticed the mistake in the radio model no. is because I own the Sony ICF 2010 and my radio does not look anything like the picture.

"I have owned the 2010 since August 2002 and have good service and performance from it. I also owned another 2010 radio from 1989 until 2002. When I go traveling I bring along the Sony ICF 7600G which I have owned since 1996. Keep up the good work and all the best to you and your readers."

Richard Statfield, KA2KDQ.

Thanks for your comments, Richard. Well, it's not, as you correctly point out, a Sony ICF-2010. It was a typo, though obvious only to those who actually owned one! I was curious as to which model it actually was and tracked down the original photo that I had gotten from DXing.com (and used by permission). In the magazine you may not be able to see it, but in the photo the label clearly reads ICF2003. And, according to DXing.com, it was made in Japan from 1987-1991 and cost $210-270 new. That was a very expensive radio in its day.

The real Sony ICF-2010, which you have, was made between 1985-2001 and was considerably more expensive, $350-450. That was serious money for a portable radio in those days! There are a lot of them out there in the used radio market. I found several on eBay from $112 to $350. Thanks for straightening me out on the numbers.

Ken KS4ZR, Features Editor

This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com

Happy monitoring!

Rachel Baughn, Editor

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http://americanbandscan.blogspot.com/ - by Doug Smith

BELOW 500KHZ
http://below500khz.blogspot.com/ - by Kevin Carey

FED FILES
http://mt-fedfiles.blogspot.com/ - by Chris Parris

LARRY'S MONITORING POST
http://monitor-post.blogspot.com/ - by Larry Van Horn

MILCOM
http://mt-milcom.blogspot.com/ - by Larry Van Horn

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http://www.signalharbor.com/ - by Dan Veeneman

SHORTWAVE
http://mt-shortwave.blogspot.com/- by Gayle Van Horn

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http://mt-utility.blogspot.com/- by Hugh Stegman
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