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

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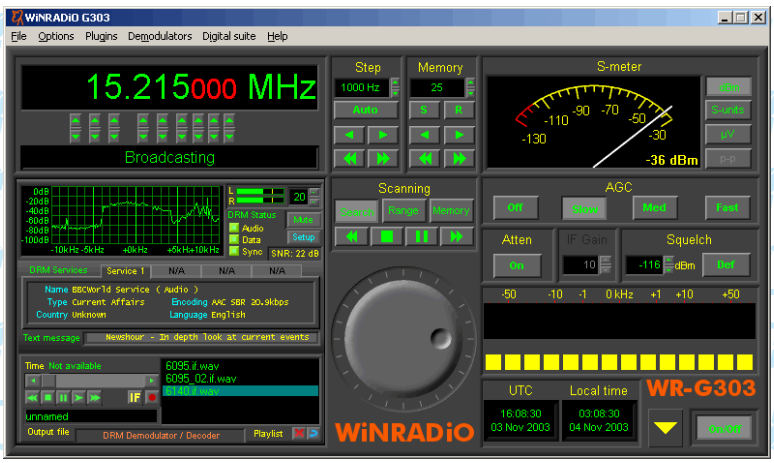
Can DRM Save Shortwave?



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In this issue:

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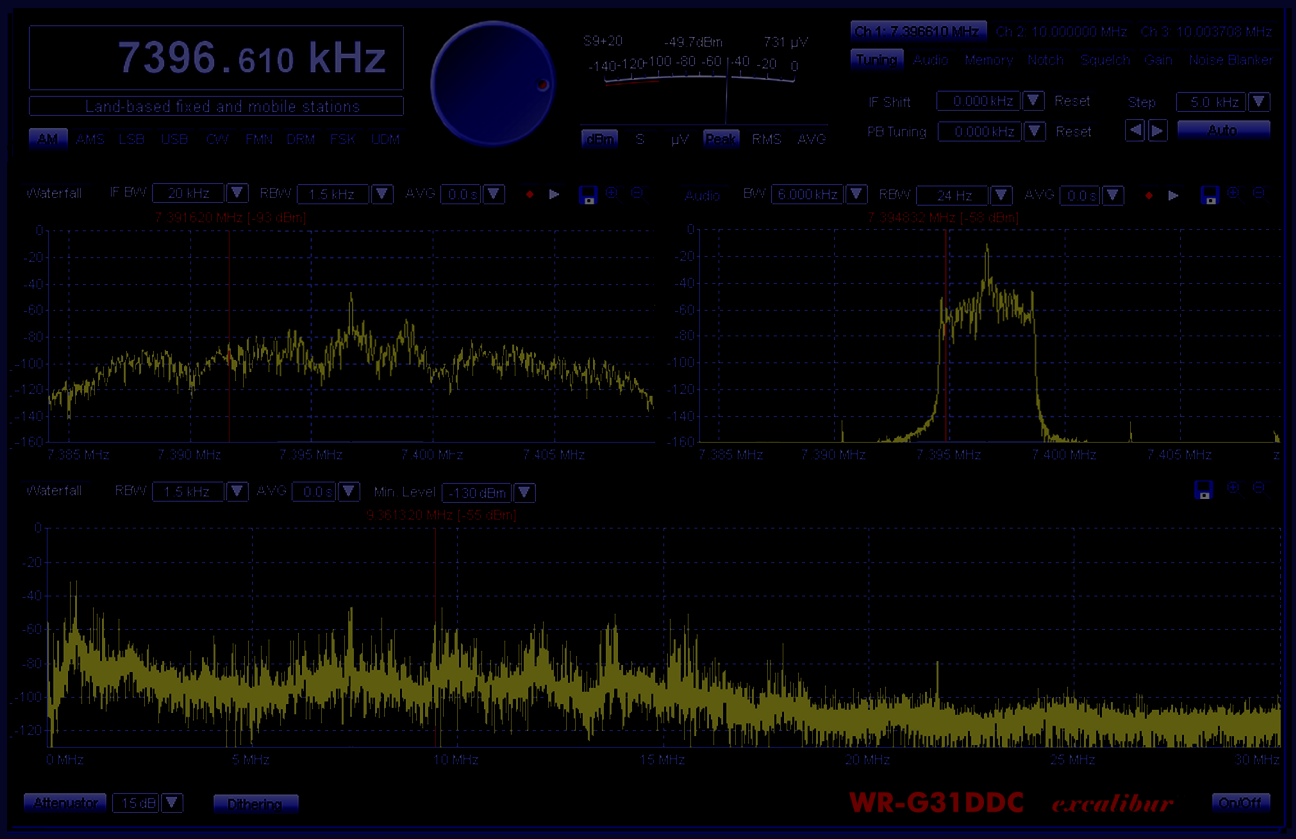

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Monitoring Times

Vol. 29 No. 4 April 2010

Chasing DRM.....8
The Elusive Dream of Digital Audio via Shortwave
By Ken Reitz KS4ZR, Ken Barber W2DTC and Dave Schmarder N2DS

Long after satellite TV, musical recordings, terrestrial TV, satellite radio and even terrestrial radio have carved niches in the digital world, shortwave radio continues to meander at a snail's pace towards a digital future.

And, even though its platform, Digital Radio Mondiale (DRM), was launched before most digital services we take for granted today, shortwave's digital future remains uncertain. This month MT examines the 12 year wait for shortwave broadcasting to find its digital voice.

In this progress report, Ken Reitz KS4ZR looks at where we are on the road to digital shortwave and reviews the first stand-alone, portable DRM shortwave radio. Ken Barber W2DTC finds a way to hear DRM broadcasts without modifying his computer-based shortwave radio. And, Dave Schmarder N2DS shows how to home-brew a tube-fired, DRM converter that works!

On Our Cover

Continental Electronics' 418DRM 100 kW transmitter for DRM shortwave broadcasts (Courtesy: Continental Electronics); WiNRADiO tuning page (Courtesy: WiNRADiO); UniWave DiWave 100 portable shortwave radio (Courtesy: Universal Electronics)

C O N T E N T S

R E V I E W S

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Departments

First Departments

Getting Started

You may contact any *MT* staff writer by email by combining their ***first and last name @ monitoringtimes.com.*** By postal mail, you may write them in care of *MT* Headquarters in Brasstown. Please enclose a self-adressed, stamped envelope if you wish the columnist to reply.

Second Departments

Technical Departments

AR-ALPHA

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- Multi-mode unit capable of receiving AM (synchronous), ISB, RZ-SSB, USB, LSB, CW, WFM including FM stereo, NFM, APCO-25 digital, and TV in both NTSC and PAL formats
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- 6-inch TFT color panel can display received video signals or depict spectrum activity over a wide choice of bandwidths including a "waterfall" function to show signal activity over a specified time period
- Composite video output on the rear panel of the unit
- Selectable IF bandwidths:200 Hz, 500 Hz, 1 KHz, 3 KHz, 6 KHz, 15 KHz, 30 KHz, 100 KHz, 200 KHz and 300 KHz along with the ability to shift the IF
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- Built-in voice-inversion descrambling**
- CW pitch control, AGC, AFC
- Auto-notch feature
- User selectable spectrum display function from 250 KHz through 10 MHz in 1 KHz increments. Above 10 MHz bandwidth, it can display 20 MHz, 50 MHz, 100 MHz or 1 GHz, but above 20 MHz bandwidth, no audio will be available
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COMMUNICATIONS

by Ken Reitz

AMATEUR RADIO/SHORTWAVE

BBG May Ax Greenville VOA Site

The Broadcasting Board of Governors (the head organization for Voice of America, Radio Free Europe/Radio Liberty, Radio Free Asia, Middle East Broadcasting Networks as well as Radio and TV Martí) released their FY 2011 budget seeking an increase of 1.5% over the previous year.

Among the budget highlights are: upgrading the Board's global satellite distribution capacity, infrastructure and network control center; expanding FM, digital, and what it called "new media opportunities." The Board also plans to add 24/7 FM transmitters in Afghanistan to carry RFE/RL and VOA Pashto and Dari language programming. It also plans to diversify distribution of VOA content in Africa as well as adding a five day/week VOA Spanish television program for Venezuela.

According to a press release, the Board also explained that the new budget would balance "competing policy priorities with available budget resources...[and] reduce contracting costs and other Agency support expenses through efficiencies." The request also includes the closure of "…selected language services and programs, operational efficiencies in broadcast services and realignment of transmission networks."

The result of that last statement has led to the expected closing of the VOA transmission facilities in Pitt County, North Carolina which broadcasts programming for VOA and Radio Martí. According to an article in the Greenville (North Carolina) *Reflector*, the broadcast site employs 23 people. The article quoted a spokesperson for the Board as saying the closing would save the agency $3.1 million dollars.

Radio New Zealand Budget Threats

Andy Sennitt reports in his Radio Netherlands Worldwide blog that proposed budget cuts to Radio New Zealand's domestic service between midnight and 6 a.m. could affect RNZ International, which airs parts of the domestic schedule on their shortwave service.

Haiti Update

U.S. Air Force MARS public information officer David Trachtenberg reports that Air Force MARS operators have been relaying official and morale phone patches for U.S. military aircraft in transit to and from the Caribbean in addition to establishing an on-the-ground presence to assist with emergency communications for medical teams and other disaster response units.

He also noted that MARS operators in Haiti successfully used the WinLink2000 "e-mail over radio" system which was used primarily to relay urgent medical traffic. WinLink was developed, according to Trachtenberg, by a non-profit consortium of amateur radio operators that allows users to send and receive e-mail by radio in the absence of Internet connectivity.

Party Like it's 1978

Dust off your dancing shoes and step back in time, because Disco Palace is on the air at 17.755 MHz. Wait! Disco on shortwave? How's *that* going to sound? Near FM quality, is the answer, because Disco Palace is broadcast only in Digital Radio Mondiale (DRM), the HF digital radio scheme from Europe that hopes to save shortwave. Right now transmissions are limited to one hour/day (2000-2100Z, not exactly prime dancing time). Disco Palace broadcasts the same programming to Europe on 6.015 MHz from (1400-1500Z).

The new service is actually more of a commercial for broadcast services offered by Alyx & Yeyi, a Miami-based company offering shortwave, satellite and Internet broadcast equipment and production services. While the music is commercial-free, it shows the potential for entertainment services on the HF bands. Can't receive DRM broadcasts? Not to worry, this month's cover story tells you how to do it.

PIRATE RADIO

FCC Scuttles FM Pirates

Since last month's report, the FCC has sent out at least 10 Notices of Unlicensed Operation (NOUO) to FM pirate operators from Connecticut, New Jersey, New York, Texas, and Pennsylvania. Among the current crop were two from Erie, Pennsylvania, one of which closed down on being visited by the FCC, while the other has chosen to make a stand, saying he remained on the air because, as he told an Erie *Times-News* reporter, "…the response was overwhelming."

But, this month's QRO (high power) FM pirate award goes to an operator in Texas whose signal was measured by FCC field agents as over 900,000 microvolts/meter measured at 363 meters. The maximum allowed for a Part 15 unlicensed FM transmitter is 250 microvolts/meter at three meters. The NOUO in the Texas case noted that the operator ceased operations during inspection of the station by field agents.

Olympics Pirate Closed in Record Time

The gold medal for closing down a pirate radio station at the Vancouver winter Olympics has to go to Canada's broadcast enforcers, Industry Canada (IC). According to *The Tyee* from British Columbia, IC officers, dressed in Olympics garb, busted a group known as VIVO Media Arts, which runs a nonprofit media production, exhibition and distribution center based in Vancouver, British Columbia. The grass-roots artist collective had announced earlier that they would be running an unlicensed low-power FM station at 91.5 MHz during the Olympics being held in Vancouver this past February. IC shut the station down after less than 24 hours on the air.

Former FM Pirates Go Legal

Two Bakersfield, California men who had enjoyed working at a cable-access radio station, a number of pirate stations and Internet radio stations for many years, finally got a chance to go legit and took it. A random encounter with a promoter for the Common Frequency Project, a California-based nonprofit pro-LPFM group, led to the application for a low-power FM permit that was granted by the FCC last November.

Now, the newly licensed pair is seeking funding for the $100,000 estimated start-up costs. They hope to secure part of that sum with a grant from the Public Telecommunications Facilities Program, which is run by the National Telecommunications and Information Administration (NTIA), yes, the same federal agency that oversaw the DTV switch last year.

PUBLIC SERVICE

IL Bill Seeks to Curb Scanner Retrans

A bill before the Illinois legislature, if passed, would limit retransmission of broadcasts made on that state's public safety radio system, without prior written authorization of the originator of the communication. This could effectively ban popular online steaming of police, fire and safety transmissions which are currently re-broadcast on several different platforms.

MT's Assistant Editor, Larry Van Horn, described the bill as, "…detrimental to that portion

of the radio hobby that streams public service audio, if passed." He added, "Other agencies and states that have reservations about streaming public service audio will be able to point to this law and possibly pass similar legislation."

Scanner Listener Saves Life

A Catskill, New York off-duty Emergency Medical Technician (EMT), who was visiting a friend, overheard a call on his friend's scanner requesting aid for a man who had apparently suffered a heart attack. Realizing that he was only a block away from the address given over the air, the EMT responded immediately and was later credited by the police department for helping save the man's life.

AM/FM/BROADCASTING

FCC OKs Power Up for FM-HD

On January 27 the FCC gave the go-ahead for FM radio stations operating HD-Radio services to increase their power output by a minimum of 6% and up to a maximum of 10%. Until now HD-Radio stations had been required to transmit at 1% of their analog power. Based on extensive tests performed last year at various cities around the U.S., the FCC is allowing stations to perform the increases on their own without advance approval from the Commission. Stations are expected to notify the Commission of the date and increase if they do increase power.

There had been fears that such a power increase would cause interference to adjacent channels operating in analog mode. However, last summer's tests proved that any such interference was within an acceptable range. The Commission stated that, since 2004, they had "not received any well documented complaints of interference to analog FM stations from digital signals." The Commission further stated that of 15 experimental authorizations that increased to 10%, some with very close first adjacent channel spacing, the Commission had not received any complaints from licensees of analog FM stations or the listening public as a result of the experiments.

The power elevation comes at a time when HD-Radio is having little impact on the terrestrial radio landscape. That has been partly blamed on the minuscule power allowed for HD-Radio programming until now. Readers with HD-capable radios should notice a marked improvement in station's locking on and holding the digital signal. The increase applies only to FM stations, not to AM outlets.

iBiquity Reduces Fees

The consortium of broadcast interests in charge of promoting HD-Radio to the U.S. listening public, iBuiquity, has lowered its fees and broadened its payment options for stations wanting to join the digital broadcast revolution. The original "one-time fee" of $25,000 has been reduced to $10,500 if paid when a station joins, or $12,500 over a 12 month payout period. The roughly $1,000/month option may attract smaller, less profitable and non-commercial stations that have stayed away from upgrading their broadcasts to include HD-Radio. Stations will still have to shell out many times that amount for actual digital transmitting equipment.

SATELLITE

Russian Spy Satellite Crashes in Mexico

Many news sources reported what was thought to be a large meteorite that fell in Mexico in mid-February, but turned out to be one of many defunct Russian spy satellites roaming the near-Earth orbit regions of space and wreaking havoc as space debris. The craft was believed to be the remains of Cosmos 2421 which had been launched by the Russian Navy in 2006 and had broken into some 15 pieces just two years later. According to *MT* milsat expert Larry Van Horn's Milcom Monitoring Post blog, Russia maintains a fleet of some 60-70 reconnaissance satellites.

Russian Spy Satellite similar to Cosmos 2421 (Courtesy: Milcom Monitoring Post)

FCC ACTIVITY

FCC Outlines Ambitious Internet Plans

In a speech at the National Association of Regulatory Utility Commissioners (NARUC) conference in mid-February, FCC Chairman Julius Genachowski laid out his vision of the future for broadband in the U.S. dubbed the "100 Squared" initiative. Genachowski said, "Our plan will set goals for the U.S. to have the world's largest market of very high-speed broadband users. A '100 Squared' initiative – 100 million households at 100 megabits per second – to unleash American ingenuity and ensure that businesses, large and small, are created here, move here, and stay here."

His speech came shortly after a federal government sponsored survey suggested that high-speed Internet connectivity is not a high priority for 31% of the U.S. population. Immediate reaction from the broadband industry to Genachowski's plan was lukewarm. Hams and shortwave listeners need to be wary of a rush to press Broadband over Power Lines (BPL) initiatives that have pretty much stalled over the last several years.

FCC Experimental Licenses

A number of experimental licenses were issued recently by the FCC and include six to the state of California in the 400 MHz range for fire weather forecasting. One individual was issued a license to operate in the 135.7-137.8 kHz and 160-190 kHz bands. Wal-Mart was issued two experimental licenses in the 902-928 MHz range for RFID testing. Radio Shack has a license to test radio navigation satellite service equipment and systems. ITT Communications Systems was issued a license to operate in 1,800-2,495 kHz range; 2,501-4,995 kHz and 5,003-9,600 kHz for testing of HF radio voice communications equipment.

Lockheed and the Aerospace Corporation were issued experimental licenses for testing WiMAX technologies. DBA Global Technical Systems is licensed to operate on 1.325 GHz to demonstrate foliage-penetrating radar. Boeing was issued a license for operations in the 433 MHz band among others to test systems on the S-100 Unmanned Aircraft System. And, Spectrum Bridge, Inc. will operate in 168-216 MHz band to conduct research using vacant spectrum in the television broadcast band and for the testing of fixed Whitespace devices.

WiFi Power Amp Cited in Interference Case

The FCC issued a Citation to a New York City man for interference caused to a licensed telecommunications network in the 800 MHz uplink band. FCC field agents determined that the interference was coming from a Hawking Technologies HSB1 WiFi amplifier (a Part 15 device) in the man's home. In 2007 Hawking Technologies was fined $22,000 for selling their WiFi amplifier as a stand-alone amplifier and not with the sole access point which the FCC had approved the HSB1 to be sold. Hawking had advised the FCC, according to 2007 documents, that it had sold some 7,500 such units in the U.S. With more similar devices being sold each year there could be an increasing problem with similar Part 15 device interference.

College Station Fined in "Hostile Visitor" Case

The FCC fined Gaston College (North Carolina) FM station WSGE, a non-commercial station programming jazz, blues, and a variety of popular music, $8,000 for failing to make available the public file required for public inspection during normal business hours by FCC rules. That's not an uncommon fine among the many fines doled out each year by the Commission. What makes this case of interest is that WSGE's failure to make the file available was pointed out by an employee of a rival school, Columbia Bible College, which, according to Gaston College, was part of a "pattern of harassment and intimidation" by the bible college in an effort to take over its license. The fine was reduced from $10,000 and serves as a warning to all stations to avoid such harassment from would-be takeover attempts by simply complying with all FCC rules, no matter how seemingly picky.

"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, Bob Margolis, and Larry Van Horn.

CHASING DRM:

The Elusive Dream of Digital Audio via Shortwave

By Ken Reitz KS4ZR

High fidelity audio on the HF bands has been the holy grail of international shortwave broadcasters for years. Twelve years ago a consortium of HF broadcast interests developed an open-standard broadcast format that all hoped would deliver this elusive dream to shortwave listeners worldwide. Dubbed Digital Radio Mondiale, this format is known simply as DRM and, to the DRM public relations people in 1998, it looked as though the moment was right for shortwave radio to join the budding digital revolution and propel shortwave broadcasting directly into the 21st century.

The Dream Deferred

But, there were a few problems. Applying digital theory to actual broadcast practice has been a well rutted road, strewn with the wreckage of various digital schemes that crashed along the way. All of these wrecks and ruts have slowed progress to a crawl and, as a result, in 2010 only a small number of international broadcasters offer DRM transmissions at various times during the broadcast day, most of which are beamed to Europe.

And, that brings up an obvious point. DRM is a product of European engineering. In the United States, digital radio technology has been under the strict control of iBiquity, a consortium of American broadcast interests which developed and secured HD-Radio as the *de facto* standard, with FCC approval, in the U.S. for AM and FM transmissions. Unless something truly extraordinary happens, DRM will not be a broadcast platform for American AM broadcasters.

So, that leaves American shortwave listeners in an awkward situation, one that we're not accustomed to: being left out of a technological development. Only a handful of relatively expensive radios capable of tuning DRM transmissions have been available in the U.S. These are Ten-Tec's RX-320D (available through Universal Radio for $369 plus shipping); WiNRADiO's G3 series software defined radios (as low as $450 plus shipping from Grove Enterprises); and now, the Uniwave Di-Wave 100, a portable DRM LW/AM/FM/SW radio (see review below) which just became available at the first of this year ($300 plus shipping from Universal Radio).

Listening to DRM (Finally!)

Not all shortwave listeners have been willing to wait for manufacturers of DRM radios to favor them with high fidelity HF reception at a more affordable price. Many have sought a more direct and time-honored approach: modifying existing shortwave radios for DRM reception. Throughout the years a list has gradually emerged at DRM headquarters detailing the modifications that can be done on 28 popular receivers (see resources below) including the Grundig Yacht Boy 400, several Sony models, and the Kenwood R2000 to name a few.

Modification instructions may include schematics, photos showing where to perform the mods, and step-by-step procedures. But, not all documentation is in English and you will need to know how to solder small parts in tight quarters. All modifications are done at the user's own risk. You should know that damage to your receiver may result from any modifications you perform and will no doubt void your warranty.

However, in addition to the official list as presented on the DRM web site, I found numerous similar modifications of popular ham radio transceivers available at a variety of web sites. Among the brands I found were Kenwood, Yaesu, and Icom – in other words, just about any radio can be modified for DRM reception. You should also note that such modification will not allow you to *transmit* in DRM, only receive.

One elegant approach to DRM reception was Ken Barber W2DTC's software-only approach (see his article *DRM Reception via Icom PCR1000* which follows this article). Ken found that, by randomly experimenting with his Icom PCR1000 and available software, he could tune in DRM shortwave transmissions.

An unusual, if less elegant, approach was found by Dave Schmarder N2DS who turned his talent for tubes to the quest for DRM reception, and it worked! His article follows Ken Barber's.

Broadcasters Slow to Embrace DRM

Economics is a big factor in keeping broadcasters from jumping on the DRM bandwagon. U.S. shortwave broadcaster Allan Weiner, WBCQ, Monticello, Maine, said, "We would have been doing DRM testing if it were reasonably priced." He sees the future for U.S.-based DRM broadcasting on a one to five year time line. But, he believes that there will have to be more DRM receivers in the field before more U.S. shortwave broadcasters start transmitting in DRM. "A better bet would be to incorporate DSP, digital signal processing, into shortwave and AM receivers," Weiner said, adding, "This digital madness to put it on an AM modulated carrier is a bit of an engineering kludge."

Jeff White, General Manager of Miami-based shortwave station WRMI, and president of the North American Shortwave Broadcasters Association, agrees with Allan Weiner about receivers needing to come first. But, White is optimistic about DRM in the long run. "The major shortwave broadcasters and manufacturers of broadcast equipment are certainly behind DRM, but the timing has been unfortunate," he said, adding, "The economic crisis hasn't helped."

White also said he agreed that the entry price tag for shortwave broadcasters to join the digital world is high. He explained that a DRM exciter (estimated at $40,000) can convert some existing analog transmitters to DRM, but noted that not all shortwave transmitters are convertible. If not convertible, stations can expect to pay ten times as much for a new DRM-capable transmitter.

White put the time for widespread DRM broadcasts in North America toward the far end of the one-to-five-year timeline. He also noted that DRM is a one or two-hop transmission mode and broadcasters will need to choose their frequencies and target audiences carefully in order to use the qualities of DRM broadcasting most effectively.

As both Weiner and White have observed, there need to be more DRM-capable radios in the field for there to be any real movement toward DRM broadcasting in North America. But, none of the traditional shortwave radio manufacturers offer DRM-capable receivers. And, until a low-end manufacturer such as Kaito enters the DRM receiver market, those numbers will climb ever so slowly.

Other Euro-based manufacturers have a few models which may eventually make it to the U.S. market, assuming FCC approval. Most notable would be StarWaves CarBox FM converter which turns your current in-dash radio into a DRM shortwave receiver.

UniWave Di-Wave 100 Portable DRM Radio:

Hearing is Almost Believing

Last year Universal Radio listed the UniWave Di-Wave 100 portable radio in their on-line catalog and had many shortwave enthusiasts drooling at the prospect of actually being able to decode the irritating hiss that was all we had known of DRM broadcasts. But, there was a problem: no FCC approval. The Di-Wave 100 would be available in the summer of '09, we were told. The months dragged by and finally, in January of this year, the Di-Wave 100 made it onto Universal Radio's shelves and almost immediately sold out. Apparently, I wasn't the only one drooling.

Smaller than I had imagined that it would be (9.25" wide, 5" high and 2.25" deep), the radio weighs just 1.5 pounds (without its four "C" batteries, not included) and sports a meager 22.5" telescoping, swivel antenna. An internal CR2025 3 volt battery backs up the time display.

But, the most obvious thing about this radio is the 3.5" TFT LCD display screen and grouping of black buttons flush with the radio's front surface. It looks more like a WiFi radio than any shortwave radio you've ever seen. But, this is no WiFi radio; it's a LW/AM/SW/FM radio with DRM tuning capability on the LW/AM and SW bands.

Since LW DRM reception is impossible in North America and not allowed on our AM band, I could only assess what was happening with DRM shortwave reception. The Di-Wave 100 has a shortwave tuning range from 1800 kHz to 30 MHz in AM modulation only, there is no sideband tuning capability. The Di-Wave 100 features 768 station memory presets (256 DRM, 256 FM and 256 AM).

There's quite an impressive list of features on this radio, many of which utilize the TFT LCD display and give us a glimpse at the future for shortwave radio which will include the capability of sending images and text. You can transfer jpeg files into the photo album viewer via the USB connection; use the built-in SD/MMC card reader to display photos; load MP3 files for playback (in the likely event there's not adequate DRM reception), and time-shift programming up to 10 minutes.

Connections on the radio's right side, besides the USB and SD card slot, include external power input (transformer included), on/off switch and headphone jack. The back panel features a 1/8" antenna jack and the admonition in the user's manual that, "Using a good outdoor antenna (not included) with a coaxial cable connected to the EXT. ANT. jack on the back of the receiver, will improve the reception and availability of DRM signals."

No kidding. Using only the telescoping whip antenna, DRM reception was very sporadic. The most powerful signal on the band, RCI's 9.800 MHz Sackville, New Brunswick transmitter, would occasionally lock. But, with an external antenna attached, that frequency was quite stable and seldom dropped out.

One of the more interesting features of this radio is an auto-search mode that allows the radio to tune rapidly through the known DRM frequencies stored in the radio's memory. You can look at this list, scroll through it and click on your selection, the radio tunes to that frequency and if, after a few seconds, no signal is received, it starts searching all available DRM frequencies.

If a strong enough signal is sensed, the radio stops and locks on. Within a few seconds the signal strength indicator lights and displays the familiar increasing bars to show signal strength. In DRM mode, additional information about the station including name, DRM frequency, program content, and language are displayed. In analog FM mode the station's RDS (Radio Data System) information is displayed.

Performance Results

I let the radio tune for hours, sorting through the list, and only twice did it find a frequency that could be ID'd. At 2140 Z on 6.030 MHz Radio Romania International, transmitting from their Galbeni, Romania site (and so displayed on the radio's LCD screen) locked on for about 10 minutes. Another time the radio locked on to CRI, but this turned out to be a relay from Sackville on 6.080 MHz. The only other station I could receive, besides RCI, was Disco Palace on 17.755 MHz from Miami via French Guiana. This signal had significant dropouts.

Audio quality from the three individual stations I could receive (using a 136-foot all-band, off-center-fed dipole at 25 feet) was good, certainly better than analog shortwave. And, it wouldn't be exaggerating to say that it was near FM quality. I played the audio through the 3-inch built-in speaker and the sound was typical for a speaker of that size. It wasn't until I played the audio through my home stereo that I could sense how close it was to what we expect from analog FM. The real worth of the audio came when music was being played. But, if the signal would not stay locked, as was the case with Disco Palace, it quickly became annoying.

Using a variety of antennas, for analog reception on the AM and FM bands, I found it was typical of any portable radio I've ever used. Analog shortwave reception is not this radio's strong suit. Navigating the tuning buttons and moving the cursor through the touch-pad display on the LCD screen while alternately hitting the OK button took a little getting used to. The option to store your favorite frequencies will help speed this process up.

Reviewing this radio in Europe would have been a totally different experience, as seen from the extensive list of stations and wide range of programs heard across the continent. And, it's entirely possible that in the next few years our listening options will greatly increase as more U.S. shortwave broadcasters begin DRM transmissions and more international broadcasters include North America in their broadcast transmission schedules.

But, for now DRM listening is confined to the one solid signal available (at least on the East Coast of the U.S.) from Radio Canada International. And, while their program line-up makes for substantial news and public affairs content, it will take considerably more than this one signal to attract the kinds of numbers that will make any difference to the future of shortwave broadcasting.

DRM RESOURCES

List of some 28 popular shortwave radios that can be modified to receive DRM broadcasts: **www.drmrx.org/receiver_mods.html**

DRM broadcast schedule to North America via Radio Canada International's Sackville, New Brunswick, Canada transmission facilities: **www.usdrm.com/usabroadcasts.html**

International DRM broadcast schedule from all sources to all regions: **www.drm.org/for-listeners/live-broadcast-schedule**

DRM Alternatives: Icom PCR-1000

By Ken Barber W2DTC

The first time I experienced a PCR-1000 in action, I was hooked. It was at the Dayton Hamvention® years ago when a group of eight hams from various states shared a suite of rooms at a local university. After dinner one evening, my New Jersey ham friend and I returned to our room and came upon a crowd of guys around one of the desks in an adjoining room. All the attention was for a little book-sized black box called the Icom PCR-1000 receiver. The proud new owner had the PCR-1000 hooked up to a laptop computer and was scanning the bands.

That was the first time I saw a software controlled receiver, and it was tiny compared to familiar boat anchors such as the R-390 and the big Hallicrafter and Hammurland tube receivers.

The PCR-1000 owner was like a kid at Christmas because, at the Dayton Hamvention, all frequencies from LF to UHF were active. He was checking out the 2 meter FM ham band, then 450 MHz, then 220 MHz, 50 MHz and all HF ham bands using AM and SSB modes. He switched to the police and fire bands, then the broadcast band and then the commercial wideband FM frequencies; in every case there were plenty of stations. All this reception on the simple whip antenna provided with this little unit. The owner couldn't wait to get home and put the receiver on a real antenna.

Everyone at this live demo was amazed and delighted, and the next day I went back to the Hamvention and bought one myself.

Accidentally Discovering DRM

After several years of use in my own ham shack, I concluded that the PCR-1000 was a versatile shortwave receiver. It also worked great on commercial FM stations and I used it many times to align receivers by putting my un-calibrated signal generator on frequency. It's not a great receiver for amateur radio "battle conditions," but when the band is "light" I can open up the IF and tune in those wideband AM stations using an outboard audio amplifier with good speakers and get really great audio reception.

One day – I'm not sure if it was from a magazine article I had read or if I heard someone talking about DRM on the ham bands – but I heard that FM quality could be obtained from HF shortwave stations. Intrigued, I started searching the Web and discovered Digital Radio Mondiale (DRM), which began around 1998 when a small group of pioneering broadcasters and manufacturers met to create a universal, digital system for AM broadcasts bands below 30 MHz. I also found that special software was necessary, as well as a wideband receiver with special DRM circuits.

I already had the Ham Radio Deluxe (HRD) software to control the PCR-1000, and the other software package called Dream was free. Knowing that I did not have a real DRM receiver and that I would not hear the FM quality, I still thought it would be interesting to tune

in the DRM frequencies to at least hear what the raw signal sounded like.

My Internet search took me to a website that listed the frequencies and times of DRM transmissions and another website to download the free Dream software for experimenters, so I did. This software is now available at my home page: **http://w2dtc.com/w2dtc-drm-page.htm.**

After getting the software loaded, I tuned the PCR-1000 to a DRM frequency and started to check things out. The raw DRM signal sounded like cicadas (17 year locusts) buzzing in the background. What was interesting was that the Dream software had a display of six vertical lights, similar to starting lights you'll see at an auto drag strip. Right away, one of the green lights was lit, perhaps by just the band noise.

I started to change frequency on the PCR-1000 and the green lights went from one to 2, then 3, then 4. I became excited and I tried widening the IF of the PCR-1000, I tried AM, wideband FM, narrowband FM, CW, LSB, USB and just playing with all the receiver options.

At one point, the green lights started to rise all the way to 5 out of 6 lights and with a little more tweaking of the HRD software, the 6TH light finally lit! The cicada bug sound quit and, sure enough, the FM quality came through. I was absolutely amazed, I sat back in my chair listening to the sound and smiling at my crazy experiment! I could hardly believe it; the sound from a distant shortwave station had FM quality, just like the comments in the articles I had read.

On my initial DRM adventure there was no music, just talk, so I couldn't get the sense of the audio that was possible. I wrote down all the software settings and the next day, same time, same frequency, I tried again and this time there was music and it did sound really good.

Lessons from Digital Shortwave

Reviewing what I had done by my trial and error experience, I found that I had to tune in the DRM station 10 kHz higher in frequency than what was posted on the frequency list. On the East coast of the U.S., I found that 9.800 MHz (Radio Canada International) was a good frequency, but I had to tune the PCR-1000 at 9810. In addition, the mode had to be set for LSB and the bandwidth at 50 kHz. With the Dream software, the "Flip input spectrum" box had to be checked. These settings were repeatable and all stations were received when they beam toward to North America.

I wish I could state that my experimentation was logical and that my settings were derived from my past radio experience. In truth, I just fooled around with all the Ham Radio Deluxe settings while looking at the Dream software display hoping to light all six lights on my computer screen.

If you decide to experiment with DRM on the PCR-1000, there are a couple of things you need to know. First, the DRM signal has to be pretty strong, and since the receiver is set for a bandwidth of 50 kHz, any adjacent stations will interfere and make DRM transmissions intermittent. The top 5 and 6 green lights, on Dream, will blink and the audio will come in and drop out. My actual DRM experience has been interference free 95% of the time.

Second, the number of DRM stations beaming to the northeast U.S. is limited as most DRM activity is beamed toward Europe. The DRM programming formats, beamed to the USA, are not exciting enough to tune in every day, so in reality, DRM stateside is for shortwave listening fun and experimentation. Still, it's fun to tune in DRM on a receiver that was never designed for it and you'll also find that it's quite satisfying to listen to FM quality on HF frequencies. If more stations offer DRM to the U.S. in the future, it will be even better.

My (mis) Adventures with DIY DRM (or) *Why is My Shortwave Radio Hissing at Me?*

By Dave Schmarder N2DS - *All graphics are courtesy the author.*

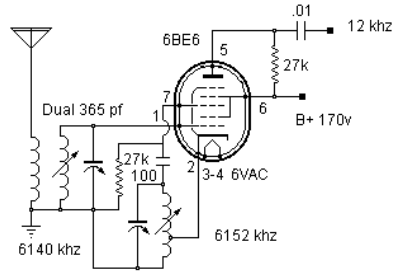
Over the years I have wanted to know what was behind the strange signals that would appear at my radio or television doorstep. Not wanting to spend a lot of money to satisfy my curiosity, the do-it yourself (DIY) approach was always first. This typically meant some sort of desktop or breadboard design and sometimes it would get ugly. Some of my early efforts included fun with slow scan television (SSTV) on the ham bands, as well as radio teletype (RTTY) on the shortwave ham and utility bands, all with homemade equipment.

Turning noise into something understandable became my side hobby. I even caught myself decoding a foreign language heard on shortwave using a dictionary and my head. Having heard the signature DRM "hiss" on the shortwave bands, I was determined to find a way to tune them in.

How to DIY DRM

There are good ways to build a DRM receiver, and there are bad ways. I did it the bad (and ugly) way. Since my active hobby is repairing old radios, I had a nice supply of tubes, so I built a mixer to convert 6140 kHz down to 12 kHz. This was the quickest way I found to discover DRM. The simple circuit I used is shown in the schematic on this page. Heater and B+ voltages are required. After connecting an antenna, and grounding the output to my computer sound card I was ready to receive.

But wait! I also need software to turn the digital signal into audio. I used some no cost software, named DReaM, which is available



DRM Receiver (c) 2004, D. Schmarder

from several places on the web, including **www.sat-schneider.de**.

Once you have installed the software and have everything configured, tune around for the signal and see if it will decode. When you are nearly ready to receive, you will see a spectrum analyzer type display on the "Input Spectrum" screen. Try to adjust the tuning so that the hump is centered at 12 kHz. If everything is right and the static is low, you have a chance of receiving the high quality audio.

A more elegant approach is to use a real shortwave radio with a 455 kHz intermediate frequency. You can buy a 455-12 kHz board (as found on the sat-schneider.de web site) or build your own. I bought mine on line from an Italian seller on eBay several years ago. It was no surprise that a seller from Europe would offer the hardware for sale as they are way ahead of us in the DRM race.

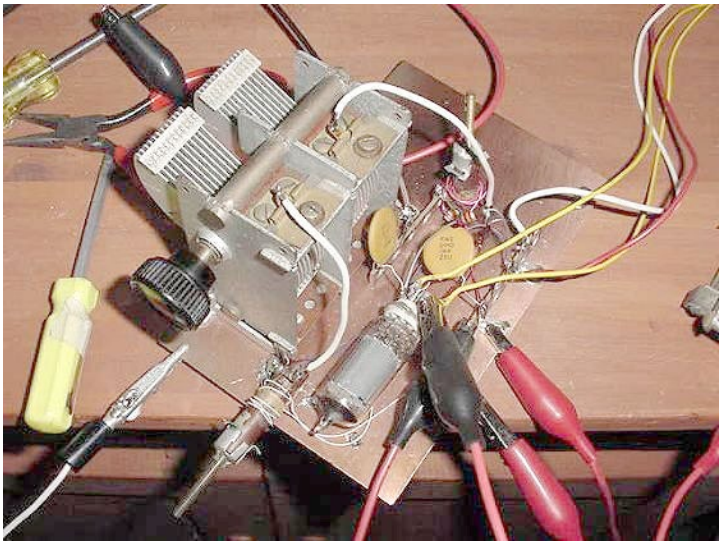
The 12 kHz output connects to your computer sound card and, since the bandwidth could

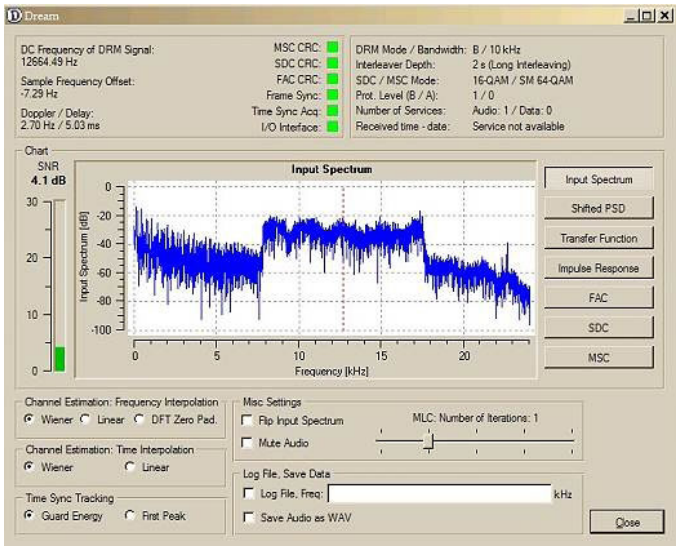
extend up to 20 kHz, you may have to connect the converter before there is a lot of filtering. A less selective receiver is actually better. Referring to the Input Spectrum display shown, the signal spreads to just under 10 kHz. The filters in the receiver must be able to pass that entire signal width to be decoded properly. Connecting the converter to an earlier point in the signal chain may be helpful. Sometimes connecting at the mixer output is the optimum place.

At any rate, don't give up! Keep probing around until you get the best connection point. I've found that both of these methods are about the same and, they're the most common methods to end up with a 12 kHz output. I'll bet that a couple of *MT* readers can figure out better methods.

Questions and Conclusions

As a shortwave enthusiast, my experiments prompted more questions than answers. Is DRM ready for prime time? Which will come first, more DRM broadcasts or more DRM listeners? Will DRM improve the shortwave bands and fulfill the promise of high fidelity distance signal reception? Will DRM make any difference if propagation continues to be poor? Maybe you can find some answers.





ALL ABOUT ANTENNAS
Part 1 of a Series

By Bob Grove W8JHD, Publisher, Monitoring Times

No subject is more widely discussed in the radio field as antennas, and with good reason; after you select your radio equipment, no accessory is more important. There are many myths surrounding antennas, and we're going to put them to rest in this series.

Radio Waves: Some Basics

When we connect a wire between the two terminals of a battery, electric current flows. This current generates a combined electric and magnetic energy "field," a zone which extends at the speed of light into space. When we break the circuit, the energy field collapses back onto the wire. If we reverse the connections back and forth rapidly, each successive pulse's electrical (positive and negative) charges and magnetic (north and south) poles reverse as well. This simulates a basic radio wave which consists of a magnetic and electric field vibrating simultaneously, or in phase.

The electric field ("E" for electro-motive force, measured in volts) is parallel to the axis of the wire, while the magnetic field ("H" named after researcher Joseph Henry) is perpendicular to it. This field is described as electromagnetic. Familiar illustrations depicting radio waves as wavy lines or crosshatched arrows are graphic representations only. There are no "lines of force" as implied when iron filings line up during magnet demonstrations; those filings line up because they all become little magnets, attracting and repelling one another. Radio waves are only a continuous field of energy which, like a beam of light, is strongest at its source, weakening with distance as it spreads its energy over an ever-widening area.

In fact, radio waves and light waves differ only in frequency over a continuous electromagnetic spectrum, with higher-frequency light having greater energy and the ability to be seen by some living organisms. Scientists even refer to an antenna as being illuminated by radio energy. Radio waves can be reflected by buildings, trees, vehicles, moisture, metal surfaces and wires, and the electrically-charged ionosphere. They can be refracted (bent) by boundaries between air masses, and they can be diffracted (scattered) by a ground clutter of reflective surfaces.

Radio and light waves travel through the vacuum of space approximately 186,000 miles (300 million meters) per second, but when they pass through a dense medium, they slow down; this velocity factor, is given as a specification for transmission lines. When we specify antenna and transmission line lengths, these are electrical wavelengths which are shorter than free-space wavelengths because of this reduction in speed.

Propagation

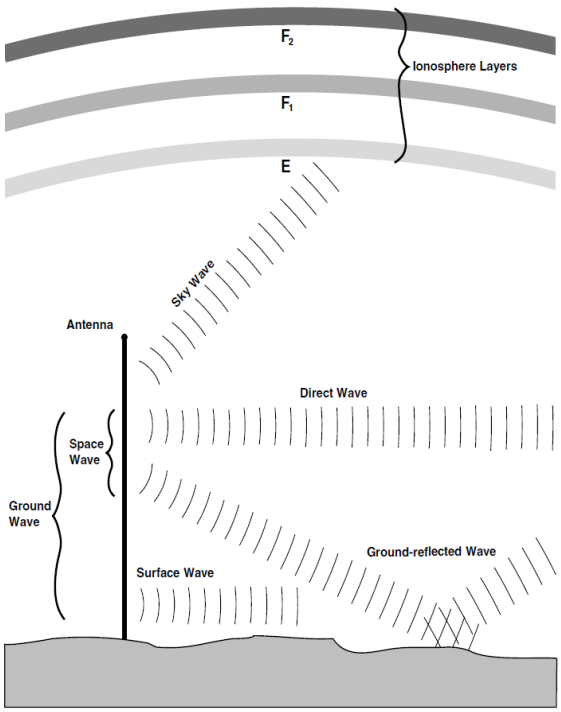
We refer to the behavior of radio waves as they travel over distance as propagation. Ground waves stay close to the earth's surface, never leaving the lower atmosphere. They are severely attenuated (reduced), rarely reaching more than a few hundred miles even under ideal conditions. Surface waves, the lowest ground waves, often reaching their destination by following the curvature of the earth. Space waves are the line-of-sight ground waves which travel directly from antenna to antenna.

Space waves at VHF and UHF, when encountering abrupt weather boundary changes, experience temperature inversions and ducting as well as other influences that can funnel signals into significantly extended ground wave coverage. At the upper reaches of our atmosphere, ultraviolet rays (UV) from the sun ionize (electrically charge) the air atoms, lending the name ionosphere to this highest zone of the earth's atmosphere. Radio waves which reach these ionized layers, averaging 25-200 miles high, are called sky waves

The lowest regions of the ionosphere, the D and E layers, are influenced directly by sunlight; their effects begin at sunrise, peak at noon, and disappear after sunset. They absorb radio signals. In other words, the longer the wavelength (that is, the lower the frequency), the more the absorption. This explains why daytime reception below roughly 10 megahertz (MHz) is so poor.

But, the E layer also reflects shorter-wavelength (higher frequency) signals back to Earth; the higher the frequency, the more the reflection. This is what provides distance (DX) on the higher shortwave frequencies. Most DX, however, is produced by the next region up, the F layer, which retains its electrical charge well into the night, reflecting signals back to the earth over great distances. All of these solar influences increase during the maximum sunspot cycle every 11 years, then gradually diminish again.

The earth itself can reflect radio waves, allowing a phenomenon called multihop; combinations of earth reflections and ionospheric refractions producing as many as five skips! More skips than that would be attenuated by ionospheric absorption and terrestrial



Signal propagation is a combination of ground waves and sky waves.

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The handheld BCD396T scanner was designed for National Security/Emergency Preparedness (NS/EP) and homeland security use with new features such as **Fire Tone Out Decoder**. This feature lets you set the BCD396T to alert if your selected two-tone sequential paging tones are received. Ideal for on-call firefighters, emergency response staff and for activating individual scanners used for incident management and population attack warning. **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. Useful for intelligence agencies for use at events where you don't have advance notice or knowledge of the radio communications systems and assets you need to intercept. The BCD396T scanner is designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS, LTR and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. **Dynamically Allocated Channel Memory** - The BCD396T scanner's memory is organized so that it more closely matches how radio systems actually work. Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 3,000 channels are typical but **over 6,000 channels are possible** depending on the scanner features used. You can also easily determine how much memory you have used and how much memory you have left. **Preprogrammed Systems** - The BCD396T is preprogrammed with over 400 channels covering police, fire and ambulance operations in the 25 most populated counties in the United States, plus the most popular digital systems. **3 AA NiMH or Alkaline battery operation and Charger** – 3 AA battery operation - The BCD396T includes 3 premium 2,300 mAH Nickel Metal Hydride AA batteries to give you the most economical power option available. You may also operate the BCD396D using 3 AA alkaline batteries. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in the BCD396T scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - A blue LCD light remains on when the back light key is pressed. Autolight - Automatically turns the blue LCD backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BCD396T automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BCD396T also works as a conventional scanner to continuously monitor many radio conversations even though the message is switching frequencies. The BCD396T comes with AC adapter, 3 AA nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, SMA/BNC adapter, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. Order on-line at www.usascan.com or call 1-800-USA-SCAN.

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AOR AR5000A+3B Wide Band 10 KHz to 3 GHz receiver	$2,599.95
AOR AR8200 Mark IIIB Wide Band handheld scanner	$594.95
AOR AR8600 Mark II Wide Band receiver	$899.95
AOR AR-ONE Goverment/Export sales only 10 KHz-3 GHz.	$4,489.95
Scancat Gold For Windows Software	$99.95
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Frequency Coverage:

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The handheld BC246T TrunkTracker scanner has so many features, we recommend you visit our web site at www.usascan.com and download the free owner's manual. Popular features include **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. **Dynamically Allocated Channel Memory** - Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 1,600 channels are typical but **over 2,500 channels are possible** depending on the scanner features used. You can also easily determine how much memory is used. **Preprogrammed Service Search (10)** - Makes it easy to find interesting frequencies used by public safety, news media TV broadcast audio, Amateur (ham) radio, CB radio, Family Radio Service, special low power, railroad, aircraft, marine, racing and weather frequencies. **Quick Keys** - allow you to select systems and groups by pressing a single key. **Text Tagging** - Name each system, group, channel, talk group ID, custom search range, and S.A.M.E. group using 16 characters per name. **Memory Backup** - When power is lost or disconnected, your BC246T retains the frequencies that were programmed in memory. **Unique Data Skip** - Allows the BC246T to skip over unwanted data transmissions and birdies. **Attenuator** - You can set the BC246T attenuator to reduce the input strength of strong signals by about 18 dB. **Duplicate Frequency Alert** - Alerts you if you try to enter a duplicate name or frequency already stored in the scanner. **22 Bands** - with aircraft and 800 MHz. The BC246T comes with AC adapter, 2 AA 1,800 mAH nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. For more fun, order our optional deluxe racing headset part **#HF24RS** for $29.95. Order now at www.usascan.com or call 1-800-USA-SCAN.

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scattering, rendering the signal unreceivable. Internet sites like **www.hfradio.org/propagation.html** publish continuously-updated radio propagation forecasts, and a variety of prediction computer programs are available elsewhere, allowing the user to plan ahead for the most productive use of the spectrum.

Tropospheric scattering in the E and F2 layers is fairly common in the 30-50 MHz spectrum, especially during the daytime and during sunspot peaks. It favors the east in the morning and the west in the afternoon. At VHF and UHF, ionospheric propagation is rare. Some sporadic E skip, lasting from a few minutes to an hour or more, may occur in the 50-200 MHz range. It is caused by erratic clouds of ionization at an altitude of 75-100 miles.

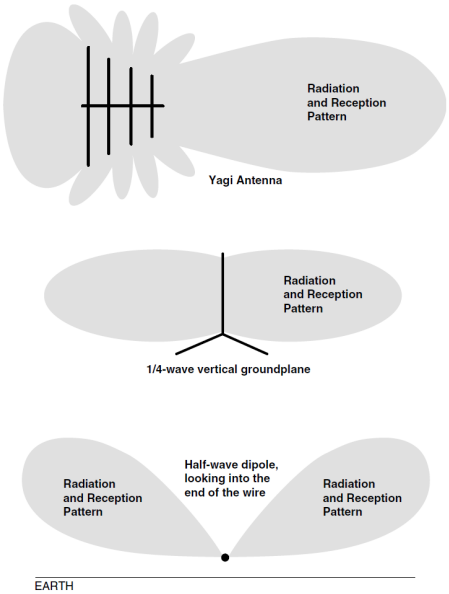
A similar phenomenon is produced when meteors enter the E layer. At such high speeds, the meteor vaporizes, producing an ionized trail which is capable of reflecting VHF signals back to earth 1000 more miles away, most dramatically in the 50-80 MHz spectrum.

It is estimated that some 200 tons of meteor material, from visible to dust size, strikes the earth every day; much more vaporizes in the upper atmosphere. Because of this constant bombardment, there are completely automated systems relying on this technique for long-distance data transfer.

Patterns

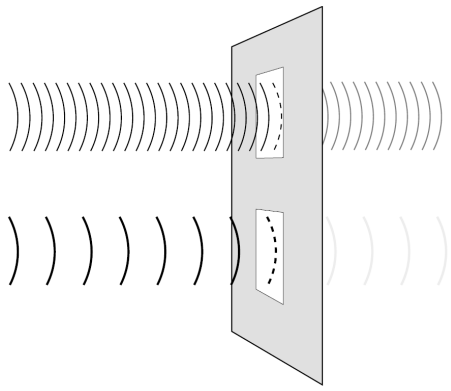
The shape of the field of energy emitted by a transmitting antenna, as well as the geometric response by a receiving antenna, is known as its pattern. It may be a simple donut shape surrounding the axis of the wire as in a half-wave, or smaller, dipole, called a doublet, or it may be multi-lobed, as in a multiple-wavelength antenna, called a longwire.

The elevation pattern, variously called radiation angle, takeoff angle, maximum amplitude elevation, and launch angle, is affected by height above ground, length of the antenna element(s), and the presence of nearby metal, including other antenna elements. It is an integral part of an antenna's gain characteristics which we will discuss in a later issue.



Antennas are designed to favor certain directions, both for transmitting and receiving. The lower the frequency, the more the signal is capable of following the contour of the terrain, and the less likely it is to be absorbed by trees and foliage. One study showed that with dense trees and vertical polarization, attenuation at 30 MHz is about 3 dB, increasing to 10 dB at 100 MHz.

Terrain, trees, wiring, metal siding, nearby buildings and other reflective surfaces all affect antenna performance. The lower the antenna, the more obstructed it is likely to be. A basement would be a very poor antenna location. Signals are unpredictably reflected by metal and wiring in and on the walls and ceiling; nearby electric and electronic appliances invite interference to reception; soil absorbs transmitted energy and also reflects signals upward; and signals come mostly from overhead (there aren't many there) rather than from the horizon.



The higher the frequency, the shorter the wavelength and the easier it is for a signal to get through an opening in an absorptive or reflective enclosure.

Nearby trees, buildings and hills take their toll, too. Locating an antenna inside a large building with steel frame and metal reinforcements may attenuate signals up to 25 dB at VHF and UHF, according to one study. Brick walls, slate or tile roofs can account for 6 dB, even more when wet. Shorter wavelengths (900 MHz) get through small windows in shielded walls where longer wavelengths (150 MHz) do not.

Location, Location, Location...

The Radio Horizon

Radio waves, like light waves, follow the line of sight. Because of the curvature of the earth, higher antennas "see" a farther horizon. Assuming a flat, unobstructed terrain, the visual horizon is about 8 miles for a 30-foot-elevated antenna, increasing to only 16 miles at 120 feet! Notice the square law effect: it requires roughly four times the height to get twice the distance. Once an antenna is high enough to "see" past nearby obstructions, it takes at least double that height to notice any improvement.

The lower the frequency, the more radio waves are capable of following the curvature of the earth beyond the visual horizon. Typical base-to-mobile communications ranges are about 50 miles in the 30-50 MHz band, 30 miles at 150-174 MHz, 25 miles at 450-512 MHz, and 20 miles at 806-960 MHz. Obviously, these distances will vary depending upon radiated power, receiver sensitivity, antenna gain, elevation and location.

Although the higher the antenna the better, coax cable losses may compromise any signal improvement; the higher the frequency, the worse those losses. For example, at 450 MHz, extending a 30-foot antenna to 60 feet could increase signal strengths by 5 dB, but if you are using common RG-58/U coax, signal strengths may be attenuated by the same amount, resulting in no improvement at all!

At 800 MHz, using this small diameter, lossy RG-58U, signals would get worse with height! Worst of all is thin RG-174U which has all the bad characteristics; in long lengths at UHF, you might as well short-circuit your antenna connector!

Always use low-loss cable such as the following, listed in increasing performance: RG-8/X, RG-8/U, Belden 9913, or 1/2" foam (Andrews), Heliax (all 50 ohm cables); or RG-59/U, RG-6/U or RG-11/U (72 ohm cables).

T.C.A.S. Technology:

A low-cost, no-license, communications method revisited

The TCAS technology system has a lot going for it. It's possibly the 'greenest' mode; it is not dependant on batteries or those annoying 'wall-warts,' and you don't even need a soldering iron to home-brew your own system. The range of TCAS is very much what you make it.

Let me explain. Your cell phone is out and you want to chat with your buddy next door. No problem: use TCAS. Want a private conversation with a guarantee of no eavesdroppers, DXers or SWLs listening in? That's the beauty of TCAS. Even the FBI, CIA and IRS cannot monitor your TCAS communications. It's hack-proof!

Interestingly, TCAS is strictly DIY because no major manufacturer or supplier will get involved with this technology and the ARRL have abandoned it, possibly because it has one major limitation, but more of that later.

Each individual TCAS unit can be personalised, just the way you want it. It doesn't matter if you want the hand-held component painted pink or with a photo of Dolly Parton for decoration; TCAS is your own unique, single-channel device, and you can make it almost any way you want. And, your buddy might like a similar unit, or he can use his own imagination when designing his part of the TCAS system.

For optimum two-way communication 'point-to-point' is best, but TCAS can be operated in mobile mode, provided that the two stations are moving in the same direction and at the same speed. Good copy can be sent and received up and down hills but here comes that major drawback. It is strictly line-of-sight. You must not allow any obstructions such as trees, vehicles or other people to physically come between the two hand-held units.

Another bug that I'm afraid cannot be ironed-out is that the speaking component is the same as the listening piece. That means you must actually listen and not speak when hearing the call.

While many different types of materials have been tried, it's evolved that metal works best. And, while TCAS units have been the subject of much experimentation over the years, the critical connecting component has remained the same since your grandfather's days. No reliable substitutes have been found. The advantage is that these vital parts are readily available everywhere and are virtually free, making TCAS not only cheap, but environmentally friendly too.

Why not try TCAS for yourself? Making a two-way TCAS system will only take about five minutes of your time. But take these few bits of advice: Clean the two tins first; it's no fun having pieces of stale tuna in your ear. Get an adult to make the two holes in the tins and tie a good U.S. Marine Corps knot in both ends of the string. Above all, as my first program director told me, "Keep It Tight!"

(Peter J. Mac Dougall MCIJ, EI/G7VEW is a radio presenter and journalist and a Council Member of the International Short Wave League. He now lives in the West of Ireland but you might remember him as 'Peter Madison –The Teenage Pensioner' on AM stations in Chicago, Florida and the European Pirates.)

MT

Amateur Radio Weather Watchers: A National Public Service

By Gregory Smith WB2PPQ

The media lists amateur radio as a disappearing activity in the 21st century, displaced by the information super highway. But, with 700,000 licensed amateur operators, their communications skills continue to provide a valuable public service in times of emergency, from routine weather reporting to the aftermath in relief efforts.

Thanks to the many knowledgeable operators with versatile, mobile, multi-band capabilities and a wide range of transmission modes, when telephone lines are down, cellular service is unavailable, and public service communications are disrupted, agencies still depend on hams.

Origins of SKYWARN

Weather data from radio amateurs reaches the National Weather Service (NWS) from multiple sources. Severe weather is reported by SKYWARN, the National Hurricane Center, the Hurricane Net, and the Maritime Mobile net. Regional weather nets report their data each morning to the NWS too. In addition, thousands of APRS weather reporting stations send continuous packets of weather data 24 hours a day via the ham radio 2 meter band. This data is made available on the Internet worldwide. The integration of amateur radio weather reports and scientific weather data at the NWS results in more accurate weather forecasting.

SKYWARN began in 1942 by the U. S. Weather Bureau to protect various military installations. The bureau trained volunteers to spot lightning near ordnance plants and report in real time. The system worked so well that the spotter mission expanded to include hazardous weather and tornadoes. After WWII, these spotter networks continued to function near military installations.

May 25, 1955 in Udall, Kansas, a tornado touched down killing 80 people and injuring 273 others. The NWS decided that severe weather spotters were needed for civilian use as well. This service would provide real time data to extend lead-time warning and improve weather status accuracy. The first official severe weather training class was held on March 8th, 1959 in Wellington, Kansas where 225 people volunteered to be trained.

The National Disaster Warning System (NADWARN) was established in 1965 to coordinate natural disaster-related emergency functions of federal agencies. The NWS at that time came-up with a specific plan to spot tornadoes and this plan was called SKYWARN.

SKYWARN's role today is to spot signs of developing tornadoes and has been expanded to include reports of all hazardous weather conditions as well. Today there are over 250,000 NWS trained SKYWARN spotters throughout the United States, many of which are licensed radio amateurs. SKYWARN is not a club or organization and it is not associated with storm chasers. Spotters' reports are sent to a Meteorologist Warning Coordinator at one of 122 NWS offices across the United States. Armed with actual weather conditions, the NWS can provide more accurate weather information and deliver appropriate severe weather warnings utilizing NOAA's Weather Radio service to help save lives.

At a recent SKWARN training session, an NWS meteorologist stated, "You can have the best of radar, computers and software but it does not take the place of a weather spotter describing actual weather events in a given area." Hams who assist the NWS have taken on meteorology as an additional facet of amateur radio.

The National Weather Service provides two SKYWARN training programs, at basic and advanced levels, so that radio amateurs can become official severe weather spotters. While there is no requirement to be a ham to participate in the SKYWARN program, amateurs have the additional ability to transmit weather conditions using hand-held transceivers or mobile radios. When a significant weather event occurs, the telephone system at the NWS can become overwhelmed and critical weather information may not reach the center. That's why the NWS prefers to get reports through SKYWARN net managers or public officials such as police or firemen.

In some areas of the U. S. there are no licensed hams to serve as SKWARN spotters, so the NWS has to rely on SKYWARN volunteers who use either Public Service Band or Citizen Band radios to communicate severe weather data.

Most SKWARN facilities have amateur radio stations similar to one at the WX4MRX in Morristown, Tennessee. This station is equipped with (3) dual-band 2 Meter/ 440 MHz and (1) 220 MHz transceivers along with a packet radio system (APRS). For emergency communications. High Frequency (HF) operation is chosen to cover long distance paths, while local communications are covered using Very High Frequency (VHF) and Ultra High Frequency (UHF).

SKYWARN spotters report visual sightings of severe weather, such as tornado, waterspout, funnel, wall cloud or the size of hail stones. Other conditions to report include flooding; rain rate greater than 1" per hour, and/or wind greater than 58 MPH (indicated by: wrist-size branches broken, whole tree or power lines down and property damage).

Some spotters use advanced weather instrument systems to monitor weather conditions that cost as much as $10,000. These top-end systems utilize licensed software packages that take current raw weather data via the internet and provide graphics depicting real-time weather conditions. This feature is a valuable asset for local SKYWARN Nets to warn of severe weather cells in specific geographic corridors.

In the U. S. the two most prone areas for severe weather are "Tornado Alley" and the "Hurricane Zone". Hams regularly remain active in these regions to assist various agencies in reporting actual weather conditions. Visual sightings from weather spotters, known as "ground truth," along with satellite and radar data provide accurate early warnings for severe weather events in these zones.

The NWS notes, "In the average year 10,000 severe thunderstorms, 5,000 floods and over 900 tornadoes occur across the United States. Over a ten year period, severe weather killed 2,300 people." NWS also notes that SKYWARN weather spotters, in addition to new technology and warning systems, have helped reduce the death toll by 800 from the previous decade.

Regional Weather Nets

The NWS receives daily weather reports from radio amateur operators across the country. These reports come from numerous regional area weather nets that operate daily, though some exclude Sundays.

Two nets that I check into regularly are: The Badger Weather Net (3,982.6 kHz) and The New England Weather Net (3,905 kHz). Both nets receive weather reports from hams over a large geographic area. The New England Weather Net, for example, receives check-ins from Florida to Nova Scotia, Canada. Both of these nets open at around 1100 UTC and welcome check-ins.

Net Managers are friendly and request that you use a simple format for reporting weather data. This data needs to be collected over a 24-hour period, a time chosen between 6-7:00 a.m. These are directed nets with all communications going through net control. Net managers tabulate the weather data each day and submit it to the NWS. Although the data is not quality controlled, it remains valuable to the NSW. The Badger Weather Net data may be found on the Internet at: **www.nws.noaa.gov/view/validProds.php?prod=PNS&node=KMKX**

The National Hurricane Center (NHC)

NHC is a division of the National Weather Service and is located at Florida International University in Miami. The NHC has the responsi-

bility for tracking and predicting tropical depressions, tropical storms and hurricanes. They issue watches and warnings 36 hours in advance to the news media and NOAA radio.

The NHC gathers weather data through scientific methods including satellite, air reconnaissance and radar. "Surface Reports" from hams provide the NWS with what is actually happening on the ground. These reports also fill the gap where no other weather data is available. At the NHC facilities during the 2002 Atlantic hurricane season radio amateurs manned W4EHW (now WX4NHC) for a total of 140 hours of operation taking 300 reports. W4EHW utilized several bilingual hams using frequencies on 20 meters along with communicating with various 40 meter Caribbean nets. Each year the NHC runs an Amateur Radio Annual Conference at the Miami Center.

National Oceanic and Atmospheric Administration (NOAA)

NOAA is an agency that falls under the U.S. Commerce Dept. There are six scientific agencies that are contained within NOAA, one being the National Weather Service. The NWS tasks are to provide forecasts, advisories, watches and warnings and operate NEXRAD Radar. To supplement their scientific weather data the NWS receives weather data from hams across the nation. NOAA Weather Radio has the responsibility to transmit weather reports and severe weather warnings 24 hours a day on these frequencies: 162.400, 162.425, 162.450, 162.475, 162.500, 162.525 and 162.550 MHz.162.400MHz.

NOAA Weather Radio broadcasts many other types of hazards: tornados, floods, earthquakes, forest fires and volcanic activity. They also provide warnings and information regarding oil and chemical spills, nuclear power plant emergencies, even terrorist attacks. There are more than 1000 NOAA Weather Radio transmitting sites. This website will provide the NOAA Weather Radio transmitting frequencies for your state and county: **www.nws.noaa.gov/nwr/indexnw.htm**

Logistical Support When Disaster Strikes

Amateurs spring into action during and after disaster strikes, filling the need for emergency communications in and out of the affected area using nets on 20, 40 and 80 meters. VHF and digital transmission modes are also used to report health and welfare status relating to injuries and deaths which are relayed to the appropriate agency. Besides health and welfare, these reports will also include; weather conditions, power outages, damaged roads, infrastructure damage, loss of telephone and other communication links.

The following organizations provide communications and humanitarian assistance:

SATERN

SATERN (Salvation Army Team Emergency Radio Network) operates on 14.265 MHz. Emergency alert status can be found on their website: **www.satern.org.** SATERN provides emergency communications to support the effort of the Salvation Army. This happens whenever their service is required in times of a national disaster including hurricanes, earthquakes, forest fires, health & welfare, along with other related emergencies. They are generally on the air from 1200Z to approximately 0100Z during times of widespread emergency. To train for such emergencies, a training session is held daily. This is a directed net, which means all communications must go through net control.

During times of a national disaster, other logistical communications must happen. Victims need to be cared for and fed; add to this the logistics of feeding large number of volunteers, and tracking supplies for the relief effort. Amateur radio operators make all this possible. SATERN was activated most recently in support of relief efforts following the devastating earthquake in Haiti.

Salvation Army Team Emergency Radio Network

Hurricane Watch Net

One of the most active hurricane nets is the Hurricane Watch Net (HWN) which operates within the National Hurricane Center. The net activates on 20 meters on a frequency of 14.325 MHz USB. When propagation is poor on 20 meters; the net shifts operation to either 40 or 75 meter band location. The HWN website is: **www.hwn.org**.

Jerry Murphy K8YUW founded the Hurricane Watch Net in 1965 during Hurricane Betsy. Jerry envisioned the need for communications in and out of the affected area as Betsy pounded the east coast of the United States causing one billion dollars of destruction. To fully realize the level of this destruction, you must consider the worth of the dollar in 1965. This net has operated during each hurricane since. Net activation takes place when a threatening hurricane is within 300 miles of landfall or becomes a danger to highly populated area.

The Hurricane Watch Net, run by some 40 highly skilled amateur operators, provides the latest weather advisories from the NWS to radio operators both maritime and within the affected area. The NHN collects real-time, ground level weather conditions to supply the National Hurricane Center with the latest observed ground weather status. To become a member of the HWN you must have experience and knowledge of tropical weather in the affected geographi area; be able to plot storm co-ordinates and be proficient in traffic handling. Candidates must also pass a probationary period of service.

HWN amateurs are strategically located from Toronto, Canada across the Continental United States, Bermuda, Mexico, Central America and the Caribbean Islands. This spread guarantees one or more continuous paths of radio communications in and out of the affected area so that information can reach the National Hurricane Center in Miami. Their training develops the skills needed for accurate emergency communications when a severe weather event strikes.

The HWN website presents some impressive graphics and satellite images that depict active storms in the Atlantic and eastern Pacific regions. You will also find weather information and observations for the United States and other countries. The HWN website provides many Internet links including a link to The National Weather Service (NWS).

SATERN VHF FREQUENCIES

City/County	State	Day	Time	Frequency	EchoLink
Fort Smith	AR	Thursday	1930 CT	145.190 PL114.8	
Riverside & San Bernadino	CA	Sunday	2000 PT	146.385+ PL 146.2	
Northern California	CA	Monday	2000 PT	147.060 PL 100.0	
Imperial & San Diego	CA	Thursday	2030 PT	145.320 PL107.2	
Chicago/Cook	IL	Tuesday	2000 CT	146.760 PL 107.2	WA9ORC-R
Rockford/Winnebago	IL	Thursday	2000CT	146.610 PL 114.8	
Kansas City Metro Area	KS/MO	Tuesday	1930 CT	145.130	
Central Louisiana	LA	Friday	1830 CT	147.330	
Boston	MA	Friday	2100 ET	145.230 PL 88.5	
Detroit	MI	Monday	2100 ET	145.330 PL 100.0	
New Jersey - New York (1)	NJ/NY	Tuesday	2030 ET	449.975 PL 114.3	W2NJR-R
Pittsburgh	PA	Tuesday	2000 ET	146.610 or 146.955	
Rhode Island (4)	RI	Thursday	2000 ET	147.330 PL 88.5	W1AQ-R
Cleveland - NE Ohio	OH	Tuesday	1900 ET	146.820 PL 110.9	
Macomb County	MI	Monday	1930 ET	147.18 PL 100	
North Texas (3)	TX	Wednesday	1930 CT	146.82 PL 100.0	N5IUF-R
Missouri (Taum Saulk)	MO	Sunday	2000CT	146.835 PL 100.0	

(1) Linked repeater system of W2NJR consisting of 8 UHF/VHF repeaters linked across NJ into PA, DE and NY.

CANWARN

CANWARN is a volunteer organization consisting of Canadian hams who have been trained to be severe weather spotters. This service requires a yearly training review. CANWARN members, utilizing VHF and UHF frequencies, provide actual visual weather conditions to verify satellite and radar information and are set up not only in homes but also in airports and police stations and even senior centers. CANWARN continues to be an important asset for Canada to spot and report severe weather.

This agency's role was greatly expanded after a severe F4 tornado touched down on July 31, 1987, known as Black Friday. The Edmonton, Alberta city tornado clocked winds of in excess of 258 MPH (416 km/h) killing 27 and doing more than $250 million dollars ($330 million Canadian dollars) damage. Ontario Province frequency information can be found using the following websites:

CANWARN's general website: **www.on.ec.gc.ca/canwarn/home-e.html**

ARES

ARES (Amateur Radio Emergency Service) is sponsored by the ARRL (American Radio Relay League) and is non-government organization. ARES members volunteer their time and equipment in times of a disaster either locally or requiring travel. Their function is focused on accurately handling written messages utilizing HF, VHF repeater nets and digital modes. **www.ares.org**

MARS

MARS (Military Auxiliary Radio System) members are hams who assist in emergency communications and are authorized to use military frequencies. These frequencies fall outside those that are assigned to Amateur Radio Service. MARS originally provided health and welfare communications to military members, civilian employees and contractors in remote areas. Since Katrina and the 9/11 attacks the DoD has MARS focused on Homeland Security. They are to provide, "contingency radio communications" to support government operations, DoD components, and "civil authorities at all levels," providing for national security and emergency preparedness. MARS operators must be capable of operation in "radio only" mode without the use of landlines or the Internet and have an emergency power source. Stations must have the capability to be transportable for deployment.

RACES

RACES (Radio Amateur Civil Emergency Service) is a public service group that, when activated, provides communications between the Office of Emergency Management (OEM) and the Federal Emergency Management Agency (FEMA). Typically, this is 2 meter FM communications between hospitals, emergency services and shelters. Check with your state, county and local government OEM offices for repeater frequencies.

Red Cross

Many Red Cross Chapters have permanent Amateur Radio Stations in place; they provide relief efforts in health and welfare along with food, clothing, financial assistance and emergency communications.

VoIP.net

VOiP utilizes EchoLink software using MS Windows environment to provide amateur radio communications. This program allows worldwide communications connections to be made between amateur stations utilizing the Internet. VoIP (Voice Over Internet Protocol) has been a valuable asset to the National Hurricane Center.

Maritime Mobile Service Net

Operates on 14.300 MHz and alternately 14.313 MHz **www.mmsn.org**. Founded in 1968, it uses volunteer radio amateurs to run maritime and emergency communications. This includes vessels in distress, medical emergencies from foreign countries and health and welfare traffic in areas affected by natural disasters. During severe weather, the net serves as a beacon for ships and broadcasts high seas and tropical weather warnings from the NWS and NHC. The net also gathers live weather information from maritime mobile stations to forward to the NWS using the internet.

Pacific Seafarer's Net

PACSEA begins operation on 14.300 MHz at 0300 UTC on the closure of the MMSN and runs for approximately 2 hours. Member stations are located in North America, Australia, New Zealand and the Pacific Islands. Traffic consists of weather observations and reports along with maritime messages. **www.pacsea.org**

WHERE TO LISTEN

The following frequency list provides information on various radio amateur weather and emergency related communications service nets. This table may be printed from the file located on the *Monitoring Times* website, **www.monitoringtimes.com/**. *MT* Utility World columnist, Hugh Stegman NV6H, provides a complete net listing that exceeds the space for this article. You can use the following link to access that listing: **www.ominous-valve.com/hurrlist.txt**

About the Author: Gregory Smith is retired and works part time as a consultant in EMC testing and mitigation. He holds an FCC Amateur Extra Class License, WB2PPQ, and is an avid weather enthusiast being a member of both the Badger Weather Net and the New England Weather Net. He is a certified SKYWARN severe weather spotter for Mount Holly, NJ and Upton, NY. MT

WEATHER, EMERGENCY & TRAINING NETS

80 METERS LSB		40 METERS LSB	
FREQ.	NET	FREQ.	NET
3696.0	BAHAMAS WX	7096.0	BAHAMAS WX
3815.0	CARIBBEAN	7158.0	CARRIBEAN
	WXNHC/NHW (NIGHT ALT)	7225.0	C. GULF COAST HURRICANE
3820.0	MARYLAND EMERG. PHONE	7235.0	C. GULF COAST HURRICANE
3855.0	TRINIDAD EMERG.		REGIONAL EMERG. HURRICANE
3873.0	ARES W. GULF EMERG.		LA, EMERG, C. GULF HURRICANE
	C. GULF COAST HURRICANE	7240.0	AMER. RED CROSS GULF COAST EMERG.
	ARES LOUISIANA		TEXAS EMERG.
	LOUSIANA EMERG. & TRAF.	7242.0	S. FLORIDA EMERG.
	MISS. EMERG. & TRAF	7243.0	ALABAMA & SC EMERG.
	ARES TEXAS		S. CARROLINA EMERG.
3905.0	DELAWARE EMERG. PHONE	7245.0	S. LOUISIANA EMERG.
3907.0	CAROLINA COASTAL EMERG.		RACES NEW YORK STATE
3910.0	ARES MISSISSIPPI	7247.0	SOUTH EAST U.S. EMERG.
	CENTRAL TEXAS EMERG.		ARES N. FLORIDA
3911.0	SKYWARN W. CENTRAL FL	7248.0	RACES TEXAS (TACT.)
3915.0	S. CAROLINA EMERG.	7250.0	SATERN SALVATION ARMY
3923.0	ARES MISSISSIPPI & TAR HEEL NET	7254.0	N. FLORIDA EMERG.
3925.0	C. GULF COAST HURRICANE	7260.0	W. GULF COAST HURRICANE
3927.0	ARES N. CAROLINA		VIRGINIA EMERG.
3930.0	C. GULF COAST HURRICANE (ALT)	7265.8	SATERN SALVATION ARMY (ALT.)
3933.0	PANHANDLE EMERG.		WX4NHC (ALT.)
3935.0	ARES SECT: LA, MI, OK & TX	7273.0	ARES TEXAS (ALT.)
3940.0	ARES S. FLORIDA		
	SATERN (ALT)		20 METERS USB
3944.0	WEST GULF EMERG.	FREQ.	NET
3950.0	ARES N. FLORIDA	14118.0	PACIFIC & CARRIBEAN EMERG.
	NATIONAL HURRICANE WATCH	14185.0	CARRIBEAN EMERG. FREQ.
3955.0	S. TEXAS EMERG.	14265.0	SATERN PRIMARY M-F
3957.0	LOUSIANA STATE EOC	14270.0	RED CROSS
3960.0	NORTHEAST COAST HURRICANE	14300.0	MARITIME MOBILE SERVICE
3965.0	ALABAMA EMERG.		U.S. COAST GUARD AMATEUR
3975.0	RACES DISTRICT 32		INTERCONTINENTAL
	ARES GEORGIA	14303.0	ARRL INTERN. ASSISTANCE
3980.0	ARES SE VIRGINIA	14310.0	MARITIME EMERG
3993.5	RACES NY, ARES KY & ARES S.C.	14313.0	U.S. COAST GUARD AMATEUR
	GULF COAST HEALTH & WELLFARE	14315.0	PACIFIC ISLANDS DISASTER
		14325.0	HURRICANE WATCH (PRIMARY)
		14327.0	U.S. COAST GUARD AMATEUR
		14340.0	MARITIME EMERGENCY

Crystal Set Leads to Lifelong Hobby and Career

By Maury Midlo

As a kid in the late 1940s and early 1950s I lived in Louisiana and was very much involved with radio, thanks to a good friend who was destined to follow in the footsteps of his father, who was an electrical engineer.

We began with the construction of crystal sets; primitive, but amazingly functional radios that could be constructed from simple ingredients. We used wire wrapped around an oatmeal box and a mysterious item called a "cat's whisker," a small rod about one and a half inches long to which a short wire was attached and randomly positioned on the surface of a small, shiny galena crystal with the almost unbelievable ability to pull radio signals out of the air and send them into earphones.

The crystal set needed no household electric power or battery. I found that a long wire antenna dramatically increased the range and efficiency of these primitive radios and eventually a copper wire ran from a pole at one end of our roof to the other, then down through a window into my room.

A crystal set couldn't be tuned with a knob like a real radio, so what I heard was largely a matter of luck. The great challenge was to hear a radio station from a distant city, and this could best be accomplished on Sunday nights, after midnight, when all the local stations went off the air. That led to the need to stay awake long after my parents declared bedtime and to secret listening that contributed to the enjoyment and excitement of the hobby.

The major powerhouse radio broadcasters of that era (that operated on Sunday nights) were in Shreveport, Saint Louis, and Pittsburg. Once I had logged the reception of those easy catches, everything else was a special trophy. Of course, to legitimately claim such a prize I had to wait until the announcer actually identified the station with its city location and call letters, KDKA, KMOX, etc. Sometimes late at night this did not occur as frequently as a kid might wish. It wasn't long before we taught ourselves to solder and follow kit-building instructions, so radios of greater complexity followed.

Now, while all of this technologically-motivated radio listening was going on, there was music being beamed into our headphones, speakers, and psyches. Initially, that was an incidental byproduct of the radio hobby and the influence and value of the music was not immediately apparent. Of course, we heard "pop" tunes and "Hit Parade" nominees, but we also heard "Country and Western" and "Gospel" music.

I don't know about my pal, but my exposure to some of this music had a profound influence on my life, politics, and philosophy. From Country and Western songs I learned that not everyone benefited from the economic advantages that accrued to those lucky enough to be born to middleclass or better parents, and thus became educated and destined for white-collar jobs or professions. Of course, many of the songs dealt with the eternal verities: love (that is, sex), death, booze, parents, regrets, injustice, infidelity, bad luck and so forth. This was an introduction to a wider world; one which I knew that I would not actually enter myself, but could always sympathize with and, in my way, respect.

Gospel music, while not prevalent on the white "top 40" stations, was heard on some of the late-night, rural-oriented broadcasters and gave me a feeling for the religion, devotion and pessimism of African-Americans at that time. Their hope that Jesus would hear their sorrowful cries and take them away to a better world someday, while infused with the power and rhythm of their musical renditions, was a strong influence on my future belief in the dignity and worth of black people.

Later in my high school years I received an amazing gift. An uncle gave me a very expensive, top-of-the-line Hallicrafters SX-42 AM-FM-shortwave radio. This device, at the complete opposite end of the complexity scale from the crystal set, was my entry to the world of international shortwave broadcasting, a fascination that became a life-long hobby. An interesting and challenging aspect of the hobby was the collection of QSL cards. Some eyebrows were raised when, during the early years of the Red-scare Cold War era, I requested and received such a card from Radio Moscow!

My buddy and I sometimes went to the home of a classmate to see his father who was an amateur radio operator (W5PDP). He would let us watch him at his rig, explain what he was doing, and perhaps let us speak briefly with the other hams he contacted around the country. That was a real treat. While my friend eventually received his amateur license I never did. Although I would have been able to easily pass the electronic theory, math, and legal portion of the amateur radio exam I did not have the self-discipline to sit down and learn Morse code.

While radio, and the forerunners of what we now call consumer electronics, was central to my teen years, these interests also influenced some major later-life decisions and affiliations.

Before graduating from college I needed to elect an Army branch in which to serve my two-year active duty obligation. I chose the Signal Corps and spent my time in radio relay companies (both VHF and UHF). In 1958 I was stationed at the Army's Electronic Proving Ground (Ft. Huachuca, Arizona) when I bought a small Heathkit shortwave radio kit and, when it was assembled and operating, heard the "beep beep beep" signal from Russia's Sputnik that heralded the arrival of the space age.

Following my military service I was fortunate to be employed by WDSU-AM-FM-TV, New Orleans, a pioneering broadcast operation. I started in the newsroom as editorial research assistant to Bill Monroe (who later went on to national prominence with NBC's "Meet the Press"). WDSU-TV was the fourth TV station in the U.S. to air editorial opinions in addition to impartial news reporting. Its liberal opinions were not always welcomed in the conservative community, but were recognized nationally.

I moved to the management side of the stations, in the promotion department, eventually becoming promotion director, responsible for audience and sales promotion. Although not personally involved in the engineering side of the business, my background in electronics, radio relay, and microwave helped me to better understand and promote the technical expertise and achievements of the broadcasting operations. MT

SCANNING REPORT

THE WORLD ABOVE 30MHZ

Dan Veeneman
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What's the Frequency, Dan?

Like many grocery store products, scanning information has a shelf life. As your frequency lists and system charts get older, they tend to go stale, becoming less and less useful over time. This month we answer a number of mailbag questions related to finding new and updated frequencies and talkgroups.

❖ Border Patrol

Dan,

I've been a Monitoring Times subscriber for many years and I have a question for you. I live in San Diego, California and I used to enjoy monitoring the U.S. Border Patrol in the 1980s using their old frequencies (162.900 and 163.something). How can I listen to them now, since they no longer use the old frequencies? Do you know what frequencies they are on now? Also, I used to listen to the local McDonalds down the street from where I live, I think the frequency was 154.400? I can no longer hear them there now. I do listen to the San Diego Police Department on my Realistic trunk tracker scanner, so that is no problem.

Thanks for your help,
Rene

The United States Border Patrol is part of Customs and Border Protection (CBP), which in turn is a component of the Department of Homeland Security (DHS). Border Patrol's San Diego Sector covers more than 7,000 square miles and includes a 66-mile-long border with Mexico, across from the cities of Tijuana and Tecate. The Sector is headquartered in Chula Vista and has seven stations and two substations located throughout San Diego County.

Border Patrol still operates in the VHF band, between 162 and 174 MHz, although in some areas the radio equipment has been upgraded to APCO Project 25 digital standards. In many cases, the voice traffic may be encrypted, in which case you won't be able to hear much but digital noise. The following is a list of reported frequencies and the areas local to you in which they can be heard:

Area	Frequencies (in MHz)
Boulevard	172.987, 173.162
Brown Field	162.900, 172.512, 173.450
Campo	168.850, 173.650
Chula Vista	162.825, 163.625, 169.387, 170.063, 173.975
El Cajon	166.225, 167.263, 167.550, 168.500, 173.188
El Centro	162.875, 163.725, 163.775, 167.650, 167.775
Imperial Beach	172.400, 173.475
Indio	163.625, 170.600
San Clemente	163.725, 165.850, 167.700
San Diego	162.300, 162.6625, 162.950, 163.125, 163.175, 163.650
Orange County	162.975, 163.675

You may find additional frequencies by using your scanner's search feature to check for activity between 162 and 174 MHz. Keep in mind that other federal departments may also be operating in this band, along with local and state agencies.

Be sure to report back what you find to Chris Parris for *The Fed Files* column in *MT*, where this agency is regularly covered.

Restaurants

Many fast food restaurant order takers use wireless headsets to communicate with the speaker box in the drive-thru lane. These headsets are low power radio transceivers operating at very short range, so checking and verifying operating frequencies for a particular establishment usually requires some local fieldwork.

Consider parking near the drive-thru and using the frequency capture feature of your scanner, if it is so equipped. Newer Radio Shack scanners have a tool called *Signal Stalker* that can automatically detect and monitor nearby radio transmissions (Uniden scanners have a similar feature named *Close Call*). Because of the variety of wireless equipment used by various fast food places, you may have to directly scan for activity in the following frequency ranges:

30 to 35 MHz
151 to 152 MHz
154 to 155 MHz
457 to 469 MHz
903 to 904 MHz
920 to 921 MHz

You may not always be successful in finding an active wireless operation. Some restaurants may use a "hard wired" ordering system where the clerk wears a wired microphone and headset, thus eliminating the radio transmission. Other establishments continue the process of outsourcing local jobs by experimenting with remote order taking. Inexpensive telecommunications make it economically feasible for centralized receptionists to take orders for restaurants located hundreds or thousands of miles away and digitally transmit the selections back to the local food staff for preparation and delivery. For example, McDonalds, Wendys and Jack-in-the-Box all operate franchise stores that use remote order takers, claiming it improves speed and accuracy and provides a consistent level of service.

You may want to keep a low profile while doing your restaurant monitoring, since there have been several publicized pranks involving these wireless headsets. By transmitting on the same frequency as the drive-thru with a more powerful radio, these pranksters engage in their own conversations with customers, with predictable results. If you're observed with "suspicious" radio equipment near an establishment that has been pranked in the past, you may become a suspect and get more attention than you'd like.

❖ O'Fallon, Missouri

The O'Fallon, Missouri police have switched from analog to LTR but I understand that they are still on the same frequencies, 854.6625 and 855.7125 MHz. Are you able to find anything on this? I have a Uniden 796D radio.

Thanks,
Tom

The City of O'Fallon is located 30 miles west of Saint Louis and is home to about 75,000 residents. It is a quickly growing metropolis, having almost doubled its population in the past ten years.

Last year the city replaced their two decade-old radio system with a new $1.8 million digital communication system from Motorola. The old system used for the following conventional analog frequencies:

Frequency	Description
155.895	Public Works
809.6625	Police (Car-to-Car)
854.6625	Police (Dispatch)
855.7125	Police (Car-to-Car)

In December the city changed over to the new system, which is trunked on the following repeater site frequencies: 769.28125, 769.75625, 770.00625, 770.50625, 770.75625 and 771.10625 MHz. These six frequencies are in the 700 MHz Public Safety band, having been reallocated from part of the old UHF television band.

700 MHz Public Safety

In 1997 the Federal Communications Commission (FCC) assigned 24 MHz of spectrum in the 700 MHz band for public safety. At the time, this spectrum was assigned to television broadcasters who were operating stations in most metropolitan areas. The slow process of moving from analog to digital TV relied on this UHF spectrum to accommodate politically powerful broadcasters as they moved to their new digital frequencies. As these broadcast stations vacated the 700 MHz band, it became available for assignment to public safety agencies.

In 2007, the FCC designated two blocks of frequencies in this band, one for narrowband operations and another for broadband activity.

The narrowband block has a total of 1,920 channels, each of which is 6.25 kHz wide. Channels 1 through 960 run from 769 to 775 MHz and are allocated for base station transmissions. Channels 961 through 1920 are between 799 and 805 MHz and are for mobile transmissions. These channels can be used as single 6.25 kHz radio channel, or aggregated with an adjacent channel to form a 12.5 kHz radio channel. Similarly, four channels may be aggregated to create a 25 kHz radio channel, giving some flexibility to public safety users with different spectrum needs, based on the way their equipment carries voice and data traffic.

The broadband block runs from 763 to 768 MHz and from 793 to 798 MHz. This block is intended to provide enough bandwidth for such emerging technologies as real-time video and high-speed Internet access for on-scene emergency personnel. A partnership between commercial interests and public safety will allow the band to be shared, where first responders will have primary access to the broadband spectrum and commercial users will be allowed to use it otherwise.

The intent is that the commercial users will cover the costs of developing new broadband equipment and services, since they can use the spectrum to make money, while public safety agencies will benefit from these new technologies without having to bear the entire cost of their development.

Scanning O'Fallon

The following talkgroups have been monitored on the new O'Fallon system:

Decimal	Hex	Description
10701	29CD	O'Fallon Police (Dispatch)
10703	29CF	O'Fallon Police (Tactical)
10715	29DB	Highway Department

The new system is not a Logic Trunked Radio (LTR) system, as Tom mentions in his letter, but rather adheres to the APCO Project 25 (P25) standards for both digital voice and digital trunking, making it a "pure" P25 system. In order to monitor this system directly, you must have a newer digital scanner that can track the P25 control channel (sometimes referred to as a *9600-baud channel*) and is also capable of tracking activity in the 700 MHz band. Unfortunately, Tom's Uniden 796D is an older model that does not tune these frequencies.

For scanners than can tune 700 MHz frequencies but cannot track them (like the Radio Shack PRO-96, for example), there is some hope. Although this is a digital trunked system, because it is not usually very busy, much of the city activity reportedly takes place on only one or two of the voice frequencies. So, if your scanner cannot track in the 700 MHz band, program the each of the frequencies as conventional (non-trunked) P25. Be sure to skip the control channel – the one that sounds like digital "hash" – which in this system is identified as 770.75625 MHz. By scanning the voice frequencies as conventional P25, you should be able to catch most of action on an older digital scanner.

❖ Nassau County, New York

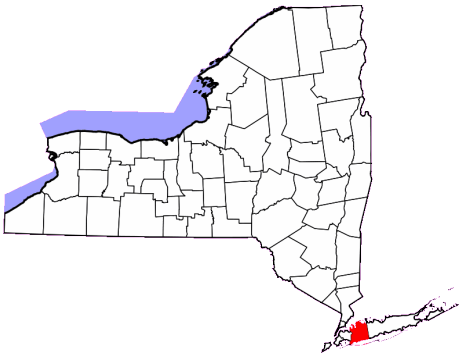
Dear Dan,

I recently updated my Bearcat 396T Scanner. Unfortunately, Nassau County in New York State rebanded their system and I cannot find the new 800 frequencies. It is the GE Ericsson System. Also, can you tell me if the talk groups remained the same, particularly the Village of Old Westbury Police and Port Washington Police?

I've been on many websites and none have this information. I am hoping you can be of assistance to me.

Dennis in New York

Nassau County is on Long Island, New



York. As we mentioned last month, their public safety radio system rebanded in November 2009 to a new set of frequencies as required by the Federal Communications Commission (FCC). 800 MHz systems all across the country are moving downward in the band to avoid interference from commercial Nextel transmitters. Nassau County operates an Enhanced Digital Access Communications System (EDACS) network, so the only thing necessary for scanner listeners to do is enter the new frequencies in Logical Channel Number (LCN) order:

LCN	Frequency
01	851.1875
02	851.3375
03	851.5875
04	851.7375
05	851.8375
06	851.9000
07	852.1125
08	852.1750
09	852.9000
10	853.1750
11	853.4250
12	853.5750
13	853.7250
14	853.6500

The talkgroups for Old Westbury and Port Washington on the Nassau County system prior to rebanding are as follows (remember that EDACS talkgroups use an Agency-Fleet-Subfleet format):

Decimal	AFS	Description
579	04-083	Port Washington Police Patrol 1
585	04-091	Port Washington Police Patrol 2
586	04-092	Port Washington Police Tactical
587	04-093	Port Washington Police (Detectives)
588	04-094	Port Washington Police (Narcotics)
589	04-095	Port Washington (Administrative)
590	04-096	Port Washington (Interagency)
1214	09-076	Port Washington Fire Chief
1215	09-077	Port Washington Fire (Maintenance)
1217	09-081	Old Westbury Police (Dispatch)
1218	09-082	Old Westbury Police Tactical 1
1219	09-083	Old Westbury Police Tactical 2
1225	09-091	Old Westbury Public Works (Primary)
1226	09-092	Old Westbury Public Works 1
1227	09-093	Old Westbury Public Works 2
1724	13-074	Port Washington Fire Department

There are reports that several village police departments have moved from the Nassau County system over to the Metro 21 radio system. Metro 21 is an EDACS network operated by the State of New York on the following frequencies:

LCN	Frequency
1	851.0375
2	851.5375
3	852.0375
4	852.5375
5	853.0375

The following talkgroups are active on the system. Note that near the bottom there are several Nassau County village police departments listed with an Agency prefix of 14. I suspect there are other villages that also made the move but are not listed here. Keep searching and report back what you find!

Decimal	AFS	Description
25	00-031	New York City Police
26	00-032	Patch to 154.695 MHz (Statewide Interagency)
273	02-021	State Police (New York City Troop)
274	02-022	State Police (New York City Troop)
275	02-023	State Police (New York City Troop)
449	03-081	Narcotics Enforcement Unit
497	03-141	State Police Criminal Investigation (Tactical 1)
498	03-142	State Police Criminal Investigation (Tactical 2)
499	03-143	State Police Criminal Investigation (Tactical 3)
529	04-021	State Police (Administrative)
530	04-022	State Police (Administrative)
561	04-061	Westchester Narcotics 1
562	04-062	Westchester Narcotics 2
563	04-063	Westchester Narcotics 3
785	06-021	White Plains Organized Crime
786	06-022	White Plains Organized Crime
787	06-023	White Plains Organized Crime
788	06-024	White Plains Organized Crime
789	06-025	White Plains Organized Crime
801	06-041	Investigators
865	06-121	Queens District Attorneys
866	06-122	Queens District Attorneys
929	07-041	State Courthouses
930	07-042	State Courthouses (Security)
1009	07-141	State Park Police
1809	14-021	Kings Point Police
1810	14-022	Lake Success Police
1811	14-023	Sands Point Police
1812	14-024	Port Washington Police
2001	15-101	State Park Police

If you're not hearing anything, be sure you have the frequencies programmed in the correct LCN order, then run your scanner in "Open" mode to capture all of the activity it picks up.

In addition, Nassau County Police use the following conventional (non-trunked) frequencies:

Frequency	Description
153.7400	Aviation
477.1875	Aviation
477.2125	Precincts 4 and 5
477.2375	Narcotics
477.2625	Emergency Service Units
477.3875	Precincts 2 and 8
478.5375	Precincts 1 and 7
478.5625	Tactical 2
478.7125	Detectives 1
478.7375	Car-to-Car
478.9125	Precincts 3 and 6
478.9375	Detectives 2
480.2875	Police (Tactical)

❖ Milwaukee, Wisconsin

It appears that the Milwaukee Police Department has completed its transition to the OpenSky system as several analog dispatch channels have been dead for two days since no voice traffic has been heard. A further news report states that the Milwaukee Fire Department should complete their changeover to OpenSky by the end of summer.

Paul in Wisconsin

Milwaukee, a city of 600,000 located on the shore of Lake Michigan in southeastern Wisconsin, began their experiment with OpenSky back in 2003, when they committed to a $15 million project to replace their existing analog public safety radio system. The project was divided into four phases, the first of which was to install a data capability for the police and fire departments. This appears to have been completed more or less successfully and has been operational for some time.

The second phase was for voice capability in the police department, originally scheduled for completion in November of 2005. A series of failed operational tests caused OpenSky's manufacturer to miss the original date as well as several subsequent target dates. The third and fourth phases of the project were planned to get voice communication into the fire, emergency medical services and public works departments.

Adding to the project's uncertainty was Tyco's sale of the M/A-Com wireless business, the home of OpenSky, to Harris in April 2009. This followed the State of New York's highly publicized cancellation of their planned $2 billion statewide OpenSky system due to numerous failures and shortcomings.

Despite a long history of problems, in January of this year the Milwaukee Police Chief stated that they will have "a fully functioning" OpenSky system by September. Reports from Paul and other readers indicate the police have switched to the new system for an extended period of testing, with continuing reports of dead spots (areas of the city with poor or no coverage), poor sound quality, and equipment reliability problems. Of particular concern are complaints that the system occasionally rejects user attempts to transmit, even when a voice channel is idle and available for use. Such rejections could put officers in danger if urgent or emergency transmissions are blocked or lost.

Scanner listeners are also unhappy because there is currently no commercially available scanner that can monitor or track OpenSky transmissions, leaving the news media and the general public in the dark.

That's all for this month. Check my web site at **www.signalharbor.com** for trunk-tracking scanner details, and as always I welcome your questions, comments and scanning reports via e-mail at *danveeneman@monitoringtimes.com*. Until next month, enjoy the April showers and look forward to the May flowers!

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

❖ GSM in the U.S.

In my February column I mentioned the widespread use of GSM cellular technology in Europe. Well-known radio amateur Larry Price, W4RA, correctly points out that GSM is growing rapidly in the U.S. as well, thus enabling court-ordered wire taps easier access than in comparable cellular systems.

Q. *I work in an electronic assembly firm and wonder why there is a highly-conductive, metal shield on the opposite side of a board-to-board connector in a cellular telephone. (Idris, Singapore)*

A. If the metal presses against the ground foil of the board, it's likely to be for any or all of the following reasons:

1. To provide a common ground bridge across the connector on the board.
2. To act as a shield against external electrical interference
3. To prevent unwanted radiation from the bare connector leads to exit into the environment;
4. To isolate the internal wiring and components from the capacitive effect of nearby objects touching it (your hand, for example);
5. To provide a uniform impedance path in the connector traces, much like the shield around coaxial cable does, thus assuring efficient signal transfer.

Q. *I have a 30-ft. wire antenna connected to my YB-550 portable multiband radio. I am experiencing considerable interference from stations all over the band like the radio is operating beyond its capability, and some signals are mirrored at different frequencies. Is there some sort of tuner I can attach to correct this problem? (Brian Valbert, Columbia, SC)*

A. You probably have already tried to switch the attenuator to "LOCAL" which should reduce the interference from strong signals; you could also try shortening the antenna.

The interference you have described is known as "front end overload." The little amplifier transistors are receiving signals too strong for them to process correctly. The "mirror" signals are called images, and they are produced the same way, but by transistors a little further down the line from the amplifier transistors.

Yes, you can connect a passive (unamplified) preselector ("tuner") between the antenna and radio to reduce both problems. Grove and other *MT* advertisers carry just such accessories, like the MFJ-956 which costs about $70.

Q. *Is the difference in impedance between the antenna and feed line the reason we have baluns and antenna tuners? (John Bishop, Hawthorne, FL)*

A. Yes. If there is a pure resistive impedance ratio between the feedline and the wire antenna, then they can use a simple balun transformer. Balun is a contraction "balanced to unbalanced," meaning that you are connecting coaxial cable (unbalanced transmission line) to a balanced feedpoint (the wire antenna).

If, however, there is reactance in the line (too much capacitance or inductance), the system needs to have the reactance canceled by a transmatch (transmission line matching device) into the line which provides inductance to cancel too much capacitance, or capacitance to cancel too much inductance, thus leaving the pure resistive impedance in the system.

When too much reactance is present, large voltages can build up on the transmission line; we call this a mismatch, described as "voltage standing wave ratio," or VSWR, often shortened simply to "SWR."

These higher voltages increase the amount of power lost by heating the insulation in the feedline, and can also reflect back into the transmitter, damaging delicate components in the final amplifier stage.

Q. *I was reading the FCC regulations on the General Mobile Radio Service (GMRS) and see that single sideband (SSB) is allowed. I thought only FM transceivers were used; who's making sideband radios? (Chuck Stevens, Concord, NH)*

A. Nobody that I'm aware of. Since the manufacturers respond to the demands of the market, and virtually everyone in the UHF land mobile service uses FM, that's where the market is. That said, there certainly is an advantage with narrowband SSB over the noisier, wider-band FM, so distances would be noticeably improved.

Q. *If I walk around the room with my portable radio, sometimes the signal will improve, and sometimes it gets weaker; I may even cause interference on the signal if I hold the whip with my hand. What causes these effects? (Ted, email)*

A. There are two effects happening with the fade:

1. Different parts of your home have different amounts of metal in them (wiring, appliances, metalized insulation, reinforcement rods and screens in the walls, metal siding, heat/air duct, etc.). These act as shielding which attenuates the incoming radio signal; and
2. Reflections of the waves from metal scatter them, and as they cross out of phase, they null, minimizing the signal at that position.

Holding the whip antenna adds your conductive body to the length of the antenna, picking up more signal strength, whether desirable radio signals or nearby interference (fluorescent lights, appliances, your computer monitor, etc.); it can also cause strong-signal overload which can interfere with your signal.

Q. *I live in an apartment and don't have much room to run a full-length shortwave antenna. Can I run it across a wooden ceiling beam, then turn it 90 degrees toward the wall, then run it back, making a "U" shape? I could do the same thing on my wooden porch rail. (Glenn Delisle, email)*

A. The best configuration is straight, second best is L-shaped, and worst is the U shape, because when it folds back on itself, signals from some directions will actually be reduced because the same signal is received on the two wires running in opposite directions, so the two signal voltages meet going in opposite directions (out of phase) and subtract rather than add together.

One possibility is to run the wire in three dimensions – along the wood horizontally, then the L, still horizontally, then up or down for the remainder. Could you put it outside on that railing and run the final length down, letting it drape, or up and tying it off above the porch somehow?

Indoor shortwave antennas are vulnerable to picking up all sorts of electrical noise interference, and signals are also attenuated by metalized insulation, wiring, heating/air ducting, metal siding, etc.

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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Israeli "Numbers" - A New 20-Meter Mystery

Last month, we mentioned that the frequency of 14000 kilohertz (kHz) was something of a bad neighborhood. All manner of utility weirdness turns up there.

14000 is, of course, the extreme lower limit of the internationally allocated, 20-meter amateur radio band. Hams really shouldn't transmit that low, since the regulations require that all of their signals remain inside the band.

That, of course, doesn't stop the people who are using the frequency without authorization. Even though this is one of the most conspicuous places in the whole non-broadcast radio spectrum, it has attracted a pretty motley crew over the years.

❖ The E10 Enigma

ENIGMA 2000, as most know, is the 21st-century online incarnation of the older European Numbers Information Gathering and Monitoring Association. Its newsletters are truly authoritative, not to mention extremely comprehensive. Its mailing list attracts some pretty sharp people. Finally, it maintains the Enigma Control List (ECL), which is the standard means of bringing order from the "numbers" chaos heard on the bands.

The ECL is the canonic list of all those funny little identifiers one sees whenever these stations are discussed. These really are incredibly useful. In the case of Israel's E10, the "E" stands for "English," and the 10 is simply the 10th station so classified.

The Enigma Control List is always available on this column's web site. It and the newsletter are also at **www.apul64.dsl.pipex.com/enigma2000/** .

❖ Basic E10 Review

E10 is also called the Phonetic Alphabet Station, from its truly weird format. A "female" computer voice gives three-letter identifiers and 5-letter-group messages using standard military phonetics in English. There are also a few procedural signals, such as "Group," "Message," "Repeat," and "End of message."

"Her" accent is kind of bizarre, and, since the transmissions are spliced from digitized words, it is always the same. "Oscar" (O) rhymes with "NASCAR." "November" (N) rhymes with "beer." And so on.

E10 is possibly the most active numbers network in existence, though the Cubans give them a very close run for it. The origin is as well known as anything ever gets in the numbers scene. It's definitely coming from the Israeli intelligence apparatus. The best known agency here is the famous Mossad, but there are other possibilities.

As if this wasn't distinctive enough, the signals are usually in a mode classified as R3E by the international bodies that standardize such things. In the case of E10, this means single-sideband, reduced-carrier emission, with only the upper sideband being transmitted. R3E has the advantage of sounding clear in either amplitude modulation (AM) or upper sideband (USB) receiver modes. In fact, it's hard to tell from AM, except that if one checks the lower sideband, it isn't there.

❖ 20-Meter Mystery

Last month, this column noted that a mysterious carrier was heard whenever the 14000 kHz frequency had propagation. Israel was suspected. Your editor couldn't hear this on the United States West Coast, but the WebSDR in the Netherlands picked it up nicely.

SDR stands for Software-Defined Radio, which is precisely what this is. It converts and digitizes several radio bands of interest to hams, and lets World Wide Web users tune through them with a Java application. It's reached at **websdr.ewi.utwente.nl:8901/** .

While the SDR's Internet stream isn't as stable as a signal from one's own radio, the fading and phase distortion were still clearly caused by ionospheric propagation. The carrier was not locally generated.

Sure enough, at 0700 Coordinated Universal Time (UTC), up popped "Alpha Romeo Tango" (ART), with a callup and message. About a week later, "Yankee Hotel Foxtrot" (YHF) was heard at 0730, also with a message. Further, "Mike L" of ENIGMA has heard "Papa Charlie Delta" (PCD) there.

The carrier definitely appears associated with these transmissions. It does not change at all for them. Is it a channel marker?

All of this is extremely significant due to E10's use of tight message slots, some lasting years. Identifiers tend to be associated with specific frequencies. It's always interesting to hear two, let alone three, on the same frequency. Further, ART, YHF, and PCD are among the most active ones. The only others in the high-traffic group are EZI and ULX. If these ever turn up on 14000 we will really have something noteworthy.

No one knows what makes this frequency so special. It might be a common channel of some sort. Perhaps it's for testing.

❖ Other E10 Frequencies

As long as we're doing E10, let's hit their latest frequencies as of early 2010.

ART: 2456, 3415, 4165, 5435, and 6986 kHz, AM or R3E.
EZI: 4270, 6840, 7690, 9130, 11565, 13533, and 15980.
PCD: 2515, 3150, 4270, 5170, 6498, 8805, 9130, and 14000.
ULX: 2743, 3270, 4880, 5230, 5820, 6270, 6298, 7760, and 14000.
YHF: 2844, 3840, 4560, 5820, 6370, 7918, 9202, 10648, and 14000.

"New" identifiers are HNC (once on 4114 kHz, in January), and TMS (once on 6428, last year). Lastly, the old identifiers of CIO, FDU, KPA, MIW, SYN, and VLB have not been heard since 2007. One is reluctant to drop them, because past E10 identifiers have sometimes come back after years.

We thank the ENIGMA 2000 group and a whole lot of other people for their dedicated watch on E10.

❖ Bye Bye Loran-C

By the time anyone reads these words, the United States will have already commenced an orderly shutdown of its entire Loran-C navigation system. Some stations in this expensive and far-flung network were expected to leave the air as early as 2000 UTC on February 8.

Since many Loran "chains" (transmitter networks) are jointly operated with Canada, their coast guard quickly announced its own shutdown. By October, all Loran in North America should be gone.

This news came quite suddenly, with a terse publication by the US Coast Guard in the January 7, 2010 Federal Register. They said simply that not many people used it, and that it had been slated for elimination by Congressional budgeting unless any Federal agency considered it indispensible. Obviously, in this age of Global Positioning System (GPS), none did.

This all seems like a no-brainer. However,

as with so many other government decisions, it's not that simple. Let's consider some history.

Loran stands for Long Range Navigation. Its rather crude Loran-A mode dates to World War II. This blasted megawatts of synchronized radio pulses to a waiting oceanic world over frequencies of 1750, 1850, 1900, and 1950 kilohertz (kHz). Its wartime allocation effectively wiped out most of the 160-meter amateur radio band for around 20 years. The hams didn't get all of it back until the 1960s, when the world had finally finished its transition to the present system, called Loran-C. This uses equally staggering pulsed power levels on 100 kHz.

Some 50 years later, Loran-C is obviously an obsolete technology. Were reality as simple as the situation described in the Coast Guard's notice and subsequent explanations, there'd be no excuse to keep it going another second. But it isn't.

One can find all manner of references to an ongoing upgrade of Loran-C to a new mode called eLoran (for "enhanced Loran"). This mode was said to be everything Loran-C wasn't. It incorporated many improvements that worked alongside GPS, improving the performance and reliability of both systems.

Depending on whom you wish to believe, the United States has already spent somewhere between zero and 150 million dollars of our money on eLoran, with most informed sources favoring that second number. Private corporations were certainly under the impression that something was happening, as they spent a bundle developing new products. These were just coming onto the market.

Money talks, and in this case it's most likely saying goodbye. One is inclined to think that it's all been wasted. Worse, we are certainly back to square one on implementation of a badly needed terrestrial complement to GPS. Many agencies consider this essential.

For now, anyway, some other countries, such as the UK, are pressing on with eLoran. We'll see how this plays out. May you have fair winds and following seas until next month.

ABBREVIATIONS USED IN THIS COLUMN

AFB.....Air Force Base
ALE .....Automatic Link Establishment
ARQ.....Automatic Repeat reQuest (teleprinting).
ATC.....Air Traffic Control
CAMSLANT .....Communications Area Master Station, Atlantic
CAMSPAC .....Communications Area Master Station, Pacific
CIS .....Commonwealth of Independent States
Coquelet-8 .....Old 8-tone French teleprinting system
CW.....On-off keyed "Continuous Wave" Morse telegraphy
DSC.....Digital Selective Calling
EAM.....Emergency Action Message
FAX.....Radiofacsimile
FEMA .....US Federal Emergency Management Agency
FSK.....Frequency-Shift Keying
HFDL .....High-Frequency Data Link
HF-GCS .....High-Frequency Global Communication System
LDOC .....Long-Distance Operational Control
LSB .....Lower Sideband
MARS .....US Military Auxiliary Radio System
MX.....Generic for Russian single-letter beacons/ markers
NS/EP .....National Security/Emergency Preparedness
RTTY .....Radio Teletype
SECURE.....State Emergency Capability Using Radio Effectively
Selcal .....Selective Calling
SITOR-A/B .....Simplex Telex Over Radio, mode A or B
STANAG.....Standardization Agreement
STANAG 4285...Military 8-state data mode
UK.....United Kingdom
Unid .....Unidentified
US .....United States
USAF.....US Air Force
USCG .....US Coast Guard
Volmet.....Scheduled aviation "Flying Weather" broadcast
X06.....Old Russian "Mazielka" audio tone calling

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 ().

474.0 "P"-Kaliningrad Naval Radio, Russia, CW channel marker (MX), switching to FSK Morse for coded message in 90 5-number groups, at 1930 (MPJ-UK).
2187.5 002734419-Astrakhan Radio, Russia, DSC call to 002734423, Makhachkala Radio, at 1914 (PPA-Netherlands). SPS-Witowo Radio, Poland, DSC all-ships call to announce voice information broadcast on 2720, at 1934 (MPJ-UK).
2289.0 CHGOIL120-Telecom company NS/EP station, Chicago, IL; with CLEVOH128, Cleveland, OH; ALE at 1311 (Jack Metcalfe-KY).
2326.0 SEMOHQ-NY State Emergency Management, WPHM 628, ALE sounding at 1202 (MDMonitor-MD).
2761.0 OSU-Oostende Radio, Belgium, live male reading information, at 2234 (MPJ-UK).
2872.0 Gander-Gander Radio, Canada, working KLM686, a Boeing 747, at 0455 (PPA-Netherlands).
2962.0 New York Radio, NY, position from Delta 126, then handed aircraft to 5598 for Santa Maria, at 0345 (Allan Stern-FL).
2971.0 Shanwick, position from Speedbird 216 (British Airways), at 0340 (Stern-FL).
3016.0 Santa Maria-Santa Maria Aeradio, Azores, selcal checks and positions with various aircraft, at 0301 (Stern-FL).
3167.0 "P"-Russian channel marker (MX), Kaliningrad, CW at 2256 (MPJ-UK).
3170.0 SPFDIL248-NS/EP station, Springfield, IL, ALE sounding at 1415 (Jack Metcalfe-KY).
3187.0 P4NX-CIS military, daily changing tactical call, calling 5SAB, CW at 2225 (MPJ-UK).
3315.0 AFA3AJ-USAF MARS, VA, Northeast Area Net with AFA2NC (NY) and AFF3WV (WV), at 0108 (Mark Cleary-SC).
3320.5 NNN0GBS-US Navy/ Marine Corps MARS, SC, South Carolina Net at 0121 (Cleary-SC).
3390.0 NNN0BKH-US Navy /Marine Corps MARS, Region 4 NC Net at 2317 (Cleary-SC).
3413.0 Shannon Volmet, Ireland, formatted aviation weather at 0528 (Stern-FL).
3446.0 Unid-Two males conversing in Japanese, at 0109 (Prez-MD).
3455.0 New York, position from Cactus 740 (USAir), gave secondary frequency of 2887, at 0332 (Stern-FL).
3485.0 New York Volmet, Terminal Aerodrome Forecasts at 0544 (Stern-FL).
3494.0 San Francisco-Aeronautical Radio, Inc., LDOC traffic at 0209 (Stern-FL).
3831.0 ZLST-German Customs, Cuxhaven, working ZHEL, Customs Cruiser *Helgoland*, ALE and data modem, at 0006 (MPJ-UK).
3890.0 UWS3-Kiev Radio, Ukraine, CW traffic list and weather for river traffic, at 2035 (27Jan10) (MPJ-UK).
4002.9 AAM4TN-US Army MARS, TN, Region 4 Tennessee net with AAT4BH (TN), others, LSB at 0106 (Cleary-SC).
4020.0 UZC2-Ukrainian government/ military, FSK Morse operator chatter with UTN7, then into 50-baud mark/ space reversals, at 2000 (ALF-Germany). UZC2, with reversals, then working UTN7 in FSK Morse, at 2200 (MPJ-UK).
4149.0 WBN6511-Crowley Maritime tug *Gauntlet*, checking in with "WPE Jacksonville," FL, at 1359 (Cleary-SC).
4209.5 XSX-Chi-lung Radio, Taiwan, SITOR-B Navtex at 1835 (PPA-Netherlands).
4295.0 FUE-French Navy, Brest, working unknown vessel in STANAG 4285, at 1714 (MPJ-UK).
4362.0 BARBARISI-Italian Financial Police, working GAETA (both city names), ALE at 1944 (MPJ-UK).
4372.0 "8-R-P"-Unknown military trigraph call, no joy calling "H-4-E" at 0215 (Cleary-SC).
4464.5 AFF6LA-USAF MARS, voice net at 0113 (Jack Metcalfe-KY).
4469.0 Florida CAP 44-FL Civil Air Patrol Net, at 1232 (Cleary-SC).
4585.0 Kitty Hawk 30-NC Civil Air Patrol net with 28, 154, and Southeast CAP 43, at 1304 (Cleary-SC).
4721.0 CRO-USAF, Croughton, UK, calling PLA, Lajes Field, Azores, ALE at 1941 (MPJ-UK).
4730.0 NOJ-USCG, Kodiak, AK, calling J12 (an MH-60J), ALE at 0220 (Cleary-SC).
4872.0 HE4-Polish Military, ALE and female voices in Polish, working AM3 and other three-figure calls, at 1102 (ALF-Germany).
4886.5 T01185-Unknown US military, also on 5236.5, ALE sounding at 2251 (Metcalfe-KY).
5001.1 4XZ-Israeli Navy, Haifa, CW marker at 0250 (PPA-Netherlands).
5065.0 9MV-Royal Malaysian Navy, Johor Bahru, CW drill messages to various addresses at 1644 (MPJ-UK).
5153.7 "D"-Russian military CW cluster beacon (MX), Odessa, parallel 8494.7 and 10871.7, at 1844 (MPJ-UK).
5153.8 "P"-MX, Kaliningrad, parallel 8494.8, CW at 1844 (MPJ-UK).
5192.0 MA1NC-Manchester, NH Emergency Operations Center, ALE sounding at 1335 (MDMonitor-MD).
5321.0 132-Morrocan civil defense, working 101 in ALE, at 2050 (MPJ-UK).
5517.0 Mogadishu-Regional air traffic control, Somalia, working unknown flight at 0045 (Prez-MD).
5520.0 New York, position from Canjet 870, then handed off to Miami, at 0302 (Stern-FL).
5536.0 Holloway-Ethiopian Airlines LDOC, Addis Ababa, taking estimated arrival time of Ethiopian 500, at 0408 (PPA-Netherlands).
5544.0 F-OHGV-Royal Jordanian A320, HFDL log-on with Muharraq, at 1939 (MPJ-UK).
5550.0 New York, position from NATO 03 (North Atlantic Treaty Organization, military E-3), sent aircraft to 3455, at 0016 (Stern-FL).
5575.0 Unid-Aviation weather in Romanian, CW at 0658 (ALF-Germany).
5598.0 New York, position from Delta 108, sent aircraft to 2899 for Gander, at 0305 (Stern-FL).
5616.0 Gander, selcal check HP-DQ with Air France B747 F-GITH, at 0218 (Stern-FL).
5658.0 Lahore-ATC, Pakistan, working China 17 at 0225 (PPA-Netherlands).
5696.0 Rescue 2117-USCG aircraft landing in Nassau, Bahamas, securing guard with CAMSLANT at 1359 (Cleary-SC).
5702.0 JNRSPR-USAF secure data net gateway, Salinas, PR, ALE sounding at 0436 (PPA-Netherlands).
5708.0 483081-USAF Air Mobility Command KC-10A tanker, ALE-initiated patch via Hickam to Tanker Airlift Control Center, at 0500 (Cleary-SC).
5718.0 KLAUSUR-Possible Austrian military, LSB ALE link checks and 110A data modem with STUDENT and NEBEL, at 1110 (ALF-Germany).
5725.0 "2-S-G"-German military players in a multi-national military exercise, doing data link orderwire with "8-T-K" and "5-O-T," at 0323 (ALF-Germany).
5746.0 RNM2-Russian military, reversals and FSK Morse calling REA, daily schedule at 0549 (ALF-Germany).

5807.0 ESCRAVOS-Nigerian National Petroleum Company, Escravos Field, ALE sounding at 0550 (ALF-Germany).
5873.0 Unid-Russian Air Defense, CW tracking messages with time stamps, also 6823.5, at 1150 (MPJ-UK).
5909.5 CSK-USCG Comm Station, Kodiak, AK, calling 708 (HC-130 Coast Guard 1708), ALE at 0419 (Cleary-SC).
6321.7 RIPPERMAIN-US military, ALE link quality analysis and 110A data setup with SAIPANMAIN, LAVAMAIN, LUNKINMAIN and DARKSIDEMAIN, also on 7601.6, at 0300 (ALF-Germany).
6348.0 FUE:-French Navy, Brest, test loop in STANAG 4285, at 1512 (MPJ-UK).
6464.0 VIE-Globe Wireless, Darwin, Australia, identifier C9 in Globedata idler, at 1618 (MPJ-UK).
6535.0 VP-BSI-Seaflight Gulfstream V bizjet, answered selcal HR-FS from Dakar, Senegal, at 0223 (ALF-Germany). Dakar, working KLM 792, a B777, at 0330 (PPA-Netherlands).
6586.0 New York, selcal check CG-EP with Iberian 6314 (A340 EC-GUP), gave secondary frequency of 5550, at 0339 (Stern-FL).
6604.0 Gander Volmet, aviation weather for St. Johns, at 0350. New York Volmet, aviation weather at 0316 (Stern-FL).
6628.0 Santa Maria, selcal JL-AS for Viking 1902, Thomas Cook Airlines A330 OY-VKF, at 0318 (Stern-FL).
6640.0 New York, selcal BD-AF for Big A 617, an Arrow Airways B757, at 0655 (Stern-FL).
6673.0 San Francisco Radio, position from American 28, at 0204 (Stern-FL).
6676.0 AXQ429-Sydney Volmet, Ningi, Australia, formatted aviation weather for Darwin, Perth, and Melbourne, at 1502 (PPA-Netherlands).
6754.0 Canforce Volmet, aviation weather at 0150 (Stern-FL).
6760.0 Unid-2 males chattering in unknown Middle Eastern language, at 2142 (Prez-MD). *[Awfully close to USAF air-air on 6761.-Hugh]*
6778.0 3771-Turkish Civil Defense on Turkish Red Crescent Emergency Operations Net, ALE at 0540 (ALF-Germany).
6803.1 WNDRFL252-NS/EP station, Windermere, FL, ALE sounding at 1423 (Metcalfe-KY).
7428.0 FC6FEM002-FEMA Region 6, TX, ALE sounding, also 9462, 10588, 10899, 12129, 12216, and 15708; at 2340 (MDMonitor-MD).
7457.0 AFA4SW-USAF MARS, KY, Region 4 net with AFA4WJ, FL, at 1411 (Cleary-SC).
7480.1 CHGOIL120-NS/EP station, Chicago, IL working CHPNSC140M, NS/EP mobile station, Chapin, SC, ALE at 1722 (Metcalfe-KY).
7527.0 Coast Guard 1708, HC-130, setting guard with CAMSPAC at 1624 (Cleary-SC).
7596.4 3A7D-Chinese Military, CW message, followed by marker calling DKG6, at 1418 (ALF-Germany).
7601.5 RIPPERMAIN-US military, calling LAVAMAIN, ALE at 1835 (PPA-Netherlands).
7628.0 "3-C-N"-French Navy aircraft, working PI (FPI, St. Assisi), at 0358 (ALF-Germany).
7632.0 WGY 9416-FEMA Auxiliary, OH, checking into SHARES (SHAred RESources) net at 1649 (Cleary-SC).
7633.5 Coast Guard 6008-USCG MH-60J, morale patch via AFA4HF, FL, at 1449 (Cleary-SC).
7697.1 CHPNSC141P-NS/EP, Chapin, SC, working LTRCAR176, Little Rock, AR, ALE at 1624 (Metcalfe-KY).
7805.0 2103CTSCSP-Unknown operation SECURE, working 2104CTSCSP, ALE at 2019 (Metcalfe-KY).
7861.0 RAL2-Russian Navy Baltic Sea Fleet, working RFH2, CW at 1611 (ALF-Germany).
8058.6 KRC83-US Embassy, Central or South America, calling KRC81 at another embassy, at 1400 (MDMonitor-MD).
8156.0 C6WC-Royal Bahamas Defence Force patrol boat, working Coral Harbour Base at 1239 (Cleary-SC).
8176.0 VMW-Wiluna Meteo, Australia, voice synthesized "male" with weather, then gave frequencies as 2096, 4149, 6230, 8113, 12337, and 16548; at 1458 (MPJ-UK).
8280.0 ESEQUIBO-Venezuelan Navy Medium Landing Ship *Esequibo*, calling *Capana*, another landing ship, LSB ALE at 0045 (MDMonitor-MD).
8282.0 YJVG4-Vanuatu registry supply vessel *Hos Achiever*, radio check at 1342 (Cleary-SC).
8337.6 Shark 25-Possible USCG Cutter *Venturous*, clear and secure at 2140. Smokey-Possible USCG Sector San Juan, Puerto Rico, ops-normal and position (off Haiti) from Bandit 12, at 2214 (MDMonitor-MD).
8337.8 Shark 11-USCG, sending helo Bandit 22 back to cutter Shark 12 for transport of injured person, at 2135 (MDMonitor-MD).
8340.0 F21-Venezuelan Navy Frigate *Mariscal Sucre*, calling CGA1 and CGA2 (Headquarters), LSB ALE at 2218 (MDMonitor-MD).
8345.0 RIW-Russian Navy, Moscow, working RJH45 and RJD38, CW at 0006 (MDMonitor-MD).
8357.0 Unknown vessel, with old-style CW maritime telegram from Master regarding arrival arrangements, at 1419 (MPJ-UK).
8443.0 Unid-Old Murmansk frequency, weak FAX weather chart at 1340 (MPJ-UK).
8484.0 HLG-Seoul Radio, Korea, CW traffic list at 1351 (MPJ-UK).
8491.0 AQP-Karachi Naval Radio, Pakistan, CW marine information at 1400 (MPJ-UK).
8494.9 "S"-MX, Severomorsk, parallel 10871.9, CW at 1718 (MPJ-UK).
8495.1 "A"-MX, Astrakhan, parallel 10872.1, CW at 1633 (MPJ-UK).
8503.9 NMG-USCG, New Orleans, LA, FAX infrared satellite image of Caribbean, at 1400 (Prez-MD). NMG-USCG, New Orleans, FAX broadcast schedule at 2029 (MDMonitor-MD).
8658.0 Unid-Unknown Japanese fishery, FAX text in Japanese, daily at 1800 (Hugh Stegman-CA).
8665.0 XSG-Shanghai Radio, China, CW weather at 1410 (MPJ-UK).
8810.0 REA4-Russian strategic air broadcast in FSK Morse 5-number groups, parallel frequency of 7018 stayed in reversals, at 1539 (MPJ-UK).
8816.0 08288-Russian Navy aircraft, flight following with RJF94, CW at 1610 (MPJ-UK).
8834.0 08-HFDL ground station, Johannesburg, South Africa, squitters and uplink to HS-TNF (Thai Airways A330), at 1920 (PPA-Netherlands).
8912.0 D70-US Customs P-3A, raised CNT (US Customs Central Node), then voice as Omaha 370 working Hammer (US Customs, March Air Reserve Base, CA), went secure at 0037 (MDMonitor-MD).
8918.0 New York, position from Canforce 3901, at 1426 (MDMonitor-MD).
8971.0 Fiddle-US Navy, FL, calling Cardfile 01, a P-3C, at 1310 (MDMonitor-MD).
8977.0 03-HFDL ground station, Reykjavik, Iceland, squitters and uplinks at 1649 (MPJ-UK).
8992.0 Home Owner-US Military, broadcasting a 123-character exercise EAM, at 0219 (Jeff Haverlah-TX). Gofer 03-MN Air National Guard C-130H, patch via Offutt HF-GCS to Homestead AFB, FL, at 1459 (Cleary-SC).
9007.0 Canforce 2343-Canadian Forces, enroute to Haiti, patch via Trenton Military to Wing Ops, at 1722 (Cleary-SC).
9010.0 Halifax Military-Canadian Forces, working Pathfinder 31, a CP-140, ALE at 1349 (Cleary-SC). CURITIBA-Possible Brazilian Army, Curitiba, Brazil, ALE sounding at 2200. HAITI-Unknown, perhaps Brazilian assets deployed to UN Haiti mission (MINUSTAH), calling HANIBAL in ALE, at 2300 (MDMonitor-MD).
9018.0 Reach 1017-USAF C-130, working Reach 1002 at 1647 (Stern-FL). Reach 1000-USAF, air-air with Reach 1017, both C-130s, at 2204 (Cleary-SC).
9025.0 AE1ALE-Unknown USAF, calling ADWALE, Andrews AFB, MD, ALE at 1400 (MDMonitor-MD). Coast Guard 1500-USCG HC-130, ALE-initiated patch to District 7 Miami Ops, at 1731 (Cleary-SC).
9031.0 Rescue Standby-British Military search and rescue, working TASCOM (Tactical Air-Sea Communication), at 1401 (ALF-Germany).
9034.0 NOJ-USCG, calling 790 (Coast Guard 1790, an HC-130), ALE at 2348 (Cleary-SC).
9047.0 0101NCRCAP-Civil Air Patrol, National Capitol Region, ALE sounding at 1845 (MDMonitor-MD).
9496.0 CVTNGA131-NS/EP station, Covington, GA; with SANATX236, San Antonio, TX; ALE at 2136 (Metcalfe-KY).
10066.0 B-2500-Shanghai Airlines flight FM0842, a B767, HFDL departure message for Hat Yai, Thailand, at 1633 (MPJ-UK).
10242.0 RUF-USCG Cutter *Mohawk*, calling ICB, Cutter *Forward*, ALE at 0550 (Cleary-SC). PAC-USCG CAMSPAC Point Reyes, CA, ALE and voice with J10, an MH-60J, at 2005 (MDMonitor-MD).
10493.0 WGY9165-FEMA Auxiliary, radio checks with WGY916 (Region 6, TX), WGY903 (Region 3, MD), and WGY901 (Region 1, MA), at 1411 (Cleary-SC). NJC21NG-NJ National Guard, Weapons of Mass Destruction Civil Support Team 21, working T43DE1 in ALE, passed text message regarding testing, also on 11608.5, at 1643 (Metcalfe-KY).
10536.0 CFH-Canadian Forces, NS, RTTY and FAX weather at 1153 (MPJ-UK).
10711.0 US Navy, FL, testing radio modes with Chart Room (USS *Taylor*), at 1345 (MDMonitor-MD).
10872.0 "C"-MX, Moscow, CW at 1633 (MPJ-UK).
11000.0 RIW-Russian Navy, Moscow, CW followed by an attempted data link with vessel RGV82, at 1210 (MPJ-UK).
11125.0 216354-Russian 6-tone selcal (X06), repeated, AM at 1449 (PPA-Netherlands).
11175.0 Andrews, 19-character EAM for Bystander, at 1525. Boeing 069-Unknown aircraft, calling Andrews at 1905 (MDMonitor-MD). Desirable-US military, sent to 11510 by Andrews HF-GCS for a patch, at 1753 (Stern-FL). Log Roll-US military, 28-character EAM at 2200 (Haverlah-TX).
11181.0 JNRSPR-USAF Secure Internet Protocol node, PR, calling MOBD13DAT, also on 15091, at 1810 (MDMonitor-MD).
11196.0 708-USCG HC-130 Coast Guard 1708, ALE sounding at 1906 (Cleary-SC).
11232.0 Canforce 2628-Canadian Forces, working Trenton Military, at 1417 (Cleary-SC). Trenton Military-Canadian Forces, patching Peach 31, an E-8C, to Peachtree Ops, Robins AFB, GA, at 1722 (Stern-FL).
11300.0 Tripoli-ATC, Libya, working Emirates 362 at 1313 (PPA-Netherlands).
11354.0 09-Barrow HFDL ground station, AK, squitters at 2047 (MDMonitor-MD).
11400.0 VAA443-Canadian Forces, also VDS408, VDX200, VEB232, VEX, and XJQ294, ALE at 1600 (Metcalfe-KY).
11510.0 Desirable-US military, came from 11175 for patch via Andrews HF-GCS to US Strategic Command Tech Control, at 1758 (Stern-FL).
11599.0 AWOZ-Russian military, repeating back CW message from LM9P on 12707, at 0815 (PPA-Netherlands).
12577.0 273327300-Russian vessel *Solidat* (UBEE), DSC safety tests with two rescue centers relayed by SVO, Olympia Radio, Greece, at 1259 (MPJ-UK). 003669995-USCG CAMSLANT, VA, working 636012341, Liberian oil tanker *SCF Byrranga* (A8EV7), DSC at 1407 (PPA-Netherlands).
12671.0 RJE57-Russian Navy, CW traffic for RJE56 in 5-letter Cyrillic groups, at 0803 (PPA-Netherlands).
12843.0 HLO-Seoul Radio, Korea, CW marker at 0746 (PPA-Netherlands).
13152.0 WLO-ShipCom/ Mobile Radio, AL, automated "female" voice with tropical Pacific and Caribbean weather, parallel on 8806, 8788, and 13110, at 1620 (Prez-MD).
13215.0 270043-USAF C-17 number 97-0043, ALE sounding at 1830 (MDMonitor-MD).
13927.0 Dark 42-USAF B-1B, patch via USAF MARS to Bat Ops, Dyess AFB, TX, regarding air refueling at 1812 (Stern-FL).
14265.0 Andrews-USAF HF-GCS control station, Andrews AFB, MD, came up on the amateur frequency for SATERN (Salvation Army Team Emergency Radio Net) during Haiti earthquake relief, got radio check, then "standing by for traffic," at 1843 (John Schmelzer-MO). *[Yes, THAT Andrews. HF-GCS came up on several ham freqs. Wow.-Hugh]*
14300.0 Amateur-International Assistance and Traffic Net, emergency earthquake traffic with Haiti, looking for Creole speakers at 1729 (Stern-FL).
14360.0 RENONV224-NS/EP, Reno, NV; with SNRMCA224, San Ramon, CA; ALE at 1740.
14389.0 AFA1RE-USAF MARS, ME, Phone Patch Admin Net at 1614. Reach 396-USAF, patch via AFA9AY at 2217 (Cleary-SC).
14582.0 TSC-US Customs, FL, calling MV9, unknown mobile, at 1749 (MDMonitor-MD).
14700.0 TU5-Tunisian Police, calling STAT154, ALE at 1043 (PPA-Netherlands).
14737.5 RIPPERMAIN-US military, link checks with several stations at 1100 (Eddy Waters-Australia).
15605.0 CHPNSC141P-NS/EP portable, SC; with CHVLNJ124, Cherryville, NJ; ALE at 1338 (27/JAN/2010) (Metcalfe-KY).
15867.0 PAC-CAMSPAC, ALE and voice with 716, HC-130H Coast Guard 1716, ALE and voice at 1955 (MDMonitor-MD).
16278.6 7RQ20-Algerian Foreign Ministry, Algiers, operator chatter in Coquelet-8, at 1016 (PPA-Netherlands).
17976.0 PLASPR-USAF secure network gateway, Lajes, Azores, working MOBD01DAT, at 1442 (MPJ-UK).
18003.0 FAA-US Federal Aviation Administration headquarters, DC, ALE sounding at 1639 (MDMonitor-MD).

DIGITAL DIGEST

DIGITAL MODES ON HF

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Around the World in One Digital Column

NORTH KOREAN DIPLOMATIC SERVICE

A few years ago, MFA Pyongyang could be heard frequently around the shortwave bands with standard RTTY traffic. The preferred mode was 50bd with the uncommon shift of 1000Hz. Also unusual was the use of standard ITA2 (i.e., Baudot) coding.

Unusual, because Korean, like Chinese and Japanese script, is not based on Western (Roman) characters for which the ITA coding is designed. The process of coding a foreign character set into something like ITA2 is called "romanization" and results in some very odd looking text indeed. You can see an example that was copied in late 1996 below:

zenseung 40 dolyqeul mazneun qemun-vye8zosen qinminqeigei qyelqyelhan chu-halauvqainda.

zinan 3 nyenganqeui gaqyelhjvkug haibang-zenzaingqeun gaz haibangdoin zosen qinminqeigei qissqese kedalan nagoanqi qanilsu qebsqessda.

The Mongolian MFA in Ulan Bator also used a similar scheme when sending messages to its embassies around the world.

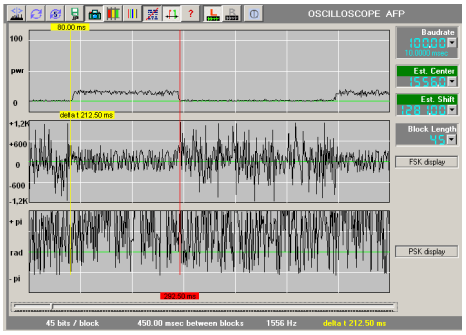
While the Mongolians no longer appear to use HF for diplomatic communications, the Koreans can still be heard on a daily basis. However, the days of Baudot RTTY have long since passed, having been replaced by a proprietary modem.

The new modem used by the Koreans sends data at either 600bd or 1200bd using FSK with shifts of 600Hz or 1200Hz, respectively. The modem uses ARQ (Automatic Repeat Request) and most operation is done in duplex mode where the MFA and the Embassy use different frequencies to listen and send.

The modem is quite distinctive when heard on-air with a rasping chirp. The modem appears to start with a call-up phase of 4 quick pulses of signal followed by a long gap at 600bd and switches to a more regularly pulsed traffic mode at either 600bd or 1200bd. In both cases, the message burst is around 200-215ms in length with a gap of 285 to 385ms. This varying gap length suggests that the modem may be adaptive to the prevailing conditions, lengthening the time that it waits for a successful "ACK".

The autocorrelation function (ACF) of the North Korean modem seems to vary, too. During the call-up phase, an ACF of 103 and 309 is observed, and most traffic at 600bd shows ACF of 60. However, I have also seen ACFs of 308 and 313. This may again be a factor of the modem's adaptive behavior.

At the time of writing, the North Koreans have been very strong at my QTH from 1200 UTC



to 1300 UTC and again from 1600 UTC to 1700 UTC, particularly on the following frequencies:

1300-1400 UTC:
11433.5, 11483, 14416.5, 14373.5, 16218.5 and 16242.5 kHz

1600-1700 UTC:
15857.5, 15878.5, 15881.5, 15998.5, 16000.5 and 16006.5 kHz

Given the strength and time of day, these are likely to be their Embassies in Ottawa and Havana, as Pyongyang no longer maintains a presence in Washington, DC.

THE TUNISIAN ALE & PACTOR-II NETWORK

As regular readers of this column will know, many networks use MIL-STD-188-141A ALE to trigger high speed modems when traffic is ready to be sent. The most frequent pairing is with the MIL-STD-188-110A 2400bd modem. This network, first reported around 2002 and believed to be operated by a Tunisian MOI operation (Police or Border Guard most likely), is unusual in that it triggers PacTOR-II instead.

A number of different identifiers are used by the network including TUD, TUx and STATx, STATxx and STATxxx as follows:

TUD
TU1, 2, 3, 4, 5
STAT1, 2, 3, 5, 11, 12, 13, 14, 15, 16, 21, 22, 23, 24, 25
STAT151, 152, 154, 155

Analyzing a few years' worth of WUN and UDXF logs suggests that there is a somewhat hierarchical structure to the way that stations interact:

TUD only appears to communicate with STATx or STATxx stations
TUx mainly with STATxxx (STAT154 most of the time)
STATxx with STATxxx

I haven't been able to determine why there does not appear to be a STAT4, 7, 8, 9 or 10 nor STAT17, 18, 19 or 20, nor has a STAT153 been logged by listeners.

PacTOR-II traffic is sent using encryption with a standard header as follows: "IPM.Note mail.hse DEFAULT@#HFARQ#STAT11" where STAT11 is the destination station. This probably indicates Microsoft Outlook email at the source. Less clear is the meaning of one string that seems to occur in most messages sent through the network "PBBDHNLODAKLE-HJBC".

Even more puzzling is that several listeners have reported one station communicating with ALE identifier RABAT. Rabat is of course the capital of Morocco, but there are certainly places within Tunisia that have Rabat in their name, including one airfield that is used by the Tunisian National Guard. Furthermore, if this is a Tunisian network communicating with Morocco, there seems to be little evidence of cooperation between these two nations at any level.

Here are the frequencies to listen out for in case you can help crack this mystery:

8180, 10113, 11111, 12140, 13945, 14700, 15000, 15635, 16125, 16285 and 18320 kHz USB (for ALE)

PacTOR-II traffic is sent with a +1700 Hz offset from the carrier frequency. In other words, PacTOR-II will be sent on 16126.7 kHz (center of data) in the case where the ALE triggered it on 16125 kHZ USB.

MULTIPSK ADDS STANAG4285

MultiPSK author, French radio amateur Patrick Lindecker, has been busy adding to the capabilities of his decoding software over the winter months. Hot on the heels of adding the MIL-STD-188-110A high-speed modem, comes support for the STANAG4285 HF modem.

The addition of these modems will be very useful for the HF digital utility listener who is using this program. Both modules allow the user to select the speed, interleave, number of bits (5, 7 or 8), parity or synchronous and various other signal parameters. If you are a licensed radio amateur, the program also allows transmission in these new modes.

MultiPSK is now becoming a very good choice for an all-round modern decoder.. Besides the two high-speed modems mentioned, it also supports MIL-188-141A ALE, PacTOR-I, Packet Radio, SITOR-A and B, and regular Baudot RTTY. The freeware version of the program carries a few restrictions in terms of features and functions, but can be opened up for the reasonable price of $45.

That's all for this month. Thanks to Bruno, Sam and Jim for help with the Tunisian network. Please keep your emails, letters, requests and questions coming.

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To QSL or not to QSL... That is the Question!

As you know from my past writings in both this column and my earlier stint as the columnist for *Beginners Corner*, I have always been a big fan of QSL cards. I collected QSL cards and verification letters from AM broadcast stations and shortwave stations as a young pup, long before I finally sat for my novice license over 30 years ago. Even though I have been in this hobby for decades, I still get a lift from opening my Post Office Box and finding a QSL card or, even better, a whole pack of DX QSLs from the Region 2 Bureau. I have no idea how many cards I actually have. I have nine binders and several shoe boxes full. That is about as accurate a count I am willing to make. Let's just say lots and lots.

I have also recently been given the honor of stewardship over the extensive QSL collection of a fellow ham who is now silent key. These cards represented a lifetime of radio fun for this ham.

But, there seems to be a growing trend in our hobby to no longer participate in the traditional exchange of QSL cards in favor of electronic verification systems such as *Logbook of the World* and E-QSL.

While electronic QSLing certainly has much to offer, I am really surprised that it has led a number of folks to completely abandon traditional paper QSL cards. I have seen hams go so far as to state in their **www.qrz.com** profiles that they want NO QSL cards sent to them. One noted ham wrote in a column in another magazine that he used domestic QSL cards to "light his wood stove."

I have had a great deal of trouble wrapping my mind around this attitude, so I found myself looking more deeply into this rebellion against a long standing amateur radio tradition. I quizzed quite a few folks who took this anti-card position and the answer most commonly given was the high cost of postage.

CON

❖ Too expensive?

Hmmm… Really now…? Let's think about that for a few minutes. Back in 1976 when I was first licensed, it cost nine cents to send a domestic post card. Since that is the most common route for a QSL card, we can use that as a benchmark. Today, sending the same card costs twenty-eight cents.

An astronomical jump, you say? Are you

sure about that?

A quick poke around the Web took me to **www.measuringworth.com**, a Web site that listed no less than seven economic tools to compare the cost/value of items from one era to the next. I used a tool that calculates the value of an object against a consumer bundle of average annual expenditures for goods and services. In other words, a pile of stuff most folks buy all the time. This particular tool calculates that my nine cent postcard stamp from 1976 is worth about thirty-eight cents today. So at the current actual rate of twenty-eight cents, I am ahead a dime per card compared to those cards I shipped out from my graduate school dorm room so long ago. (Shhh… please don't tell the post office… Let's keep this bargain our little secret, okay?)

By the way, of those seven economic calculators I mentioned, only one rated the current value at twenty-eight cents. All the other calculations were higher, the highest being seventy-one cents: the average across all seven was fifty cents. Sending a QSL card is still a great value.

I did a similar work-up on the cost of having QSL cards printed by comparing ads from 1976 ham magazines and today's cost, and I found that, based on value, the costs remained comparable to what I found with postage rates. Likewise, the cost of purchasing such items as International Reply Coupons (IRCs) for swapping DX cards.

This ends the economics lesson, but it raises a more important question: If the relative cost of QSLing has remained static (or, as in the case of postage, become relatively cheaper) over time, why don't some folks want to swap cards anymore?

❖ Time consuming?

Another point raised by some folks I questioned was that they didn't have the time. Well, I could give you another academic lecture akin to the above economics study referencing time and motion analysis, but instead I will cut to the chase. Does it really take all that much longer to fill out a card by hand than it does to log onto your computer, mouse on over to a QSL supporting Web site, enter your call-sign and password, and then dig through the site screens to enter the relevant information into the database that will only represent a responsible exchange if the station on the other end of the QSO is also a participating member in that Web site's program?

No, I did not ask my long suffering XYL to hold a stop watch on me, but trust me, I found filling out the traditional card was much faster, even when I took the time to avoid my traditionally sloppy, CW copying handwriting. And don't forget that many modern logging programs print labels out from online databases so you can even save more time there if you are so inclined.

I use a memory keyer for exchanging the basic QSO information on the CW bands so I can often start to fill out the card while the keyer is doing its business. Now *that's* efficiency for you!

❖ Postal problems?

My probe into non-QSLing behavior revealed another reason, usually stated: "I don't like to fight with the postal system." Okay, when dealing with certain DX entities, I will admit that getting a card to move along the traditional mail route can represent a nearly insurmountable challenge. But, if you are a dedicated DXer, you are going to swim oceans to get your confirmation if need be.

This argument does not apply to hardcore contesters and award chasers. Here we are talking about common courtesy among mainly domestic hams just having a nice rag chew. Can you honestly tell me the last time you had any serious problems with your local post office? Our country may be going through some rough times right now, but you can still slap a stamp on a post card and trust that it will arrive at the address written on the back in a timely fashion.

In my 40 plus years of playing radio in one form or another, I must admit that even DX QSLing has become much easier. Many postal services that were highly suspect in decades gone by are nearly as reliable as the USPS. And, of course, the international amateur radio community continues to maintain and perfect the bureau system, to ensure that hams can move cards around the world even when local postal service might be sub-standard. Some specialty

clubs even manage and maintain bureau services that address the needs of domestic hams, further reducing mail costs and improving response and return rate.

Okay, it is my hope that I have shot reasonably large holes into all the alleged arguments against the common courtesy of sending out a QSL card to folks you share the airwaves with. With that out of the way, allow me to share what I feel are some of the great reasons to QSL beyond simple courtesy.

PRO

❖ It makes sense to non-hams!

Hams often use QSL cards to show and tell a little about themselves beyond their interest in radio. This has strong appeal to non-hams.

Let me share an experiment with you that you can try at home. I have mentioned in this column in the past that my XYL and I are dedicated kayak campers. We have a great group of folks we like to go on river trips with, and recently we had the bunch over to the house for a dinner to plan trips for the coming summer season.

I casually mentioned that, a few nights previous, I had a conversation via amateur radio with a guy in Maryland named Ken. This brought about a general yawn from the gathered boaters. But then I showed my kayaking companions the QSL card Ken N3GN sent me. On it was Ken, out in the bay, in his sea kayak. This got everybody excited. They couldn't stop talking about it and wanted me to make a point of inviting Ken to join our group when we make our annual trip down to the waters of the Delmarva Peninsula.

My younger son is a talented musician, but never had much interest in ham radio. Recently I gave him a gander at a QSL card from Ed W4ELP. Ed is not only a great QRP CW Op but he plays a beautiful old Gretsch guitar as shown on his QSL card. I think I had the longest talk about ham radio with Number Two Son that I ever had after that.

I can't begin to count the number of times folks have given little more than a nod toward my radio shack but would spend a great deal of time pouring over my QSL card collection. If folks didn't exchange cards with me, I wouldn't be able to use this wonderful resource to try to grow interest and understanding of our hobby. When thought of this way, QSLing is almost a duty to the cause!

❖ It helps bring in other radio hobbyists

From time to time, every ham gets a request for confirmation from a non-ham shortwave listener. Personally, I think any ham who fails to send a card out to one of these folks should just turn in their license and take up knitting or something. Most SWLs who take the time to listen and report to ham stations are just the kind of folks we want to invite into our hobby with open arms.

When I get an SWL QSL request I don't just send a card. I'll put it in a first class envelope with a note telling them more about my station and inviting them to join in the fun by contacting their local ham community or an online source for going for a ham license. I started out as an SWL. I am happy to acknowledge any SWL who takes the time to copy my signal and let me know about it.

❖ It's a great way to say thanks!

Many hams put out great efforts beyond their personal station activities. Hams will operate from a club station, a special event with a short callsign, they may staff a large multiop contest station. For example, as I write this, the Straight Key Century Club is just finishing up their annual K3Y operation. This club makes use of this special callsign throughout the various regions using different operators on a rotating schedule.

I usually work the station several times during the month long event. I make a point of finding out the name and personal callsign of each operator. I then send them out a QSL to their home station address to thank them for taking time away from their own log to help the club out. I do the same for other operations where hams are on the air but not using their own call as well. Whenever the opportunity presents itself to show appreciation to the actions of brother or sister hams, a QSL card is a great way to go.

❖ Don't forget the wallpaper!

Many awards and certificates are now supported by the major online QSL services. But there are some caveats to playing the electronic QSL game. For example, ARRL Awards cannot be applied for using the E-QSL system, only the Logbook of the World system. Many other variations exist.

But, with the exception of a very small number of "electronic submission only" awards (the League's Triple Play WAS comes to mind), you can't go wrong with using good old fashioned paper cards to seal the deal when it comes to getting most awards.

There is nothing quite like the sense of accomplishment that goes with handing over that stack of 100 QSLs to a Official ARRL card checker at a hamfest or other ham activity. Then, when you show hams and non-hams that DXCC Certificate on your wall, you can proudly display those hundred cards and tell everyone the joys and challenges of nailing down those hundred DX entities. I know that the electronic system of doing this might be easier in some ways, but staring at a list in a database just doesn't have the same "look and feel" to me.

❖ Did I forget to mention that it's fun!?

You come home from a hard day's work. After dinner and a few family chores, you get some time to head into your radio shack. You fire up the rig, tune around and hear someone calling CQ. You answer and begin a chat, getting to know the ham at the other station. You make the standard exchanges and then go on a bit more about things that interest you. You make a new friend. You feel good about the time spent at the radio. So, to commemorate that time you take a few short moments to send that ham a QSL card (at a cost just a few pennies over two bits).

It is my hope that the ham on the other end of the conversation will also feel strongly enough about the time spent and join with you in the time-honored amateur radio tradition of the QSL exchange.

Look for me on the bottom end of 40 meters, and count on my QSL card showing up in your mailbox after our QSO. I'm just old fashioned, I guess.

GETTING STARTED

THE BEGINNER'S CORNER

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Your Antenna is Up: Now What?

Sometimes the easiest part of getting a shortwave listening or ham radio antenna installed is getting it in the air. Bringing the feed line into the house is a time-consuming effort that can result in all kinds of mistakes. By not making the right entry through the exterior wall of your house, you could be inviting torrents of rain, a bug thoroughfare and easy access for rodents, reptiles, bees and bats.

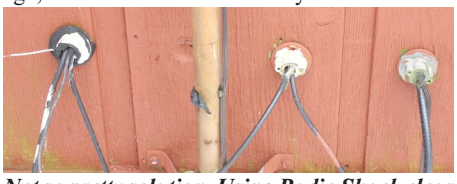
❖ The Feed-Through Tube

My first antenna feed-through was for a TV/FM antenna and rotator on the roof. For this I brought the wires through the gable vent, forming a drip-loop (allowing several feet of lead-in to loop below the entry into the vent so that any rain following the cable would simply drip off on to the ground instead of running into the attic). I cut a small slit in the screen behind the vent and threaded each cable through. If you cut too big a slit you'll be amazed at what can get through: hornets, wasps, and other stinging insects that love to build nests in your dark, roomy and weather-proof attic space.

Flat ribbon coax exterior wall fitting. (Courtesy: Skyvision)

That system worked well for feed lines that were going to interior rooms. But, once I put my first satellite TV system in (1984) I had to contend with a rather bulky cable that held 2 RG/6 coax, DC motor drive wires, and three servo-motor drive wires. These all needed to be brought in through an exterior wall at ground level. Satellite TV installers in those days had solved a lot of cable-entry problems and one solution remains today: a flat cable feed-through exterior wall cover that's still sold today through Skyvision (see figure).

By 1988, when I got my Novice ticket, I needed to bring in additional antenna wires but needed these to come in at ground level. That's when I discovered the feed-through tube. Years ago, when Radio Shack actually was a store for people who were involved with radios, they made an inexpensive product called the Feed-Through tube. It was a foot long acrylic tube with an interior and exterior bulkhead flange for each end.



Not so pretty solution. Using Radio Shack clear plastic feed through tubes (no longer available) an assortment of cable of various dimensions make it into the house, note the Coax-Seal that stops critters and rain. (Courtesy: Author)

By drilling a hole through an exterior wall where you wanted your antenna feed line to enter, you simply cut the tube with a saw to the thickness of your wall and slipped the tube through. Attaching the bulkhead flanges to each end secured the tube and let you thread any number of coax or other wires through. Once you had all your wires in place, you filled in the gaps in the tube with Coax-Seal and were done.

I found I could get about two or three coax cables through each tube (see photo) so, I ended up having three tubes through the wall where most of the wires come through. I even had room for antenna rotator wires, ground wires, and thermometer sensor wires. Today, I have wires for three ham antennas, one FM antenna, one TV antenna, one Beverage antenna, a rotator cable, and cabling for five satellite dishes. I have three 8' ground rods at each of the antenna locations where the heavy-duty ground wire comes into the house.

Many hams have used various sizes of PVC pipe parts, including 90º and 45º elbows, to make larger entry for more and larger cables. For tower installations, on which a number of large diameter cables and rotor wire might be fed, a more permanent PVC pipe installation can be done. A length of PVC pipe in a three or four inch diameter is laid in the ground with a "U" fitting at the tower end to prevent rain from entering the pipe, this also allows for additional cable to be threaded through the pipe at a later date. You can get creative in the pipe section of the plumbing department at Lowe's or other similar store.

UG363 Bulkheads from Universal Radio solve the problem of connection through an exterior wall using adaptors that allow female 259 sockets at each end. UG363 bulkheads come in 8 lengths from 1inch to 1 foot in length and are priced from $2 to $12 plus shipping from Universal Radio, requires a 5/8" hole in the wall. (Courtesy: Universal Radio)

Universal Radio offers a one-antenna solution with its UG-363 bulkhead adapter that allows insertion of a PL259 female plug into each end. These come in assorted sizes from one inch to one foot and range in priced from $2 to $15 plus shipping (see photo).

I've also gone to Lowes for dish supports for small Ku-band dishes. I've found that their steel threaded pipe is perfect for turning a wall-mount satellite dish into a ground-mount dish. I use whatever size diameter the dish mount takes, in a four foot length. With a splitting mall or sledgehammer, drive the pipe in the ground, plumbing it up with a level. Use a 2 x 4 block of wood on the top of the post to prevent it from being damaged by the hammer. Once the pipe is perfectly plumb, mount the dish, attach the cable to the LNBF and run it along the ground to the house entry point. With a small spade you can dig a "slice" in the ground into which you stuff the cable. It makes the job go really fast.

❖ More Elegant Solutions

Since the Shack no longer carries the cheap tube (though these are widely available online through individual sellers and may still be on the shelves of smaller, out-of-the-way or affiliate Radio Shack stores), hams and shortwave listeners are forced to find alternatives. One company that has developed alternatives is MFJ Enterprises which offers two products that allow for maximum expansion and should serve the needs of most hams and shortwave listeners.

The MJF-4602 (see photo) is designed to be used with an existing horizontal or vertically sliding window and can be cut to fit your particular window size. The actual connectors are embedded in a 48" long pressure-treated 1 x 4 that has an

MFJ 4602 weatherproof window antenna feed through panel comes with pressure treated and coated panel 48" long that can be cut to fit your window in a vertical or horizontal frame. This feed through features three coax-fed HF/VHF/UHF fittings as well as balance line, random wire and ground. $65 plus shipping from Universal Radio (Courtesy: Universal Radio)

MFJ 4603 Universal Window Feed Through can accommodate 8 antennas with F connectors, N connectors, UHF, balanced line, random wire, ground and power fittings. $79 plus shipping from Universal Radio. (Courtesy: Universal Radio)

exterior of white enamel paint. The plate on which the connectors are mounted is stainless steel on both inside and outside panels. The MFJ-4602 features three SO-239 coax connectors, ceramic balanced line and random wire feed-through insulators as well as a stainless steel ground post. Cost of the MFJ-4602 is $64.95 plus shipping from Universal Radio.

Need more flexibility and more connectors? Not a problem. For only $15 more MFJ offers their 4603 model which lets you connect 1 RG/6 coax cable (for off-air TV or satellite TV); 1 "N" connector; 4 SO-239 connectors for HF/VHF/UHF antennas; 2 threaded stainless steel posts with washer and wing nuts for balanced line antennas; 1 threaded stainless steel post with washer and wing nut for a random wire antenna; 1 threaded stainless steel post with washer and wing nut for ground; two binding posts for 50 volt 15 amp maximum AC or DC electrical power, and a grommeted opening that lets you pass a larger cable for a rotor or other device (the cable plug pictured is not included, it's just there for illustration). All this for $79.95 plus shipping from Universal Radio. You'll note that the panel is labeled so that you can put it in upside down and it won't matter.

With these installations you'll have to figure out how to secure the window from unwanted entry and, with so many cables coming up to window height, it does serve as an advertisement about the radio-related contents of the room into which the lead-in wires are going. You'll probably want to have this sort of installation on the back side of your house.

❖ Installation Accessories

Once you have your antennas up and your feed-through selected and installed, you have to give some consideration to how you'll run the feed from the antenna to the house. In the case of satellite dishes, I've used the trench method: digging a shallow trench a few inches deep, laying in the "direct burial" cable in and covering it up. More than once I had run temporary RG/6 feed lines simply laying the cable on the ground and by the end of the summer it had disappeared, covered up conveniently by the fast growing grass. Problem solved.

If you're running cables down the side or along the side of the house, I recommend the use of cable clamps (available at nearly any hardware store) that have round, molded plastic bits studded with short nails that can be tacked into siding as you run the cable along the siding. You can also you these inside your house when running cables along baseboard. This method keeps the cables from flapping in the wind or drooping across windows or doors. There are similar cable clamps with flat surfaces that, instead of nails, are outfitted with sticky tape that is peeled off for use on vinyl or aluminum siding, thus avoiding nailing into such siding.

Cable clamps keep your cables in place on wood surfaces for RG/8X or RG/59 coax cables, 10 for just 99 cents (Courtesy: Universal Radio)

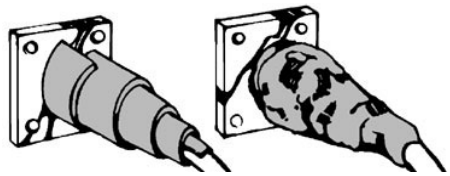
Cable stand-offs (see photo) can be used when you need to keep the cable or wire a certain distance from whatever surface you're attaching the cable to. There are screw-in stand-offs to use on wood surfaces, masonry surfaces, and for attaching directly to antenna masts. These stand-offs keep your feed lines tightly in place so that they're not banging against the mast or side of the house. You can install these even after you've put up your feed line by cutting a slot in the round plastic insulator, attaching the cable and rotating the insulator so that the cable doesn't slip out.

Cable stand-offs keep your cables in place on all types of surfaces, from $1.29 to $1.49 for 2 or 4 in a package. (Courtesy: Universal Radio)

Whenever you have a cable fitting, whether it's a satellite TV "F" connector, ham radio SO239, or any other outdoor connector, it's always good practice to seal the connector with Coax-Seal. Forget the rubber boots that are often sold with antenna transformers or antenna cable. Coax-Seal works. This is a malleable substance that comes in a strip about a half-inch wide, sandwiched in wax paper, and in a variety of lengths.

Cutting off a few

Coax-Seal $3 for a five foot roll. (Courtesy: Universal Electronics)



Using Coax-Seal (Courtesy: Universal Radio)

inches for each installation, wrap as shown in the illustration. Once wrapped, simply mold it against the fitting and cable until it appears to be one piece. This material is very flexible (the warmer the outside temperature, the more flexible the Coax-Seal). A five foot roll ($2) will go a long ways, and a twelve foot roll ($20) may last your lifetime.

Sealing connectors, particularly at the UHF frequency range, prevents signal loss due to moisture getting into the connector. There are a number of other products you can use to fill in various openings in your antenna lead-in installation such as Cross Devices STUF, a tube of low-density paste filler ($5) that can be applied in a number of circumstances.

Tube of foam paste filler ($5) seals up to 100 coax connectors, prevents moisture from seeping into connectors, especially good for insertion loss at UHF frequencies and up. (Courtesy: Universal Radio)

PROGRAMMING SPOTLIGHT

WHAT'S ON WHEN AND WHERE?

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Touring Radio Taiwan International

One of the first topics I covered in this column, back in 2006, was the programming available from China, both from Beijing (China Radio International) and Taipei (Radio Taiwan International). This month, we'll shine the *Programming Spotlight* on Radio Taiwan International.

There have been many changes at both stations since we first visited them, and as Taiwan and China seem to be in the news quite a bit recently, I thought it was worth taking another look. This month we'll look at the programming of RTI and in a future column that of CRI. Let's get right to it.

Radio Taiwan International is among the easiest stations to hear in North America. One can tune in any night from 02-0300, 03-0400 and 05-0600 UTC on 5950 kHz. In addition, one can hear the past seven days of RTI programming via its website at **http://english.rti.org.tw/default.aspx** This is also your gateway to other RTI content.

MONDAY TO FRIDAY –
Hear in Taiwan

This program is a daily look at what is making news in Taiwan. It is not a newscast *per se*, but the hosts (there seems to be a rotating panel) discuss various news stories in a conversational manner.

It is an interesting approach to news coverage. In an early February edition of the program, items discussed included the government cracking down on pirate radio stations, politics in Taiwan, a fraud conviction involving a legislator, and other headlines. The news is gleaned from the local press.

Other topics discussed in depth included efforts to build 300 swimming pools in schools across the country, and a discussion of the housing market in Taiwan.

MONDAY –
Chinese to Go (Huang Shih-han)

The program opens with the tagline "Chinese to Go, Real Chinese for Real People, Dig In!" Although there are no textbooks available, the current program's dialogue and some vocabulary are available online at a link on the RTI home page.

The program for Feb 8 and 12 discussed Spring Couplets, which are "words written on vertical strips of red paper. People hang up spring couplets around their doors during the Lunar New Year as part of its celebration. A spring couplet comprises of at least two lines. The first line is posted on the right side of the front door, while the second line is posted on the left. Sometimes a third horizontal piece may be posted above the door. Typically, the spring couplet contains a happy, hopeful, or uplifting message about a better New Year, written in the best calligraphic style." (**http://english.rti.org.tw/Content/SpecialReportsArchives.aspx**)

"Huang Shih-han graduated from National Taiwan University with a BA in foreign languages and literatures. She then went on to France and the UK for studies and received her MA in Comparative Literature from the University of London.

"She worked as research assistant at Academia Sinica before joining RTI." (RTI website) Huang Shih-han also hosts *Timelines*, and can be heard occasionally on *Hear in Taiwan*.

Soundwaves (Shirley Lin)

This is Radio Taiwan International's pop music program. Except for the Chinese lyrics, none of this music would be out of place on any American or Canadian pop music station. If you like the Black Eyed Peas or Lady Gaga (that is, hip-hop and dance), then this is the program for you. Shirley Lin gives you a little background about each song and performer, but doesn't go overboard, letting the music do the "talking." She manages to squeeze several songs into each edition of the program. It is very reminiscent of *Hits in Germany* from Deutsche Welle.

Shirley is a busy person at RTI, hosting *Soundwaves*, *We've Got Mail*, and *People*. "Shirley was born in Taiwan. She grew up in Hong Kong, Japan and the United States and graduated from Wellesley College with a double major in Economics and Math." (RTI website)

TUESDAY –
We've Got Mail (Natalie Tso and Shirley Lin)

This is one of the few programs which hasn't been changed since I first wrote about RTI back in the fall of 2006, and for good reason. As I stated then, "Natalie and Shirley have a good chemistry, which makes this program very enjoyable to listen to. Listeners' letters are interspersed with chat and some really good Taiwan/Chinese (and Western) pop music." In addition, a letter of the month is selected, and if that person has included a phone number, they may be called by RTI and interviewed on the program.

On the Global Exchange segment, each month RTI asks listeners a question and then reads interesting entries from around the world. A recent segment featured the question, "What is the most memorable thing your other half has ever said to you?"

Q & A responds to listeners' specific questions about Taiwan. Listeners whose questions are answered on the air will receive an RTI souvenir.

"An American born Chinese, Natalie grew up in sunny California and graduated from Columbia University. She has traveled to over 20 countries, and her love for Asia has planted her in Taiwan. She's lived here since 1991 and started her radio career in 1993." She has written a book called *Free To Be You: A Woman's Guide to Dreams, Love, and Self-Discovery* (in Chinese) and is a contributor to *TIME* magazine. (RTI website)

WEDNESDAY –
Time Traveller (Huang Shih-han)

This program is one of the gems to be found via Radio Taiwan International. It seems to be relatively new in the last few months. Or maybe I just haven't been paying sufficient attention. *Time Traveller* promises to take you on a "time trip" in order to know events from the past that have had a profound impact on Taiwan, and to meet interesting people and places.

In early February, one such program was about ROC diplomat Dr. Ho Feng-shan, who was Ambassador to Austria from the Republic of China. After Austria was annexed by Nazi Germany, the embassy in Austria was reduced to a consulate and he remained as Consul-General. After witnessing the Kristallnacht pogrom against the Jews, he determined to save as many people as he could. In all, he issued visas to thousands of people allowing them to get out of Nazi Germany, many of whom made a new life in Shanghai. You can read about him here **http://blog.rti.org.tw/english/?p=3210**. I don't know if this particular diplomat was involved, but a very dear friend of mine here in St. Catharines got out of Germany in just this manner. It brought her story alive to me. Bravo, Huang Shih-han and RTI for bringing such stories alive via *Time Traveller*.

Jade Bells and Bamboo Pipes (Carlson Wong)

Perhaps, in my opinion, and others', the best program on (the) station. An excellent presentation of Chinese and Taiwanese traditional music and in one recent episode, some Latin flavored music that wouldn't have been out of place on Radio Habana Cuba. The program leaves one wanting to learn and know more about the music of Taiwan and Asia in general…That's part of the beauty of shortwave and the internet: listeners are exposed to so many different musical genres. But that's a discussion for another day.

I wrote that in 2006 and it still holds true today. Are you interested in Chinese Folk Opera or Chinese and Taiwanese traditional music? This is the program for you. This long running program has been highly acclaimed by many. Several years ago I remember tuning in very late one night/early one morning to some sort of what I assume was a Chinese opera in progress on a Chinese mainland domestic frequency. At first I dismissed it as sounding like Edith Bunker on a bad day, but the more I listened the more fascinated I became. This program is a good introduction to such Chinese traditional music.

"Carlson was born in Indonesia and has lived in Taiwan half his life. He is a graduate of National Taiwan University. He also went to

the graduate school of American Studies at Tamkang University. He has been an English translator, teacher, and now a radio personality. His first job as an announcer was at the Broadcasting Corporation of China (BCC), one of the oldest and largest radio stations in Taiwan." (RTI website) Carlson also hosts the *On The Line* program on RTI.

THURSDAY -

Ilha Formosa (Paula Chao)

"The Portuguese call Taiwan Ilha Formosa, or the beautiful island." Thus opens RTI's program about the environment. Efforts to save energy, become eco-friendly, prevent air pollution, and expansion of nuclear power are highlighted.

Breakfast Club (Natalie Tso)

"This is Taiwan's weekly date with Australia, as RTI's Natalie Tso chats with Radio Australia hosts Phil Kaflacoudes and Adelaine Ng about the latest news and trends in both Australia and Taiwan."

Phil Kaflacoudes and Adelaine Ng host Radio Australia Today, which can be heard coincidentally on Radio Australia, UTC Sunday through Friday at 0005, 0105, 2131 and 2240. The program promises interesting interviews, lively music, entertainment news, sport, art, finance and weather. It is also available as a podcast. **www.radioaustralia.net.au/programguide/253.htm**

Instant Noodles (Andrew Ryan and Charlie Storrar)

This is the most amusing program on RTI, with comedic bits and news of the weird and the wacky from the Asia-Pacific region. Andrew and Charlie seem to be having more fun than international broadcasters should be allowed to have! Stories of cranky dolphins and rogue kangaroos abound, as well as bad puns. As RTI points out, "it's delicious and far from nutritious!"

FRIDAY –

News Talk (Natalie Tso)

This program provides an in-depth analysis of selected issues affecting Taiwan. In February, discussion centred on economic sanctions, which have been threatened by Beijing over plans to sell US arms to Taiwan.

People (Shirley Lin)

People is very similar to Estelle Winters' Voice of Russia *Timelines* program. Shirley talks to ex-pats living in Taiwan, and Taiwanese about their lives and perspectives on the country. The last episode I heard featured an Israeli woman who moved to Taiwan, about her life in the country, her efforts to speak the local language and adjustment to eating the local cuisine. It's an interesting window on Taiwanese life. If you want to compare them, *Timelines* can be heard via Voice of Russia on Saturday at 05.30 and 11.30, 15.30 and 23.30, Sunday at 07.30, 09.30 and 16.30 and 21.30 and on Monday at 02.30 UTC.

Chinese to Go (Huang Shih-han)

This is a repeat of Monday's program.

SATURDAY –

Weekends on RTI are a bit more laid back, dominated by feature programming.

The Occidental Tourist (Charlie Storrar)

The program seems to be a brief essay, written by Charlie about life in Taiwan, in the same way Alistair Cooke's *Letter from America* chronicled life in America and his impressions of it.

Feast Meets West (Ellen Chu and Andrew Ryan)

This program features lively banter between the hosts (in February mostly about the impending birth of Ellen's child), music, and as the name implies, recipes. Each episode concludes with the feature "52 Dishes in a Year." Each week they present a new recipe. The first episode featured Russian Pirozhki, made with help from a woman in the RTI Russian Service.

SUNDAY -

The Sino Files

According to the introduction, *The Sino Files* presents "a closer look at China and its people." A recent episode opened with news of the week related to China. The stories concerned the problems Google was having in China, US arms sales to Taiwan, and warnings from Beijing against President Obama meeting the Dalai Lama. This weekly news recap was followed by a story/folk tale about…bunnies.

Women Making Waves (Paula Chao)

Women Making Waves is "a 15-minute program, features interviews with women who are breaking a few boundaries and making their voices heard." The program opens with a snippet of Helen Reddy's "I am Woman". The interviewee might be a politician, a diplomat or an academic. In the most recent program I listened to, a Professor of Health Management and Policy at Taiwan National University was the featured guest. She spoke about issues of mental health in Taiwan, and how different cultures view mental health.

"Paula Chao graduated from Tamkang University with a BA degree in history. She received her MA degree in Comparative Education and Social Science from the University of California, Los Angeles. Paula worked for the Voice of Free China for six years before joining RTI." (RTI website) She also hosts *Ilha Formosa* (see above)

On The Line (Carlson Wong)

RTI's website suggests "*On the Line* is a lively forum where important personages including local and foreign diplomats, policy experts, academics, and government officials, are invited to discuss current events and issues involving Taiwan and the world."

The guest in early February was the ROC ambassador to the Caribbean island of St. Lucia, who was chosen by a local newspaper as "Person of the Year." Taiwan resumed diplomatic relations with St. Lucia in 2007. The ambassador discussed the honor he had received, and the ups and downs of being Taiwan's representative. The government welcomed him, but the opposition St. Lucia Labour Party (whose leader favored a one-China policy) not so much. It was an interesting discussion, illustrating Taiwan's efforts to overcome its diplomatic isolation.

❖ RTI's brand new 30-minute webcast

RTI has launched a brand new 30-minute webcast called "RTI Plus." The webcast includes news analysis, the editorial ***Taiwan Perspectives*** and features on prominent topical figures in ***Newsmakers***. In addition, there are two new feature programs: ***Soft Power*** and ***In Mystical Taiwan***. It seems to complement the on-air programming of RTI. Daily features include ***News Plus*** and ***Think Tank*** providing news and analysis.

Taiwan Perspectives is heard Monday-Friday. On weekends the programming includes ***Soft Power*** on Saturdays (about the NGOs which are affecting change at home and abroad) and on Sundays ***In Mystical Taiwan***, which covers all things "spiritual, mystical and fantastical" in Taiwan. 30 extra minutes of daily programming from RTI! Access it here: **http://english.rti.org.tw/English/special/plus/index.aspx**

❖ Next Month

This year the National Association of Shortwave Broadcasters will be meeting right in my backyard in Hamilton, Ontario, in May. Next month I plan to focus on programming from the member stations of the NASB. If any of you are attending, I hope to be there myself (the only fly in the ointment being the timing of some surgery I have to undergo shortly, as yet still unscheduled). Having said that, if I can be there, I will. I look forward to the opportunity to meet and get reacquainted with some of you there!

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

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

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

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

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

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

MT MONITORING TEAM

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Additional Contributors to This Month's Shortwave Guide:

Thank You to …

BCL News; DX Asia; British DX Club; Cumbre DX; DSWCI-DX Window, HFCC; 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.

Alokesh Gupta, New Delhi, India; Bob Padula, Australia; Daniel Sampson, Ernest Riley/PTSW; Elena Ospinova/ VO Russia; Ivo Ivanov; Bulgaria; Mike Barraclough, UK; Jaisakthivel, India; Sean Gilbert, UK; Noel Green, UK; Rachel Baughn/MT; Rich D' Angelo/NASWA Flash Sheet, NASWA Journal; Tom Taylor, UK; Wolfgang Büeschel, Germany.

Shortwave Broadcast Bands

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

Notes

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

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

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

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

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

0000	0020		Japan, NHK World/ Radio Japan				5920eu
			5960eu	6145na	13650as		17810as
0000	0030		Australia, HCJB Global		15400as		
0000	0030		Egypt, Radio Cairo	7580na			
0000	0030		Thailand, Radio Thailand World Service				9680na
0000	0030		USA, Voice of America		7405as		
0000	0030		USA, Voice of America/Special English				6180as
			9325as	9620as	9715as		11695as
			12005as	15185as	15205as		15290as
			17820as				
0000	0045		India, All India Radio		6055as		7305as
			9705as	11645as			
0000	0045		USA, WYFR/Family Radio Worldwide				6085na
			11720sa				
0000	0057		Canada, Radio Canada International				9880as
0000	0057		China, China Radio International				6005na
			6020na	6180na	7350as		7425as
			9425as	9570as	11650as		11885as
			11730as	11790as			
0000	0100	twhfas	Albania, Radio Tirana		7425na		
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		9660as		12080pa
			13690pa	15240pa	17715pa		17750as
			17665as	17795pa			
0000	0100		Bahrain, Radio Bahrain		6010me		9745al
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 John's NF		6160na		
0000	0100		Canada, CKZU Vancouver BC		6160na		
0000	0100		Germany, Deutsche Welle		7265as		9785as
			15640as				
0000	0100		Malaysia, RTM/Traxx FM		7295do		
0000	0100		New Zealand, Radio NZ International				15720pa
0000	0100	DRM	New Zealand, Radio NZ International				17675pa
0000	0100		Russia, Voice of Russia		6240eu		7250eu
0000	0100		Spain, Radio Exterior de Espana				6055na
0000	0100		UK, BBC World Service		5970as		6195as
			7360as	9410as	9740as		13735as
			15335as	15360as			
0000	0100		USA, American Forces Network				4319usb
			5446usb	5765usb	6350usb		7812usb
			10320usb	12133usb	12759usb		13362usb
0000	0100		USA, EWTN/WEWN Vandiver AL				15610af
0000	0100		USA, WBCQ Monticello ME		5110am		7415am
0000	0100		USA, WHRI Cypress Creek SC		5875na		7385na
0000	0100		USA, WINB Red Lion PA		9265ca		
0000	0100		USA, WJHR International Milton FL				15550usb
0000	0100	vl	USA, WRMI Miami FL		9955va		
0000	0100		USA, WTJC Newport NC		9370na		
0000	0100		USA, WTWW Lebanon TN		5755na		
0000	0100		USA, WWCR Nashville TN		5070na		7465na
			9980na	13845na			
0000	0100		USA, WWRB Manchester TN		3185na		3215na
			5050am	5745af			
0000	0100		USA, WYFR/Family Radio Worldwide				5950na
			7360ca	9505na	9595na		15440na
0000	0100		Zambia, 1 Africa Radio/CVC		4965af		
0005	0100	twhfa	Canada, Radio Canada International				9755na
0010	0100	m	Greece, Voice of Greece		7475va		9420va
0030	0100		Australia, Radio Australia		15415as		
0030	0100		Thailand, Radio Thailand World Service				12095na
0030	0100	sfa	UK, Bible Voice Broadcasting		9490as		
0030	0100		USA, Voice of America		6170va		
0030	0100		USA, Voice of America/Special English				6170as
0030	0100		Uzbekistan, CVC Intl/ The Voice Asia				7395as

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

0100	0104		Canada, Radio Canada International				9755na
0100	0127		Czech Republic, Radio Prague	7355na			
0100	0127		Slovakia, Radio Slovakia International				6040na
			9440sa				
0100	0130		Australia, Radio Australia		9660as		12080pa
			13690pa	15240pa	15415as		17715pa
			17750as	17795pa			
0100	0130		Vietnam, Voice of Vietnam		6175na		
0100	0156		Romania, Radio Romania International				6145na
			9800na				
0100	0157		Canada, Radio Canada International				6040as
			6165as				
0100	0157	DRM	China, China Radio International				6080na
0100	0157		North Korea, Voice of Korea		7140as		9345as
			9730as	11735sa	13760sa		15180sa
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, HCJB Global		15400as		
0100	0200		Bahrain, Radio Bahrain		6010me		9745al
0100	0200		Canada, CFRX Toronto ON		6070na		
0100	0200		Canada, CFVP Calgary AB		6030na		
0100	0200		Canada, CKZN St John's NF		6160na		
0100	0200		Canada, CKZU Vancouver BC		6160na		
0100	0200		China, China Radio International				6005as
			6020eu	6080eu	6175as		7350as
			9570na	9580as	11650as		11730as
			11885as				
0100	0200		Cuba, Radio Havana Cuba		6000na		6140na
0100	0200		Malaysia, RTM/Traxx FM		7295do		
0100	0200		New Zealand, Radio NZ International				15720pa
0100	0200	DRM	New Zealand, Radio NZ International				17675pa
0100	0200		Russia, Voice of Russia		6240eu		7250eu
0100	0200		Sri Lanka, SLBC	6005as		9770as	15745as
0100	0200		Taiwan, Radio Taiwan International				11875as
0100	0200		UK, BBC World Service		5940as		5970as
			9410as	9740as	12020as		12070as
			15335as	15360as	17615as		
0100	0200		Ukraine, Radio Ukraine International				7440na
0100	0200		USA, American Forces Network				4319usb
			5446usb	5765usb	6350usb		7812usb
			10320usb	12133usb	12759usb		13362usb
0100	0200		USA, EWTN/WEWN Vandiver AL				11520me
0100	0200		USA, Voice of America		7325va		9435va
			11705va				
0100	0200		USA, WBCQ Monticello ME		5110am		7415am
0100	0200		USA, WHRI Cypress Creek SC		5875na		7385na
0100	0200		USA, WINB Red Lion PA		9265ca		
0100	0200		USA, WJHR International Milton FL				15550usb
0100	0200	vl	USA, WRMI Miami FL		9955va		
0100	0200		USA, WRNO New Orleans LA		7505am		
0100	0200		USA, WTJC Newport NC		9370na		
0100	0200		USA, WTWW Lebanon TN		5755na		
0100	0200		USA, WWCR Nashville TN		5070na		5935na
			7490na	9980na			
0100	0200		USA, WWRB Manchester TN		3185na		5050am
			5745af				
0100	0200		USA, WYFR/Family Radio Worldwide				7455na
			9505na	15440na			
0100	0200		Uzbekistan, CVC Intl/ The Voice Asia				7395as
0100	0200		Zambia, 1 Africa Radio/CVC		4965af		
0105	0110	m	Greece, Voice of Greece		7475va		9420va
			12105va				
0105	0200		Canada, Radio Canada International				9755na
0130	0145	twhfas	Albania, Radio Tirana		6130na		
0130	0158	mtwhfa	Serbia, International Radio of Serbia				6190na
0130	0200		Iran, Voice of Islamic Rep. of Iran				6120na
			7250na				
0130	0200	ta	USA, Voice of America/Special English				5960ca
			7405ca				
0140	0200		Vatican City State, Vatican Radio				5895as
			7335as				

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

0200	0204		Canada, Radio Canada International				9755na
0200	0227		Czech Republic, Radio Prague	7355na			
0200	0227		Iran, Voice of Islamic Rep. of Iran				6120na
			7250na				
0200	0230		Thailand, Radio Thailand World Service				15275na
0200	0230		Uzbekistan, CVC Intl/ The Voice Asia				7395as
0200	0257		China, China Radio International				9550as
			11785as	13640as	15435as		
0200	0257		North Korea, Voice of Korea		13650as		15100as
0200	0258	DRM	Germany, Deutsche Welle		15205eu		
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, HCJB Global		15400as		
0200	0300		Australia, Radio Australia		9660pa		12080pa
			13690pa	15240pa	15415as		15515pa
			17750as	21725pa			
0200	0300		Bahrain, Radio Bahrain		6010me		9745al
0200	0300		Canada, CFRX Toronto ON		6070na		
0200	0300		Canada, CFVP Calgary AB		6030na		
0200	0300		Canada, CKZN St John's NF		6160na		

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0200	0300		Canada, CKZU Vancouver BC	6160na		
0200	0300		Cuba, Radio Havana Cuba	6000na	6140na	
0200	0300		Egypt, Radio Cairo6270na			
0200	0300		Indonesia, Voice of Indonesia	9526va	11785al	
0200	0300		Malaysia, RTM/Traxx FM	7295do		
0200	0300		New Zealand, Radio NZ International		15720pa	
0200	0300	DRM	New Zealand, Radio NZ International		17675pa	
0200	0300		Philippines, PBS/ Radyo Pilipinas		11880me	
			15285me	17770me		
0200	0300		Russia, Voice of Russia	6240eu	7250eu	
0200	0300	DRM	Russia, Voice of Russia	15735as		
0200	0300		South Korea, KBS World Radio		9580sa	
0200	0300		Sri Lanka, SLBC 6005as	9770as	15745as	
0200	0300		Taiwan, Radio Taiwan International		5950na	
			9680na			
0200	0300		Uganda, UBC Radio	4976do		
0200	0300		UK, BBC World Service	5940as	6005af	
			6195me	9410as	15310as	
0200	0300		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0200	0300		USA, EWTN/WEWN Vandiver AL		11520me	
0200	0300		USA, KJES Vado NM	7555na		
0200	0300		USA, WBCQ Monticello ME	5110am	7415am	
0200	0300		USA, WBCQ Monticello ME	5110am	7415am	
0200	0300		USA, WHRI Cypress Creek SC	5875na	7385na	
0200	0300		USA, WINB Red Lion PA	9265ca		
0200	0300		USA, WJHR International Milton FL		15550usb	
0200	0300	vl	USA, WRMI Miami FL	9955va		
0200	0300		USA, WRNO New Orleans LA	7505am		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WTWW Lebanon TN	5755na		
0200	0300		USA, WWCR Nashville TN	3215na	5070na	
			5890na	5935na		
0200	0300		USA, WWRB Manchester TN	3185na	5050am	
			5745af			
0200	0300		USA, WYFR/Family Radio Worldwide		4985na	
			5985na	6890na	7455na	9505na
			9525na			
0200	0300		Zambia, 1 Africa Radio/CVC	4965af		
0215	0230		Nepal, Radio Nepal	5005as		
0230	0255	Sun	China, Voice of the Strait	4940do	9505do	
0230	0300		Sweden, Radio Sweden	6010na	11550as	
0230	0300		Uzbekistan, CVC Intl/ The Voice Asia		11970as	
0230	0300		Vietnam, Voice of Vietnam	6175na		
0245	0300	twhfas	Albania, Radio Tirana	6130eu		
0245	0300		Zambia, ZNBC (Radio Two)	6165do		
0250	0300		Vatican City State, Vatican Radio		6040am	
			7305am			

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

0300	0315	Sun	Swaziland, TWR Africa	3200af		
0300	0330		Croatia, Croatian Radio	3985va	7375va	
0300	0330		Egypt, Radio Cairo6270na			
0300	0330		Philippines, PBS/ Radyo Pilipinas		11880me	
			15285me	17770me		
0300	0330		Sri Lanka, SLBC 6005as	9770as	15745as	
0300	0330		Vatican City State, Vatican Radio		7360af	
			9660af			
0300	0357		China, China Radio International		6190na	
			9460na	9690na	9790as	
0300	0357		North Korea, Voice of Korea	7140as	9345as	
			9730va			
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	9660as	12080pa	
			13690pa	15240pa	15415as	15515pa
			17750as	21725pa		
0300	0400		Bahrain, Radio Bahrain	6010me	9745al	
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 John's NF	6160na		
0300	0400		Canada, CKZU Vancouver BC	6160na		
0300	0400		Cuba, Radio Havana Cuba	6000na	6140na	
0300	0400		Germany, Deutsche Welle	11695as	17800as	
0300	0400	Sun	Greece, Voice of Greece	7475va	9420va	
0300	0400		Malaysia, RTM/Traxx FM	7295do		
0300	0400		New Zealand, Radio NZ International		15720pa	
0300	0400	DRM	New Zealand, Radio NZ International		17675pa	
0300	0400		Oman, Radio Oman	15355af		
0300	0400		Russia, Voice of Russia	6240eu	7250sa	
			12030eu	12040eu	13735eu	
0300	0400	DRM	Russia, Voice of Russia	15735as		
0300	0400		South Africa, Channel Africa	3345af	6120af	
0300	0400		Taiwan, Radio Taiwan International		5950na	
			15320as			
0300	0400		Uganda, UBC Radio	4976do		
0300	0400		UK, BBC World Service	3255af	6005af	
			6105af	6145af	6190af	6195as
			7255af	7445af	9410as	12095as
			15310as	17790as		
0300	0400		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0300	0400		USA, EWTN/WEWN Vandiver AL		11520me	
0300	0400		USA, Voice of America	4930af	6080af	
			9885af	15580af		
0300	0400		USA, WBCQ Monticello ME	5110am	7415am	
0300	0400		USA, WHRI Cypress Creek SC	5875na	7385na	
0300	0400		USA, WJHR International Milton FL		15550usb	
0300	0400	vl	USA, WRMI Miami FL	9955va		
0300	0400		USA, WRNO New Orleans LA	7505am		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WTWW Lebanon TN	5755na		
0300	0400		USA, WWCR Nashville TN	3215na	4775na	
			5890na	5935na		
0300	0400		USA, WWRB Manchester TN	3185na	5050am	
			5745af			
0300	0400		USA, WYFR/Family Radio Worldwide		7455na	
			9505na	9930ca	9985eu	
0300	0400		Zambia, 1 Africa Radio/CVC	4965af		
0300	0400		Zambia, ZNBC (Radio Two)	6165do		
0300	4000		Uzbekistan, CVC Intl/ The Voice Asia		11970as	
0330	0400	twhfas	Albania, Radio Tirana	6150na		
0330	0400	Sun	Sri Lanka, SLBC 6005as	9770as	15745as	
0330	0400		Sweden, Radio Sweden	6010na		
0330	0400		UK, BBC World Service	11945af		
0330	0400		Vietnam, Voice of Vietnam	6175na		
0340	0400		Vatican City State, Vatican Radio		9545as	
0345	0400	vl/Sat/Sun	Uganda, UBC Radio	4976do		

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

0400	0427		Czech Republic, Radio Prague	7345na		
0400	0430		France, Radio France International		7315af	
			9805af			
0400	0445		USA, WYFR/Family Radio Worldwide		7445na	
			9505na			
0400	0455		Turkey, Voice of Turkey	6020va	6040me	
			7240na			
0400	0456		Romania, Radio Romania International		6130na	
			7310na	9690as	11895as	
0400	0457		China, China Radio International		6190na	
			9460na	13620as	15120as	17725as
			17855as			
0400	0458		New Zealand, Radio NZ International		15720pa	
0400	0458	DRM	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	15240pa	15515pa	17750as
			21725pa			
0400	0500		Bahrain, Radio Bahrain	6010me	9745al	
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na		
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St John's NF	6160na		
0400	0500		Canada, CKZU Vancouver BC	6160na		
0400	0500		Cuba, Radio Havana Cuba	6000na	6140na	
0400	0500		Germany, Deutsche Welle	5905af	5945af	
			6180af	15600af		
0400	0500		Malaysia, RTM/Traxx FM	7295do		
0400	0500		Russia, Voice of Russia	6240ca	12030na	
			12040na	13735eu		
0400	0500	DRM	Russia, Voice of Russia	15735as		
0400	0500		South Africa, Channel Africa	7230af		
0400	0500	Sun	Sri Lanka, SLBC 6005as	9770as	15745as	
0400	0500		Uganda, UBC Radio	4976do		
0400	0500		UK, BBC World Service	3255af	6005af	
			6190af	7255af	7445af	9410as
			11945af	12035af	15310as	15360as
			17790as			
0400	0500		Ukraine, Radio Ukraine International		7440na	
0400	0500		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0400	0500		USA, EWTN/WEWN Vandiver AL		11520me	

0400	0500		USA, Voice of America	4930af	4960af	
			6080af	9885af	15580af	
0400	0500		USA, WBCQ Monticello ME	5110am	7415am	
0400	0500		USA, WHRI Cypress Creek SC	5875na	7385na	
0400	0500	Sat	USA, WHRI Cypress Creek SC	9640af		
0400	0500		USA, WJHR International Milton FL		15550usb	
0400	0500	vl	USA, WRMI Miami FL	9955va		
0400	0500		USA, WRNO New Orleans LA	7505am		
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WTWW Lebanon TN	5755na		
0400	0500		USA, WWCR Nashville TN	3215na	4775na	
			5890na	5935na		
0400	0500		USA, WWRB Manchester TN	3185na		
0400	0500		USA, WYFR/Family Radio Worldwide		6915na	
			9680na	9715na		
0400	0500		Uzbekistan, CVC Intl/ The Voice Asia		11970as	
0400	0500		Zambia, 1 Africa Radio/CVC	4965af	7160af	
0400	0500		Zambia, ZNBC (Radio Two)	6165do		
0430	0457		Czech Republic, Radio Prague	9855va		
0430	0500	twhfas	Albania, Radio Tirana	6100na		
0430	0500		Australia, Radio Australia	15415as		
0430	0500	mtwhf	Swaziland, TWR Africa	3200af	4775af	
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 - 1AM EDT / 12AM CDT / 10PM PDT

0500	0507	twhfas	Canada, CBC NQ SW Service	9625na		
0500	0530		France, Radio France International		7315af	
			9805af			
0500	0530	DRM	France, Radio France International		11995af	
0500	0530		Germany, Deutsche Welle	6130af	6180af	
			9755af	12045af	15600af	
0500	0530		Japan, NHK World/ Radio Japan		5975eu	
			6110na	9770va	15325as	17810as
0500	0530		Vatican City State, Vatican Radio		7360af	
			9660af	11625af		
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	13690pa	17750as	
0500	0600		Bahrain, Radio Bahrain	6010me	9745al	
0500	0600		Bhutan, Bhutan Broadcasting Service		6035as	
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St John's NF	6160na		
0500	0600		Canada, CKZU Vancouver BC	6160na		
0500	0600		China, China Radio International		5960na	
			6190af	7220as	11880as	15350as
			15465as			
0500	0600	Sat/Sun	Clandestine, Sudan Radio Service/ SRS		13720af	
0500	0600		Cuba, Radio Havana Cuba	6000na	6010na	
			6060na	6140na		
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	9855na	9840na	
			12030na			
0500	0600	DRM	Russia, Voice of Russia	15735as		
0500	0600		South Africa, Channel Africa	7230af		
0500	0600		Swaziland, TWR Africa	3200af	4775af	
			6120af	9500af		
0500	0600		Taiwan, Radio Taiwan International		5950na	
0500	0600		Uganda, UBC Radio	4976do		
0500	0600		UK, BBC World Service	3255af	3995eu	
			5875eu	6005af	6190af	7255af
			9410as	11765af	11945af	12095eu
			15310as	15360as	17640af	17790as
0500	0600	smtwhf	UK, BBC World Service	15420af		
0500	0600		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0500	0600		USA, EWTN/WEWN Vandiver AL		11520me	
0500	0600		USA, Voice of America	4930af	6080af	
			9885af	15580af		
0500	0600		USA, WBCQ Monticello ME	5110am	7415am	
0500	0600	Sun	USA, WHRI Cypress Creek SC	11565va		
0500	0600		USA, WHRI Cypress Creek SC	5875na	7385af	
0500	0600		USA, WJHR International Milton FL		15550usb	
0500	0600	vl	USA, WRMI Miami FL	9955va		
0500	0600		USA, WTJC Newport NC	9370na		
0500	0600		USA, WTWW Lebanon TN	5755na		
0500	0600		USA, WWCR Nashville TN	3215na	4775na	
			5890na	5935na		
0500	0600		USA, WWRB Manchester TN	3185na		
0500	0600		USA, WYFR/Family Radio Worldwide		6915na	
			9680na			
0500	0600		Uzbekistan, CVC Intl/ The Voice Asia		11970as	
0500	0600		Zambia, 1 Africa Radio/CVC	4965af	7160af	
0500	0600		Zambia, ZNBC (Radio Two)	6165do		
0515	0530		Rwanda, Radio Rwanda	6055do		
0530	0600	mtwh	Slovakia, IRRS/Euro Gospel Radio		5990va	
0530	0600		Thailand, Radio Thailand World Service		11730va	

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

0600	0615	Sat/Sun	South Africa, TWR	11640af		
0600	0615	Sat/Sun	Swaziland, TWR Africa	11640af	6120af	
			9500af			
0600	0620		Vatican City State, Vatican Radio		4005eu	
			5965eu	7520eu		
0600	0630	Sat/Sun	Australia, Radio Australia	15180as	15290as	
			15415as			
0600	0630		France, Radio France International		11995af	
			13680af	15160af		
0600	0630	DRM	France, Radio France International		9765af	
			15160af			
0600	0630		Germany, Deutsche Welle	5945af	7240af	
			12045af			
0600	0630		Laos, Lao National Radio	7145as		
0600	0630		Uzbekistan, CVC Intl/ The Voice Asia		11970as	
0600	0645	mtwhf	South Africa, TWR	11640af		
0600	0645	mtwhf	Swaziland, TWR Africa	11640af		
0600	0657		China, China Radio International		6115af	
			11750af	11770as	11880as	13645as
			15145as	15350as	15465as	17505va
			17540as	17710as		
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	15240pa
			17750as			
0600	0700		Bahrain, Radio Bahrain	6010me	9745al	
0600	0700		Canada, CFRX Toronto ON	6070na		
0600	0700		Canada, CFVP Calgary AB	6030na		
0600	0700		Canada, CKZN St John's NF	6160na		
0600	0700		Canada, CKZU Vancouver BC	6160na		
0600	0700		Cuba, Radio Havana Cuba	6000na	6010na	
			6060na	6140na		
0600	0700		Greece, Voice of Greece	7475eu	9420eu	
			12105eu			
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		Russia, Voice of Russia	9855na	9840na	
			12070na			
0600	0700	mtwh	Slovakia, IRRS/Euro Gospel Radio		5990va	
0600	0700		South Africa, Channel Africa	7230af	15255af	
0600	0700		Uganda, UBC Radio	7195do		
0600	0700		UK, BBC World Service	3995eu	5875eu	
			6005af	6190af	9860af	11760as
			11765af	12015af	12095eu	15310as
			17640af	17790as		
0600	0700	Sat/Sun	UK, BBC World Service	15420af		
0600	0700	DRM	UK, BBC World Service	3995eu		
0600	0700		Ukraine, Radio Ukraine International		7440na	
0600	0700		USA, American Forces Network		4319usb	
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0600	0700		USA, EWTN/WEWN Vandiver AL		11520me	
0600	0700		USA, Voice of America	6080af	9885af	
			15580af			
0600	0700		USA, WBCQ Monticello ME	5110am	7415am	
0600	0700		USA, WHRI Cypress Creek SC	5875na	7465na	
			9615af			
0600	0700		USA, WJHR International Milton FL		15550usb	
0600	0700	vl	USA, WRMI Miami FL	9955va		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WTWW Lebanon TN	5755na		
0600	0700		USA, WWCR Nashville TN	3215na	4775na	
			5890na	5935na		
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR/Family Radio Worldwide		5745sa	
			6000ca	9680na	9985eu	11530va
0600	0700		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0600	0700		Zambia, ZNBC (Radio Two)	6165do		

0630	0656		Romania, Radio Romania International	7370eu
			17780pa 21600pa	
0630	0656	DRM	Romania, Radio Romania International	6020eu
0630	0700		Australia, Radio Australia 15415as	
0630	0700		Uzbekistan, CVC Intl/ The Voice Asia	15700as
0630	0700		Vatican City State, Vatican Radio	7360af
			9660af 11625af	
0659	0700		New Zealand, Radio NZ International	9765pa
0659	0700	DRM	New Zealand, Radio NZ International	9870pa

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

0700	0705		Croatia, Croatian Radio 6165eu	
0700	0727		Slovakia, Radio Slovakia International	13715va
			15460va	
0700	0730	DRM	France, Radio France International	15605af
0700	0730	Sun	UK, Bible Voice Broadcasting 5945eu	
0700	0745		USA, WYFR/Family Radio Worldwide	5745sa
			5950na	
0700	0757		China, China Radio International	11785as
			11880as 13645as 15125eu	15350as
			15465as 17505as 17540as	17710as
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	13630as
			15160pa 15240pa	
0700	0800		Bahrain, Radio Bahrain 6010me	9745al
0700	0800		Canada, CFRX Toronto ON 6070na	
0700	0800		Canada, CFVP Calgary AB 6030na	
0700	0800		Canada, CKZN St John's NF 6160na	
0700	0800		Canada, CKZU Vancouver BC 6160na	
0700	0800		Cuba, Radio Havana Cuba 6060na	
0700	0800	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af
0700	0800	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
0700	0800	DRM	Germany, Deutsche Welle 3995eu	6130eu
0700	0800		Greece, Voice of Greece 12105va	
0700	0800		Malaysia, RTM/Traxx FM 7295do	
0700	0800		Malaysia, RTM/Voice of Malaysia	6175as
			9750as 15295as	
0700	0800		Myanmar, Myanma Radio 9730do	
0700	0800		New Zealand, Radio NZ International	9765pa
0700	0800	DRM	New Zealand, Radio NZ International	9870pa
0700	0800		Palau, T8WH/WHRI/Sound of Hope Radio	
			13840as	
0700	0800	DRM	Russia, Voice of Russia 11635eu	
0700	0800		Russia, Voice of Russia 17665pa	17805pa
0700	0800		South Africa, Channel Africa 9625af	
0700	0800		Swaziland, TWR Africa 6120af	
0700	0800		Uganda, UBC Radio 7195do	
0700	0800		UK, BBC World Service 6190af	9860af
			11760me 11765af 13820af	15310af
			15400af 15575as 17790as	17830af
0700	0800	Sat/Sun	UK, BBC World Service 15420af	
0700	0800	Sat	UK, Bible Voice Broadcasting 5945eu	
0700	0800		USA, American Forces Network	4319usb
			5446usb 5765usb 6350usb	7812usb
			10320usb 12133usb 12759usb	13362usb
0700	0800		USA, EWTN/WEWN Vandiver AL	11520me
0700	0800		USA, WBCQ Monticello ME 5110am	7415am
0700	0800		USA, WHRI Cypress Creek SC 5875na	7385na
			7465eu	
0700	0800	Sun	USA, WHRI Cypress Creek SC 11565va	
0700	0800		USA, WJHR International Milton FL	15550usb
0700	0800	vl	USA, WRMI Miami FL 9955va	
0700	0800		USA, WTJC Newport NC 9370na	
0700	0800		USA, WTWW Lebanon TN 5755na	
0700	0800		USA, WWCR Nashville TN 3215na	4775na
			5890na 5935na	
0700	0800		USA, WWRB Manchester TN 3185na	
0700	0800		USA, WYFR/Family Radio Worldwide	5950na
			6915na 7455na 9495ca	11580va
0700	0800		Uzbekistan, CVC Intl/ The Voice Asia	15700as
0700	0800		Zambia, 1 Africa Radio/CVC 6065af	13590af
0700	0800		Zambia, ZNBC (Radio Two) 6165do	
0730	0745		Vatican City State, Vatican Radio	4005eu
			5965eu 7250eu 9645eu	11740eu
			15595eu	
0730	0800		Australia, HCJB Global 11750as	
0730	0800		Bulgaria, Radio Bulgaria 5900eu	7400eu
0730	0800		Clandestine, Cotton Tree News	11875af
0745	0800	Sun	Germany, TWR Europe 6105eu	
0745	0800	Sun	Monaco, TWR Europe 9800eu	
0745	0800	f	UK, Bible Voice Broadcasting 5945eu	

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

0800	0815	Sat	UK, Bible Voice Broadcasting 5945eu	
0800	0827		Czech Republic, Radio Prague 7345eu	
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, Myanma Radio 9730do	
0800	0845		USA, WYFR/Family Radio Worldwide	11580va
0800	0850	mtwhf	Germany, TWR Europe 6105eu	
0800	0850	Sun	Germany, TWR Europe 6105eu	
0800	0850	mtwhf	Monaco, TWR Europe 9800eu	
0800	0850	Sun	Monaco, TWR Europe 9800eu	
0800	0857		China, China Radio International	9415as
			11785as 11880as 15350as	15465as
			15625as 15465as 15625as	17490eu
			17540as	
0800	0900		Anguilla, Worldwide Univ Network	6090am
0800	0900		Australia, HCJB Global 11750pa	
0800	0900		Australia, Radio Australia 5995pa	9475as
			9580pa 9590pa 9710pa	11945pa
			12080pa 13630as	
0800	0900		Bahrain, Radio Bahrain 6010me	9745al
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 John's NF 6160na	
0800	0900		Canada, CKZU Vancouver BC 6160na	
0800	0900		China, Guangxi FBS/Beibu Bay Radio	5050as
			9820as	
0800	0900		Cuba, Radio Havana Cuba 6060na	
0800	0900	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af
0800	0900	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af
0800	0900	DRM	Germany, Deutsche Welle 9610eu	13810eu
			12005as	
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		Nigeria, Voice of Nigeria/External Service	9690af
0800	0900		Palau, T8WH/WHRI/Sound of Hope Radio	
			13840as	
0800	0900	DRM	Russia, Voice of Russia 11635eu	
0800	0900		Russia, Voice of Russia 17650af	17665af
			17805af	
0800	0900	Sat	South Africa, Amateur Radio Mirror Intl	7205af
			17860af	
0800	0900	Sun	South Africa, Amateur Radio Mirror Intl	17860af
0800	0900		South Africa, Channel Africa 9625af	
0800	0900		South Korea, KBS World Radio	9570as
0800	0900		Uganda, UBC Radio 7195do	
0800	0900		UK, BBC World Service 6190af	9860af
			11760me 15310as 15400af	15575as
			17640af 17790as 17830af	21470af
0800	0900		USA, American Forces Network	4319usb
			5446usb 5765usb 6350usb	7812usb
			10320usb 12133usb 12759usb	13362usb
0800	0900		USA, EWTN/WEWN Vandiver AL	11520me
0800	0900		USA, KNLS Anchor Point AK 6150as	
0800	0900		USA, WBCQ Monticello ME 5110am	7415am
0800	0900		USA, WHRI Cypress Creek SC 5875na	7385na
			7465eu	
0800	0900	mtwh	USA, WHRI Cypress Creek SC 11565va	
0800	0900	Sun	USA, WHRI Cypress Creek SC 5875va	
0800	0900		USA, WJHR International Milton FL	15550usb
0800	0900	vl	USA, WRMI Miami FL 9955va	
0800	0900		USA, WTJC Newport NC 9370na	
0800	0900		USA, WTWW Lebanon TN 5755na	
0800	0900		USA, WWCR Nashville TN 3215na	4775na
			5890na 5935na	
0800	0900		USA, WWRB Manchester TN 3185na	
0800	0900		USA, WYFR/Family Radio Worldwide	5950na
			6915na 7455na	
0800	0900		Uzbekistan, CVC Intl/ The Voice Asia	15700as
0800	0900		Zambia, 1 Africa Radio/CVC 6065af	13590af
0800	0900		Zambia, ZNBC (Radio Two) 6165do	
0815	0850	Sat	Germany, TWR Europe 6105eu	
0815	0850	Sat	Monaco, TWR Europe 9800eu	
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	

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

0900	0910	mtwhfa	Guam, KTWR/TWR	11840pa		
0900	0930		Australia, HCJB Global	11750pa		
0900	0930		Japan, NHK World/ Radio Japan	9625pa		
			9825pa	11815as	15590as	
0900	0930		Uzbekistan, CVC Intl/ The Voice Asia	15700as		
0900	0957		China, China Radio International	9415as		
			15210va	15270eu	15350as	17490eu
			17570eu	17690va	17750as	
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	9745al	
0900	1000	t/DRM	Belgium, TDP Radio	6015eu		
0900	1000		Canada, CFRX Toronto ON	6070na		
0900	1000		Canada, CFVP Calgary AB	6030na		
0900	1000		Canada, CKZN St John's NF	6160na		
0900	1000		Canada, CKZU Vancouver BC	6160na		
0900	1000		China, Guangxi FBS/Beibu Bay Radio	5050as		
			9820as			
0900	1000		Cuba, Radio Havana Cuba	6060na		
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	21780as	
0900	1000	3rd Sun	Germany, European Music Radio	6140eu		
0900	1000	4th Sun	Germany, Radio Gloria International	6140eu		
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		Palau, T8WH/WHRI/Sound of Hope Radio			
			13840as			
0900	1000		Russia, Voice of Russia	17605af	17665af	
			17805af			
0900	1000	3rd Sat	Slovakia, IRRS/Radio City	9510va		
0900	1000	1st Sat	Slovakia, IRRS/Radio Joystick	9510va		
0900	1000		South Africa, Channel Africa	9625af		
0900	1000		Tajikistan, Voice of Tajik/External Svc	7245va		
0900	1000		Uganda, UBC Radio	7195do		
0900	1000	DRM	UK, BBC World Service	9610eu	13810eu	
0900	1000		UK, BBC World Service	6190af	6195as	
			9740as	9860af	11760me	15310as
			15400af	15575as	17640af	17760as
			17830af	21470af		
0900	1000		USA, American Forces Network	4319usb		
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
0900	1000		USA, EWTN/WEWN Vandiver AL	9390as		
0900	1000		USA, WBCQ Monticello ME	5110am	7415am	
0900	1000		USA, WHRI Cypress Creek SC	5875na	7385na	
			7465eu			
0900	1000	Sun	USA, WHRI Cypress Creek SC	11565va		
0900	1000		USA, WJHR International Milton FL	15550usb		
0900	1000	vl	USA, WRMI Miami FL	9955va		
0900	1000		USA, WTJC Newport NC	9370na		
0900	1000		USA, WTWW Lebanon TN	5755na		
0900	1000		USA, WWCR Nashville TN	3215na	4775na	
			5890na	5935na		
0900	1000		USA, WWRB Manchester TN	3185na		
0900	1000		USA, WYFR/Family Radio Worldwide	5950na		
			6915na	7455na	9465as	
0900	1000		Zambia, 1 Africa Radio/CVC	6065af	13590af	
0900	1000		Zambia, ZNBC (Radio Two)	6165do		
0930	1000		Saudi Arabia, BSKSA/Saudi Radio	15250af		

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

1000	1005		Croatia, Croatian Radio	11675va		
1000	1025		China, Voice of the Strait	4940do	9505do	
1000	1029		Czech Republic, Radio Prague	21745af		
1000	1030	Sat/Sun/DRM	Bulgaria, Radio Bulgaria	11900eu		
1000	1030		Vietnam, Voice of Vietnam	9840as	12020as	
1000	1057		China, China Radio International	5955na		
			7215as	11640as	13590as	13720va
			15190as	15210as	15350as	17490eu
			17690va			
1000	1057		Netherlands, R Netherlands Worldwide	6040va		
			9720as	12065as		
1000	1057		North Korea, Voice of Korea	11710sa	11735as	
			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	9745al	
1000	1100	w/DRM	Belgium, TDP Radio	6015eu		
1000	1100		Canada, CFRX Toronto ON	6070na		
1000	1100		Canada, CFVP Calgary AB	6030na		
1000	1100		Canada, CKZN St John's NF	6160na		
1000	1100		Canada, CKZU Vancouver BC	6160na		
1000	1100		Cuba, Radio Havana Cuba	6060na		
1000	1100	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
1000	1100	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1000	1100		India, All India Radio	7270as	13710pa	
			15235as	15260as	17800as	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		Palau, T8WH/WHRI/Sound of Hope Radio			
			13840as			
1000	1100		Russia, Voice of Russia	7205af	17650af	
			17665af	17805af		
1000	1100		South Africa, Channel Africa	9625af		
1000	1100		Uganda, UBC Radio	7195do		
1000	1100	Sat/Sun	UK, BBC World Service	15400af	17830af	
1000	1100	DRM	UK, BBC World Service	9545eu	13810eu	
1000	1100		UK, BBC World Service	6190af	6195as	
			9545eu	9740as	9860af	11760me
			11895as	15310as	15575as	17640af
			17790as	21470af		
1000	1100		Ukraine, Radio Ukraine International	9950eu		
1000	1100		USA, American Forces Network	4319usb		
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1000	1100		USA, EWTN/WEWN Vandiver AL	9390as		
1000	1100		USA, KNLS Anchor Point AK	6150as		
1000	1100		USA, WBCQ Monticello ME	5110am	7415am	
1000	1100		USA, WHRI Cypress Creek SC	7385na	7520eu	
1000	1100	Sun	USA, WHRI Cypress Creek SC	11565va		
1000	1100		USA, WINB Red Lion PA	9265ca		
1000	1100		USA, WJHR International Milton FL	15550usb		
1000	1100	vl	USA, WRMI Miami FL	9955va		
1000	1100		USA, WTJC Newport NC	9370na		
1000	1100		USA, WTWW Lebanon TN	5755na		
1000	1100		USA, WWCR Nashville TN	4775na	5890na	
			5935na	9985na		
1000	1100		USA, WWRB Manchester TN	3185na		
1000	1100		USA, WYFR/Family Radio Worldwide	5950na		
			6890na	6915na	7455na	9460as
			9465as			
1000	1100		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1000	1100		Zambia, ZNBC (Radio Two)	6165do		
1015	1045	Sun	UK, Bible Voice Broadcasting	5910as		
1030	1100		Australia, HCJB Global	15400as		
1030	1100		Iran, Voice of Islamic Rep. of Iran	15460as		
			17660as			
1030	1100		Mongolia, Voice of Mongolia	12085as		
1030	1100	Sun	Slovakia, IRRS/Euro Gospel Radio	9510va		
1059	1100		New Zealand, Radio NZ International	13660pa		

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

1100	1105	mtwhf	Croatia, Croatian Radio	7370va		
1100	1105		Pakistan, PBC/ Radio Pakistan	15100eu	17700eu	
1100	1127		Iran, Voice of Islamic Rep. of Iran	15460as		
			17660as			
1100	1130	Sat/DRM	South Korea, KBS World Radio	9760eu		
1100	1130		Vietnam, Voice of Vietnam	7285as		
1100	1145		USA, WYFR/Family Radio Worldwide	5950na		
			6000ca			
1100	1157		China, China Radio International	5955as		
			5960na	6060as	9570as	11650as
			11795as	13590va	13645eu	13665eu
			13720as	17490va		
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, HCJB Global	15400as		
1100	1200		Australia, Radio Australia	5995pa	6020pa	
			9475as	9560pa	9580pa	9590pa
			11945pa	12080pa	17880as	

SHORTWAVE GUIDE

1100	1200		Bahrain, Radio Bahrain	6010me	9745al	
1100	1200	h/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 John's NF	6160na		
1100	1200		Canada, CKZU Vancouver BC	6160na		
1100	1200	mtwhf	Equatorial Guinea, Radio Africa # 2	15190af		
1100	1200	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1100	1200	DRM	Germany, Deutsche Welle	9545eu	13810eu	
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		Palau, T8WH/WHRI/Sound of Hope Radio 13840as			
1100	1200		Russia, Voice of Russia	7205af		
1100	1200		Saudi Arabia, BSKSA/Saudi Radio	15250af		
1100	1200	Sun	Slovakia, IRRS/Euro Gospel Radio	9510va		
1100	1200		South Africa, Channel Africa	9625af		
1100	1200		Taiwan, Radio Taiwan International 11715as	7445as		
1100	1200		Uganda, UBC Radio	7195do		
1100	1200	Sat/Sun	UK, BBC World Service	15400af		
1100	1200		UK, BBC World Service	6190af	6195as	
			9545eu	9605as	9740as	9860af
			11760me	11895as	15310as	15575as
			17640af	17790as	17830as	21470af
1100	1200		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1100	1200		USA, EWTN/WEWN Vandiver AL			9390as
1100	1200		USA, WBCQ Monticello ME	5110am	7415am	
1100	1200		USA, WHRI Cypress Creek SC	5875na	7385na	
			7520eu			
1100	1200		USA, WINB Red Lion PA	9265ca		
1100	1200		USA, WJHR International Milton FL			15550usb
1100	1200	vl	USA, WRMI Miami FL	9955va		
1100	1200		USA, WTJC Newport NC	9370na		
1100	1200		USA, WTWW Lebanon TN	5755na		
1100	1200		USA, WWCR Nashville TN	4775na	5890na	
			5935na	9985na		
1100	1200		USA, WWRB Manchester TN	3185na		
1100	1200		USA, WYFR/Family Radio Worldwide			6890na
			7455na	9670as	11725ca	11830sa
1100	1200		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1100	1200		Zambia, ZNBC (Radio Two)	6165do		
1105	1200	Sun	Greece, Voice of Greece	9420va	15650va	
1115	1130	mtwhf	UK, Bible Voice Broadcasting	5945as		
1115	1200		UK, Bible Voice Broadcasting	5945as		
1115	1200	Sat	UK, Bible Voice Broadcasting	5945as		
1130	1145	f	USA, Eternal Good News	15525as		
1130	1157		Czech Republic, Radio Prague	9880eu		
1130	1200	sthf	Guam, KSDA/ AWR	15260as		
1130	1200	f	Vatican City State, Radio Vatican 17765as			15595as
1130	1200		Vietnam, Voice of Vietnam	9840as	12020as	
1145	1200		Australia, HCJB Global	15340as		

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

1200	1230		France, Radio France International			21620af
1200	1230		Germany, AWR-Europe	15495as		
1200	1230		Japan, NHK World/ Radio Japan			6120na
			9625as	9695as	9790eu	
1200	1230		Saudi Arabia, BSKSA/Saudi Radio			15250af
1200	1245		USA, WYFR/Family Radio Worldwide			6890na
1200	1256		Romania, Radio Romania International			11970eu
			15105eu	15430af	17760af	
1200	1257		China, China Radio International			5955as
			7250as	9460as	9600as	9645as
			9730va	9760as	11650as	11690as
			11760va	11980as	12015as	13665eu
			13790eu	17490eu		
1200	1258		New Zealand, Radio NZ International			13660pa
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, HCJB Global	15340as		
1200	1300		Australia, Radio Australia	5995pa	6020pa	
			9475as	9560pa	9580pa	9590pa
			11945pa	17880as	17880as	
1200	1300		Bahrain, Radio Bahrain	6010me	9745al	
1200	1300	f/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 John's NF	6160na		
1200	1300		Canada, CKZU Vancouver BC	6160na		
1200	1300	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1200	1300	mtwhf	Ethiopia, Radio Ethiopia/National Service	5990do		
			7110do	9704do		
1200	1300	DRM	Germany, Deutsche Welle	9545eu	13810eu	
1200	1300		Malaysia, RTM/Traxx FM	7295do		
1200	1300		Nigeria, Voice of Nigeria/External Service	9690af		
1200	1300		Palau, T8WH/WHRI/Sound of Hope Radio 13840as			
1200	1300		Russia, Voice of Russia	7340af	7350af	
			9695af	11660af		
1200	1300	Sun	Slovakia, IRRS/Euro Gospel Radio			9510va
1200	1300		South Korea, KBS World Radio			9650na
1200	1300		Uganda, UBC Radio	7195do		
1200	1300		UK, BBC World Service	5875as	6190af	
			6195as	9545eu	9605as	9740as
			9860af	11760me	15310as	15575as
			17640af	17790as	17830af	21470af
1200	1300		Ukraine, Radio Ukraine International			9950eu
1200	1300		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1200	1300		USA, EWTN/WEWN Vandiver AL			9390as
1200	1300		USA, KNLS Anchor Point AK	6150as	6915as	
1200	1300		USA, Voice of America	7575va	9640va	
			11705va	11730va	11750va	
1200	1300		USA, WBCQ Monticello ME	5110am	7415am	
1200	1300		USA, WHRI Cypress Creek SC	7385na	15665va	
1200	1300		USA, WINB Red Lion PA	9265ca		
1200	1300		USA, WJHR International Milton FL			15550usb
1200	1300	vl	USA, WRMI Miami FL	9955va		
1200	1300		USA, WTJC Newport NC	9370na		
1200	1300		USA, WTWW Lebanon TN	9480na		
1200	1300		USA, WWCR Nashville TN	4775na	5935na	
			9980na	15825na		
1200	1300		USA, WWRB Manchester TN	9385am		
1200	1300		USA, WYFR/Family Radio Worldwide			7455na
			11530ca	11970am		
1200	1300		Zambia, 1 Africa Radio/CVC	6065af	13590af	
1200	1300		Zambia, ZNBC (Radio Two)	6165do		
1215	1300		Egypt, Radio Cairo	17835as		
1230	1300		Bangladesh, Bangladesh Betar			7250as
1230	1300		Thailand, Radio Thailand World Service			9720va
1230	1300		Vietnam, Voice of Vietnam	9840as	12020as	

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

1300	1330		Egypt, Radio Cairo	17835as		
1300	1345		USA, WYFR/Family Radio Worldwide			7455na
			11970na			
1300	1357		China, China Radio International			5995as
			7300na	9570na	9730as	9765va
			9870as	11760as	11885as	11900eu
			11980as	13790eu	15230na	17490va
1300	1357		North Korea, Voice of Korea	9335na	11710na	
			13760eu	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	15340as	15400as	
1300	1400		Australia, Radio Australia	5995pa	6020pa	
			9560pa	9580pa	9590pa	
1300	1400		Bahrain, Radio Bahrain	6010me	9745al	
1300	1400	a/DRM	Belgium, TDP Radio	6015eu		
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 John's NF	6160na		
1300	1400		Canada, CKZU Vancouver BC	6160na		
1300	1400	Sat/Sun	Equatorial Guinea, Radio East Africa	15190af		
1300	1400	DRM	Germany, Deutsche Welle	9545eu	13810eu	
1300	1400		Indonesia, Voice of Indonesia	9526va	11785al	
1300	1400		Malaysia, RTM/Traxx FM	7295do		
1300	1400		New Zealand, Radio NZ International			6170pa
1300	1400		Nigeria, Voice of Nigeria/External Service	9690af		
1300	1400		Poland, Polish Radio	11675eu	11860eu	
1300	1400		Russia, Voice of Russia	7205af		
1300	1400		South Korea, KBS World Radio			9570as
			9770as			
1300	1400		Uganda, UBC Radio	4976do		
1300	1400		UK, BBC World Service	5875as	6190af	
			6195as	9410as	9545eu	9740as
			9860af	11760me	11835as	15310as
			15420af	15575eu	21470af	
1300	1400		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb

1300	1400		USA, EWTN/WEWN Vandiver AL			13835eu
1300	1400		USA, Voice of America	7575va	9640va	
			9760va	11705va		
1300	1400		USA, WBCQ Monticello ME	5110am	7415am	
1300	1400		USA, WHRI Cypress Creek SC	9840na	15665va	
1300	1400		USA, WINB Red Lion PA	9265ca		
1300	1400		USA, WJHR International Milton FL			15550usb
1300	1400	vl	USA, WRMI Miami FL	9955va		
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WTWW Lebanon TN	9480na		
1300	1400		USA, WWCR Nashville TN	4775na	9980na	
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	9385am		
1300	1400		USA, WYFR/Family Radio Worldwide			6025as
			7560as	9310na	11830na	11620as
			11830na	11855na		
1300	1400		Zambia, 1 Africa Radio/CVC	6065af		13590af
1300	1400		Zambia, ZNBC (Radio Two)	6165do		
1310	1340		Japan, NHK World/ Radio Japan			9875as
1330	1400	mtwhfa	Guam, KSDA/ AWR	15660as		
1330	1400		India, All India Radio	9620as	11620as	
			13710as			
1330	1400		Laos, Lao National Radio	7145as		
1330	1400		Sweden, Radio Sweden	7405as		
1330	1400		Turkey, Voice of Turkey	12035eu	15300as	
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as	

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

1400	1425		Turkey, Voice of Turkey	12035eu	15300as	
1400	1429		Czech Republic, Radio Prague	11600as		
1400	1430		Australia, HCJB Global	15400as		
1400	1430	Sun	Germany, Pan American Broadcasting			13645as
1400	1430	`	Japan, NHK World/ Radio Japan			5995as
			9875as	11705na	11780eu	21560va
1400	1430		Thailand, Radio Thailand World Service			9725va
1400	1430	Sun	United Arab Emirates, FEBA Radio			12045as
1400	1440		Guam, KTWR/TWR	9975as		
1400	1457		China, China Radio International			5955na
			6075na	7300na	7325na	9460as
			9560as	9700as	9765va	9870as
			11665as	13675eu	13685eu	13740na
			15230af	17630af		
1400	1459		Netherlands, R Netherlands Worldwide			12080va
			15595va			
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	5995pa	6080pa	
			7240pa	9590pa		
1400	1500		Bahrain, Radio Bahrain	6010me	9745al	
1400	1500	s/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 John's NF	6160na		
1400	1500		Canada, CKZU Vancouver BC	6160na		
1400	1500	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1400	1500		Germany, CVC Intl-Christian Vision			17770af
1400	1500		India, All India Radio	9620as	11620as	
			13710as			
1400	1500		Libya, LJB/Voice of Africa	17725af	21695af	
1400	1500		Malaysia, RTM/Traxx FM	7295do		
1400	1500		New Zealand, Radio NZ International			6170pa
1400	1500		Nigeria, Voice of Nigeria/External Service			9690af
1400	1500		Oman, Radio Oman	15140va		
1400	1500	DRM	Russia, Voice of Russia	5905eu		
1400	1500		Russia, Voice of Russia	7205af	7340af	
			11660af	12055af		
1400	1500		South Africa, Channel Africa	9625af		
1400	1500		Uganda, UBC Radio	4976do		
1400	1500		UK, BBC World Service	5875as	5975as	
			6190af	6195as	9410as	9545as
			9625as	9740as	9860af	11760as
			15420af	17640af		
1400	1500	DRM	UK, BBC World Service	9545eu	13590eu	
1400	1500	Sat/Sun	UK, Bible Voice Broadcasting	13730as		
1400	1500		United States, Overcomer Ministries			6110eu
			13810va			
1400	1500		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1400	1500		USA, EWTN/WEWN Vandiver AL			13835eu
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KNLS Anchor Point AK	6890as		
1400	1500		USA, Voice of America	4930af	6080af	
			7575va	9760va	9930va	11985va
			12150va	15205va	15580af	17650af
			17715af			
1400	1500		USA, WBCQ Monticello ME	5110am	7415am	
1400	1500		USA, WHRI Cypress Creek SC	9840na	17540af	
1400	1500		USA, WINB Red Lion PA	13570ca		
1400	1500		USA, WJHR International Milton FL			15550usb
1400	1500	vl	USA, WRMI Miami FL	9955va		
1400	1500		USA, WTJC Newport NC	9370na		
1400	1500		USA, WTWW Lebanon TN	9480na		
1400	1500		USA, WWCR Nashville TN	4775na	9980na	
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385am		
1400	1500		USA, WYFR/Family Radio Worldwide			6225as
			9485as	9770as	11560na	11855na
			13695na	11565na	17760na	
1400	1500		Zambia, 1 Africa Radio/CVC	6065af		13650af
1400	1500		Zambia, ZNBC (Radio Two)	6165do		
1400	1557		China, China Radio International			5955as
			6095as	7325as	7405as	9435na
			9870as	13685as	13740na	17630va
1405	1500	Sat	Greece, Voice of Greece	9420eu		
1415	1430	mtwhfa	Germany, Pan American Broadcasting			13645as
1415	1430		Nepal, Radio Nepal	5005as		
1425	1455	mtwhf	Swaziland, TWR Africa	6025af		
1430	1445	Sun	Germany, Pan American Broadcasting			13645as
1430	1500		Australia, Radio Australia	9475as	11660as	
1430	1500		China, CPBS/CNR Business Radio			6155do
			7245do	7315as	7335as	7375as
			9820as	9775as		
1430	1500		Sweden, Radio Sweden	9400as		

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

1500	1510	mtwhfa	Turkmenistan, Turkmen Radiosi			5015eu
1500	1515	Sun	UK, Bible Voice Broadcasting	15680af		
1500	1530		Australia, HCJB Global	15340as		
1500	1530	Sat/Sun	Clandestine, Sudan Radio Service/ SRS			17745af
1500	1530		Guam, KSDA/ AWR	15255as		
1500	1530		UK, BBC World Service	9410af	11860af	
			15105af			
1500	1530	Sat	UK, Bible Voice Broadcasting	11880as		
1500	1530		Vietnam, Voice of Vietnam	7285as	9840as	
			12020as			
1500	1545		USA, WYFR/Family Radio Worldwide			15210sa
1500	1550		New Zealand, Radio NZ International			6170pa
1500	1557		Canada, Radio Canada International			9635as
			11975as			
1500	1557		China, China Radio International			5955as
			6060as	6100as	7235as	7255as
			7420as	7435as	9435as	9525eu
			9570as	9600na	11650as	
1500	1557		Libya, LJB/Voice of Africa	17725af	21695af	
1500	1557		Netherlands, R Netherlands Worldwide			12080as
			15595va			
1500	1557		North Korea, Voice of Korea	9335na	11710na	
			13760eu	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	9745al	
1500	1600	DRM	Belgium, TDP Radio	6015eu		
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 John's NF	6160na		
1500	1600		Canada, CKZU Vancouver BC	6160na		
1500	1600	Sat/Sun	Equatorial Guinea, Radio East Africa			15190af
1500	1600		Germany, CVC Intl-Christian Vision			17770af
1500	1600		Malaysia, RTM/Traxx FM	7295do		
1500	1600		Myanmar, Myanma Radio	5985as		
1500	1600		Russia, Voice of Russia	4975me	7260af	
			9660af			
1500	1600	DRM	Russia, Voice of Russia	5905eu		
1500	1600		South Africa, Channel Africa	9625af		
1500	1600		Uganda, Dunamis Shortwave	4750af		
1500	1600		Uganda, UBC Radio	4976do		
1500	1600		UK, BBC World Service	5875as	5975as	
			6190af	6195as	7395as	9740as
			9855as	9860af	12095af	15400af
			15420af	17640af		
1500	1600	DRM	UK, BBC World Service	5790eu	13590eu	
1500	1600		United States, Overcomer Ministries			6110eu
			13810va	17485eu		

1500	1600		USA, American Forces Network				4319usb
			5446usb	5765usb	6350usb	7812usb	
			10320usb	12133usb	12759usb	13362usb	
1500	1600		USA, EWTN/WEWN Vandiver AL				15610me
1500	1600		USA, KJES Vado NM			11715am	
1500	1600		USA, Voice of America			4930af	6080af
			7545va	9310va	9685va	9930va	
			11525va	11765va	12150va	15580af	
			17715af	17895af			
1500	1600		USA, Voice of America/Special English				6140va
			7520va	9760va	15460va		
1500	1600		USA, WBCQ Monticello ME			5110am	7415am
			9955na				
1500	1600		USA, WHRI Cypress Creek SC			9840na	
1500	1600	mtwhfa	USA, WHRI Cypress Creek SC			21640af	
1500	1600		USA, WINB Red Lion PA			13570ca	
1500	1600		USA, WJHR International Milton FL				15550usb
1500	1600	vl	USA, WRMI Miami FL			9955na	
1500	1600		USA, WTJC Newport NC			9370na	
1500	1600		USA, WTWW Lebanon TN			9480na	
1500	1600		USA, WWCR Nashville TN			4775na	9980na
			13845na	15825na			
1500	1600		USA, WWRB Manchester TN			9385am	
1500	1600		USA, WYFR/Family Radio Worldwide				6280as
			9495as	11565na	11855na	12015as	
			17760na				
1500	1600		Zambia, 1 Africa Radio/CVC			6065af	13650af
1500	1600		Zambia, ZNBC (Radio Two)			6165do	
1515	1530		Vatican City State, Vatican Radio				7585as
			9310as	11850as	13765as		
1525	1600	Sat/Sun	Swaziland, TWR Africa			6025af	
1530	1545		India, All India Radio			7255as	9620as
			9820as	9910as			
1530	1600	mtwhfa	Albania, Radio Tirana			13640na	
1530	1600		Iran, Voice of Islamic Rep. of Iran				6160as
			7380as				
1530	1600		Mongolia, Voice of Mongolia			9665as	
1530	1600		Sweden, Radio Sweden			9360va	
1530	1600	Sat	UK, BBC World Service			9410af	11860af
			15105af				
1530	1600	Sun	UK, Bible Voice Broadcasting			13590me	
1530	1600		UK, Bible Voice Broadcasting			15680as	
1530	1600	Sat	Vatican City State, Vatican Radio				7585as
			11850as	13765as			
1545	1600	mtwhfa	UK, Bible Voice Broadcasting			13590me	
1551	1600		New Zealand, Radio NZ International				7440pa
1551	1600	DRM	New Zealand, Radio NZ International				6170pa

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

1600	1610		Pakistan, PBC/ Radio Pakistan			7535me	11565af
			15100va				
1600	1615	f	UK, Bible Voice Broadcasting			13590me	
1600	1620	t	UK, Bible Voice Broadcasting			13590me	
1600	1625	Sat/Sun	Swaziland, TWR Africa			6025af	
1600	1627		Iran, Voice of Islamic Rep. of Iran				6160as
			7380as				
1600	1630		Guam, KSDA/ AWR			9585as	11690as
1600	1630		Myanmar, Myanma Radio			9730do	
1600	1630	Sat	USA, Voice of America			11750af	
1600	1630		Vietnam, Voice of Vietnam			7220me	7280eu
			9550me	9730va			
1600	1645		USA, WYFR/Family Radio Worldwide				11565na
			11830na	17760na			
1600	1657		North Korea, Voice of Korea			9990va	11545va
1600	1700		Anguilla, Worldwide Univ Network				11775am
1600	1700		Australia, ABC NT Alice Springs				2310do
1600	1700		Australia, ABC NT Katherine			2485do	
1600	1700		Australia, Radio Australia			5995pa	6080pa
			7240pa	9475as	9710pa	11660as	
1600	1700		Bahrain, Radio Bahrain			6010me	9745al
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 John's NF			6160na	
1600	1700		Canada, CKZU Vancouver BC			6160na	
1600	1700		Egypt, Radio Cairo12170af				
1600	1700		Ethiopia, Radio Ethiopia/External Service				7165va
			9560af				
1600	1700		France, Radio France International				15605af
1600	1700		Germany, CVC Intl-Christian Vision				17770af
1600	1700		Germany, Deutsche Welle			5965as	
1600	1700		Malaysia, RTM/Traxx FM			7295do	
1600	1700		New Zealand, Radio NZ International				7440pa
1600	1700	DRM	New Zealand, Radio NZ International				6170pa
1600	1700		Russia, Voice of Russia			4975me	6130eu
			7305af	9470va	11630af		
1600	1700		South Korea, KBS World Radio				9515eu
1600	1700		Taiwan, Radio Taiwan International				11550as
			11995as				
1600	1700		Uganda, Dunamis Shortwave			4750af	
1600	1700		Uganda, UBC Radio			4976do	
1600	1700		UK, BBC World Service			3255af	3995eu
			5790eu	5975as	6190af	7255as	
			9740as	11860af	12095eu	13820af	
			15400af	15420af	17640af		
1600	1700	DRM	UK, BBC World Service			3995eu	5790eu
1600	1700	Sat	UK, BBC World Service			9410af	15105af
1600	1700	Sun	UK, Bible Voice Broadcasting			13590me	
1600	1700		USA, American Forces Network				4319usb
			5446usb	5765usb	6350usb	7812usb	
			10320usb	12133usb	12759usb	13362usb	
1600	1700		USA, EWTN/WEWN Vandiver AL				15610me
1600	1700		USA, KJES Vado NM			11715am	
1600	1700		USA, Voice of America			4930af	6080af
			6225af	15580af	17715af	17895af	
1600	1700		USA, Voice of America/Special English				9395va
			13600va	15445va			
1600	1700		USA, WBCQ Monticello ME			5110am	7415am
			9955na				
1600	1700		USA, WHRI Cypress Creek SC			9840na	21640af
1600	1700		USA, WINB Red Lion PA			13570ca	
1600	1700		USA, WJHR International Milton FL				15550usb
1600	1700	vl	USA, WRMI Miami FL			9955na	
1600	1700		USA, WTJC Newport NC			9370na	
1600	1700		USA, WTWW Lebanon TN			9480na	
1600	1700		USA, WWCR Nashville TN			4775na	9980na
			13845na	15825na			
1600	1700		USA, WWRB Manchester TN			9385am	
1600	1700		USA, WYFR/Family Radio Worldwide				5960na
			6085af	9445af	9795af	11740af	
			11830eu	13695eu	17690eu	18980eu	
			21455eu				
1600	1700		Zambia, 1 Africa Radio/CVC			6065af	13650af
1600	1700		Zambia, ZNBC (Radio Two)			6165do	
1600	1757		China, China Radio International				6060af
			6100as	7235as	7255as	7420as	
			7435as	9435as	9525eu	9570as	
			9600eu	11650va			
1605	1700		Canada, Radio Canada International				9610na
1605	1700	DRM	Canada, Radio Canada International				9800na
1615	1630	mtwhf	Swaziland, TWR Africa			6130af	
1615	1700	Sun	UK, BBC World Service			9410af	11860af
			15105af				
1615	1700		UK, Bible Voice Broadcasting			13590me	
1630	1700		China, Xizang People's BC Station/ Tibet				6200do
1630	1700		Guam, KSDA/ AWR			9840as	
1640	1650	mtwhfa	Turkmenistan, Turkmen Radiosi				4930eu

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

1700	1704		Canada, Radio Canada International				9610na
1700	1704	DRM	Canada, Radio Canada International				9800na
1700	1727		Czech Republic, Radio Prague			5930eu	
1700	1730		Croatia, Croatian Radio			6165va	
1700	1730		Sweden, Radio Sweden			7465va	
1700	1730		UK, Bible Voice Broadcasting			13590me	
1700	1745		UK, BBC World Service			9410af	11860af
1700	1745		USA, WYFR/Family Radio Worldwide				18980eu
1700	1750		New Zealand, Radio NZ International				7440pa
1700	1750	DRM	New Zealand, Radio NZ International				6170pa
1700	1757		China, China Radio International				6090af
			6100as	6140as	6165af	7205af	
			7255af	7335as	7410eu	7420af	
			7425eu	7435va	9570eu		
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	9580pa	9710pa	11880pa	
1700	1800		Bahrain, Radio Bahrain			6010me	9745al
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 John's NF			6160na	
1700	1800		Canada, CKZU Vancouver BC			6160na	
1700	1800		Egypt, Radio Cairo12170af				
1700	1800		Equatorial Guinea, Radio Africa				7190af
			15190af				
1700	1800		Germany, CVC Intl-Christian Vision				17770af
1700	1800		Kuwait, Radio Kuwait			11990va	
1700	1800		Malaysia, RTM/Traxx FM			7295do	
1700	1800		Nigeria, Voice of Nigeria/External Service				15120af
1700	1800		Russia, Voice of Russia			4975me	7240af
			7305af	9470va			

1700	1800		South Africa, Channel Africa	15235af			
1700	1800		Swaziland, TWR Africa	3200af			
1700	1800		Taiwan, Radio Taiwan International	11850af	15690as		
1700	1800		Tajikistan, Voice of Tajik/External Svc	7245va			
1700	1800		Uganda, Dunamis Shortwave	4750af			
1700	1800		Uganda, UBC Radio	4976do			
1700	1800		UK, BBC World Service	3255af	3995eu	5975as	6190af
			7355as	12095af	13820af	15400af	15420af
1700	1800	DRM	UK, BBC World Service	3995eu			
1700	1800	Sat	UK, Bible Voice Broadcasting	9430me			
1700	1800	Sun	UK, Bible Voice Broadcasting	13590me			
1700	1800		USA, American Forces Network	4319usb	5446usb	5765usb	6350usb
			7812usb	10320usb	12133usb	12759usb	13362usb
1700	1800		USA, EWTN/WEWN Vandiver AL	15610me			
1700	1800		USA, Voice of America	6080af	6225af	13710af	15580af
			17895af				
1700	1800		USA, WBCQ Monticello ME	5110am	7415am	9955na	
1700	1800		USA, WHRI Cypress Creek SC	9840na	21640af		
1700	1800		USA, WINB Red Lion PA	13570ca			
1700	1800		USA, WJHR International Milton FL	15550usb			
1700	1800	vl	USA, WRMI Miami FL	9955va			
1700	1800		USA, WTJC Newport NC	9370na			
1700	1800		USA, WTWW Lebanon TN	9480na			
1700	1800		USA, WWCR Nashville TN	9980na	12160na	13845na	15825na
1700	1800		USA, WWRB Manchester TN	9385am			
1700	1800		USA, WYFR/Family Radio Worldwide	13695af	17555na	21455eu	21680af
1700	1800		Zambia, 1 Africa Radio/CVC	4965af	13590af		
1700	1800		Zambia, ZNBC (Radio Two)	6165do			
1705	1800		Canada, Radio Canada International	9610na			
1705	1800	DRM	Canada, Radio Canada International	9800na			
1717	1730		Vatican City State, Vatican Radio	4005eu	5885eu	7250eu	7290eu
			9645eu				
1720	1740	Sat/Sun	USA, Voice of America/Studio 7	4930af	12080af	15775af	
1730	1757		Slovakia, Radio Slovakia International	5915eu	6055eu		
1730	1800		Clandestine, Sudan Radio Service/ SRS	9840af			
1730	1800		UK, Bible Voice Broadcasting	13590me			
1730	1800	Sun	UK, Bible Voice Broadcasting	9430me			
1730	1800	mtwhf	USA, Voice of America/Studio 7	4930af	12080af	15775af	
1730	1800		Vatican City State, Vatican Radio	9755af	11625af	13765af	
1745	1800		Bangladesh, Bangladesh Betar	7250as			
1745	1800	DRM	India, All India Radio	9950eu			
1745	1800		India, All India Radio	6180eu	7410eu	11935af	15075af
1751	1800		New Zealand, Radio NZ International	9765pa			
1751	1800	DRM	New Zealand, Radio NZ International	9890pa			

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

1800	1804		Canada, Radio Canada International	9610na			
1800	1804	DRM	Canada, Radio Canada International	9800na			
1800	1815	mtwhf	Moldova, (Transnistria) Radio PMR	6240eu			
1800	1815	Sun	UK, Bible Voice Broadcasting	13590me			
1800	1827		China, China Radio International	6020eu			
1800	1827		Czech Republic, Radio Prague	5930eu			
1800	1830	w	Austria, AWR Europe	9515af			
1800	1830	DRM	Romania, Radio Romania International	5895eu			
1800	1830		South Africa, AWR Africa	3215af	3345af	11830af	
1800	1830		UK, BBC World Service	5975as	7260as	7355as	
1800	1830		UK, Bible Voice Broadcasting	13590me			
1800	1830	fa	UK, Bible Voice Broadcasting	9430me			
1800	1830		USA, Voice of America	4930af	6080af	11975af	12080af
			13710af	15580af	15775af	17895af	
1800	1830	Sat/Sun	USA, Voice of America	4930af			
1800	1830		Vietnam, Voice of Vietnam	5955eu			
1800	1850		New Zealand, Radio NZ International	9765pa			
1800	1856		Romania, Radio Romania International	7215eu			
1800	1856	DRM	Romania, Radio Romania International	6065eu			
1800	1857		China, China Radio International	6100eu	7265eu	7405eu	
1800	1857		Netherlands, R Netherlands Worldwide	6020af	11655af	12045af	
1800	1857		North Korea, Voice of Korea	13760eu	15245eu		
1800	1859		Canada, Radio Canada International	9740af	11845af	13650af	15365af
			17790af				
1800	1900		Anguilla, Worldwide Univ Network	11775am			
1800	1900	mtwhf	Argentina, Radio Nacional RAE	15345eu			
1800	1900		Australia, ABC NT Alice Springs	2310do			
1800	1900		Australia, ABC NT Katherine	2485do			
1800	1900		Australia, Radio Australia	6080pa	7240pa	9475as	9580pa
			9710pa	11880pa			
1800	1900		Bahrain, Radio Bahrain	6010me	9745al		
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 John's NF	6160na			
1800	1900		Canada, CKZU Vancouver BC	6160na			
1800	1900		Equatorial Guinea, Radio Africa	7190af	15190af		
1800	1900		Germany, CVC Intl-Christian Vision	17770af			
1800	1900	DRM	Germany, Deutsche Welle	3995eu			
1800	1900	DRM	India, All India Radio	9950eu			
1800	1900		India, All India Radio	9445af	11935af	15075af	
1800	1900		Kuwait, Radio Kuwait	11990va			
1800	1900		Malaysia, RTM/Traxx FM	7295do			
1800	1900	DRM	New Zealand, Radio NZ International	9890pa			
1800	1900		Nigeria, Voice of Nigeria/External Service	15120af			
1800	1900		Poland, Polish Radio	9650eu			
1800	1900	DRM	Poland, Polish Radio	6130eu			
1800	1900		Russia, Voice of Russia	4975me	7240af	7270me	7305af
			7330eu				
1800	1900	fas	Slovakia, IRRS/Euro Gospel Radio	6170va			
1800	1900		South Africa, TWR 9500af				
1800	1900		South Korea, KBS World Radio	7235eu			
1800	1900		Swaziland, TWR Africa	3200af			
1800	1900		Taiwan, Radio Taiwan International	3965eu			
1800	1900		Uganda, Dunamis Shortwave	4750af			
1800	1900		Uganda, UBC Radio	4976do			
1800	1900		UK, BBC World Service	3255af	3995eu	5875eu	5945as
			5955as	6190af	7390eu	11810af	12095af
			13820af	15400af	15420af		
1800	1900	Sun	UK, Bible Voice Broadcasting	6130eu	9430me		
1800	1900		USA, American Forces Network	4319usb	5446usb	5765usb	6350usb
			7812usb	10320usb	12133usb	12759usb	13362usb
1800	1900		USA, EWTN/WEWN Vandiver AL	15610me			
1800	1900		USA, WBCQ Monticello ME	5110am	7415am	9955na	
1800	1900		USA, WHRI Cypress Creek SC	9840na	21640af		
1800	1900		USA, WINB Red Lion PA	13570ca			
1800	1900		USA, WJHR International Milton FL	15550usb			
1800	1900	vl	USA, WRMI Miami FL	9955ca			
1800	1900		USA, WTJC Newport NC	9370na			
1800	1900		USA, WTWW Lebanon TN	9480na			
1800	1900		USA, WWCR Nashville TN	9980na	12160na	13845na	15825na
1800	1900		USA, WWRB Manchester TN	9385am			
1800	1900		USA, WYFR/Family Radio Worldwide	6045af	6915na	7395af	9895af
			13695na	15115af	17535na	17555na	
1800	1900		Zambia, 1 Africa Radio/CVC	4965af	13590af		
1800	1900		Zambia, ZNBC (Radio Two)	6165do			
1830	1845		Rwanda, Radio Rwanda	6055do			
1830	1900		Bulgaria, Radio Bulgaria	6200eu	7400eu		
1830	1900	DRM	Bulgaria, Radio Bulgaria	9700eu			
1830	1900		UK, BBC World Service	6005af	9410af		
1830	1900	f	UK, Bible Voice Broadcasting	9430me			
1830	1900		USA, Voice of America	4930af	6080af	11975af	13710af
			15580af	17895af			
1845	1900	mtwhf	Moldova, (Transnistria) Radio PMR	6240eu			
1845	1900		UK, Bible Voice Broadcasting	11830af			
1851	1900		New Zealand, Radio NZ International	11725pa			

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

1900	1930		Germany, Deutsche Welle	9735af	11690af	13780af	
1900	1930		Vietnam, Voice of Vietnam	7280eu	9730eu		
1900	1935	DRM	New Zealand, Radio NZ International	9890pa			
1900	1945	DRM	India, All India Radio	9950eu			
1900	1945		India, All India Radio	9445af	11935af	15075af	
1900	1945		USA, WYFR/Family Radio Worldwide	6085na	15565as		
1900	1957		China, China Radio International	7285eu	7295va	9440va	
1900	1957		Netherlands, R Netherlands Worldwide	7425af	12080af		
1900	1957		North Korea, Voice of Korea	7100af	9975va	11910af	11535va

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	9580pa	9710pa	11880pa
1900	2000		Bahrain, Radio Bahrain	6010me	9745al	
1900	2000	DRM	Belgium, TDP Radio/Disco Palace			17755na
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St John's NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000		Egypt, Radio Cairo11510af			
1900	2000		Equatorial Guinea, Radio Africa			7190af
			15190af			
1900	2000		Germany, CVC Intl-Christian Vision			17770af
1900	2000	DRM	Germany, Deutsche Welle	3995eu		
1900	2000		Kuwait, Radio Kuwait	11990va		
1900	2000		Malaysia, RTM/Traxx FM	7295do		
1900	2000		New Zealand, Radio NZ International			11725pa
1900	2000		Nigeria, Voice of Nigeria/External Service			15120af
1900	2000		Russia, Voice of Russia	4975me	5985me	
			7290me	7330eu		
1900	2000	fas	Slovakia, IRRS/Euro Gospel Radio			6170va
1900	2000	mtwhf	Spain, Radio Exterior de Espana			9605af
			9665eu			
1900	2000		Swaziland, TWR Africa	3200af		
1900	2000		Thailand, Radio Thailand World Service			7570eu
1900	2000		Uganda, UBC Radio	4976do		
1900	2000		UK, BBC World Service	3255af	5875eu	
			5955as	6005af	6190af	7390eu
			9410af	9835af	11810af	12095af
1900	2000		UK, Bible Voice Broadcasting	11830af		
1900	2000		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
1900	2000		USA, EWTN/WEWN Vandiver AL			15610af
1900	2000		USA, KJES Vado NM	15385va		
1900	2000		USA, Voice of America	4930af	4940af	
			6080af	11975af	13710af	15580af
			17895af			
1900	2000		USA, Voice of America/Special English			9585va
			12020va			
1900	2000		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
1900	2000		USA, WHRI Cypress Creek SC	9840na		15665af
1900	2000		USA, WINB Red Lion PA	13570ca		
1900	2000		USA, WJHR International Milton FL			15550usb
1900	2000	vl	USA, WRMI Miami FL	9955ca		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WTWW Lebanon TN	9475na		
1900	2000		USA, WWCR Nashville TN	9980na	12160na	
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385am		
1900	2000		USA, WYFR/Family Radio Worldwide			3230af
			6020af	6915af	7395af	9480af
			9885af	13695na	15115af	17535na
			17555na			
1900	2000		Zambia, 1 Africa Radio/CVC	4965af		13590af
1900	2000		Zambia, ZNBC (Radio Two)	6165do		
1905	1915		Croatia, Croatian Radio	6165va		
1905	1920	Sat	Mali, ORTM Du Mali	5995do		
1905	2000	m	South Africa, Amateur Radio Mirror Intl			3215af
1930	1957		Slovakia, Radio Slovakia International			5915eu
			7345eu			
1930	1958		Serbia, International Radio of Serbia			6100eu
1930	2000		Iran, Voice of Islamic Rep. of Iran			6010eu
			6040eu	7320eu	9855af	11695af
1930	2000		South Africa, RTE Radio One	6225af		
1930	2000		Turkey, Voice of Turkey	6050eu		
1936	1950	DRM	New Zealand, Radio NZ International			11675pa
1945	2000	mtwhas	Albania, Radio Tirana	11635eu		
1945	2000	mtwhf	UK, Bible Voice Broadcasting	11830af		
1951	2000	DRM	New Zealand, Radio NZ International			11675pa

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

2000	2005	m	South Africa, Amateur Radio Mirror Intl			3215af
2000	2025		Turkey, Voice of Turkey	6050eu		
2000	2027		Iran, Voice of Islamic Rep. of Iran			6010eu
			6040eu	7320eu	9855af	11695af
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu		13640na
2000	2030		Egypt, Radio Cairo11510af			
2000	2030		South Africa, RTE Radio One	6225af		
2000	2030		Swaziland, TWR Africa	3200af		
2000	2030		USA, Voice of America	4930af	4940af	
			6080af	11975af	13710af	15580af
2000	2030		Vatican City State, Vatican Radio			7365af
			9755af	11625af		
2000	2045	h	Rwanda, Radio Rwanda	6055do		
2000	2045		USA, WYFR/Family Radio Worldwide			5745eu
2000	2050		New Zealand, Radio NZ International			11725pa
2000	2057		China, China Radio International			5960eu
			5985af	7415va	7285eu	7295eu
			9440eu	9600af	11640af	13630af
2000	2057		Netherlands, R Netherlands Worldwide			7425af
			11655af	21525af		
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	9500as	11650pa	
			11660pa	11880pa		
2000	2100	Sat/Sun	Australia, Radio Australia	6080pa	7240pa	
			12080pa			
2000	2100		Bahrain, Radio Bahrain	6010me	9745al	
2000	2100	DRM	Belgium, TDP Radio	9790na		
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St John's NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		Equatorial Guinea, Radio Africa			7190af
			15190af			
2000	2100		Germany, CVC Intl-Christian Vision			17770af
2000	2100		Germany, Deutsche Welle	9690af	9735af	
			13780af			
2000	2100		Indonesia, Voice of Indonesia	9526va	11785al	
2000	2100		Kuwait, Radio Kuwait	11990va		
2000	2100		Malaysia, RTM/Traxx FM	7295do		
2000	2100	DRM	New Zealand, Radio NZ International			11675pa
2000	2100		Nigeria, Voice of Nigeria/External Service			15120af
2000	2100		Russia, Voice of Russia	7330af		
2000	2100	fas	Slovakia, IRRS/Euro Gospel Radio			6170va
2000	2100		Uganda, UBC Radio	4976do		
2000	2100		UK, BBC World Service	3255af	6005af	
			6190af	9410af	9615af	11810af
			12095af	15400af		
2000	2100		Ukraine, Radio Ukraine International			7510eu
2000	2100		USA, American Forces Network			4319usb
			5446usb	5765usb	6350usb	7812usb
			10320usb	12133usb	12759usb	13362usb
2000	2100		USA, EWTN/WEWN Vandiver AL			15610af
2000	2100		USA, KJES Vado NM	15385ca		
2000	2100		USA, WBCQ Monticello ME	5110am	7415am	
			9955na			
2000	2100	mtws	USA, WHRI Cypress Creek SC	7520eu		
2000	2100	fas	USA, WHRI Cypress Creek SC	15665af		
2000	2100	Sun	USA, WHRI Cypress Creek SC	9575va		
2000	2100		USA, WINB Red Lion PA	13570ca		
2000	2100		USA, WJHR International Milton FL			15550usb
2000	2100	vl	USA, WRMI Miami FL	9955ca		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WTWW Lebanon TN	9475na		
2000	2100		USA, WWCR Nashville TN	9980na	12160na	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385am		
2000	2100		USA, WYFR/Family Radio Worldwide			6020na
			6260eu	6915eu	7240as	9480af
			9610af	9630af	15115af	15195ca
			17535ca	17555ca	17575ca	
2000	2100		Zambia, 1 Africa Radio/CVC	9505af		
2000	2100		Zambia, ZNBC (Radio Two)	6165do		
2000	2105		Uganda, UBC Radio	4976do		
2030	2045		Thailand, Radio Thailand World Service			9535eu
2030	2100		Cuba, Radio Havana Cuba	11760am		
2030	2100		Sweden, Radio Sweden	9490af		
2030	2100		USA, Voice of America	7405as		
2030	2100	Sat/Sun	USA, Voice of America	4940af		
2030	2100		Vietnam, Voice of Vietnam	7220me	7280eu	
			9550me	9730eu		
2045	2100		India, All India Radio	6180eu	7410eu	
			9445eu	11620pa	11715pa	
2045	2100	DRM	India, All India Radio	9950eu		
2045	2100	DRM	Vatican City State, Vatican Radio			9800am
2050	2100		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu		
2051	2100		New Zealand, Radio NZ International			17675pa

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

2100	2120		Vatican City State, Vatican Radio			4005eu
			5885eu	7250eu		
2100	2127		China, China Radio International			7250af
			11640af	13630af		
2100	2127		Czech Republic, Radio Prague	5930va		
2100	2130	mtwhfa	Albania, Radio Tirana	7430eu	9895eu	

2100	2130		Australia, ABC NT Alice Springs				2310do
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		Cuba, Radio Havana Cuba	11760am			
2100	2145		USA, WYFR/Family Radio Worldwide				6915na
			15115af	17535na	17555na		
2100	2150	DRM	New Zealand, Radio NZ International				11675pa
2100	2157		China, China Radio International				5960eu
			6135af	7205eu	7225af		7325af
			7405af	7415af	9600af		
2100	2157		North Korea, Voice of Korea	13760eu			15245eu
2100	2200		Angola, Radio Nacional de Angola				7217do
2100	2200		Anguilla, Worldwide Univ Network				11775am
2100	2200		Australia, Radio Australia	9500as			9660pa
			11695as	12080pa	13630pa		15515pa
2100	2200		Bahrain, Radio Bahrain	6010me			9745al
2100	2200		Belarus, Radio Belarus	6155eu			7360as
			7390eu				
2100	2200		Canada, CFRX Toronto ON	6070na			
2100	2200		Canada, CFVP Calgary AB	6030na			
2100	2200		Canada, CKZN St John's NF	6160na			
2100	2200		Canada, CKZU Vancouver BC	6160na			
2100	2200		Equatorial Guinea, Radio Africa				7190af
			15190af				
2100	2200		Germany, Deutsche Welle	7280af			9545af
			11690af	13780af			
2100	2200		India, All India Radio	11620pa			11715pa
2100	2200	DRM	India, All India Radio	9950eu			
2100	2200		Malaysia, RTM/Traxx FM	7295do			
2100	2200		New Zealand, Radio NZ International				17675pa
2100	2200	f	Slovakia, IRRS/Euro Gospel Radio				6170va
2100	2200		Syria, Radio Damascus	9330eu			12085as
2100	2200	DRM	UK, BBC World Service	3995eu			
2100	2200		UK, BBC World Service	3255af			3915as
			5875as	5965as	6005af		6190af
			6195as	7445af	9410af		9915af
			12095af				
2100	2200		USA, American Forces Network				4319usb
			5446usb	5765usb	6350usb		7812usb
			10320usb	12133usb	12759usb		13362usb
2100	2200		USA, EWTN/WEWN Vandiver AL				15610af
2100	2200		USA, Voice of America	6080af			7405as
			15580af				
2100	2200		USA, WBCQ Monticello ME	5110am			7415am
			9955am				
2100	2200	mtwhfa	USA, WHRI Cypress Creek SC	9525va			
2100	2200	fas	USA, WHRI Cypress Creek SC	15665af			
2100	2200		USA, WINB Red Lion PA	9265ca			
2100	2200		USA, WJHR International Milton FL				15550usb
2100	2200	vl	USA, WRMI Miami FL	9955ca			
2100	2200		USA, WTJC Newport NC	9370na			
2100	2200		USA, WTWW Lebanon TN	9475na			
2100	2200		USA, WWCR Nashville TN	7465na			9980na
			12160na	13845na			
2100	2200		USA, WWRB Manchester TN	3215na			9385am
2100	2200		USA, WYFR/Family Radio Worldwide				5950na
			6240eu	9480af	15115af		15195af
2100	2200		Zambia, 1 Africa Radio/CVC	9505af			
2100	2200		Zambia, ZNBC (Radio Two)	6165do			
21000	2200		Japan, NHK World/ Radio Japan				13640pa
2115	2200		Egypt, Radio Cairo6270eu				
2130	2156		Romania, Radio Romania International				6115na
			7380eu	9755na			
2130	2156	DRM	Romania, Radio Romania International				6030eu
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
			7415as				
2130	2200		Guam, KSDA/ AWR	9625as			
2130	2200		Sweden, Radio Sweden	7425af			
2130	2200		Turkey, Voice of Turkey	9610va			
2151	2200	DRM	New Zealand, Radio NZ International				15720pa

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

2200	2205		Zambia, ZNBC (Radio Two)	6165do			
2200	2215	mtwhs	Moldova, (Transnistria) Radio PMR				6240na
2200	2225		Turkey, Voice of Turkey	9610va			
2200	2228		Serbia, International Radio of Serbia				6100eu
2200	2230	mwf	Guam, KSDA/ AWR	11850as			
2200	2230		India, All India Radio	11620pa			11715pa
2200	2230	DRM	India, All India Radio	9950eu			
2200	2230		South Korea, KBS World Radio				3955eu
2200	2235		New Zealand, Radio NZ International				17625pa
2200	2235	DRM	New Zealand, Radio NZ International				15720pa
2200	2245		Egypt, Radio Cairo6270eu				
2200	2245		USA, WYFR/Family Radio Worldwide				17690af
2200	2257		China, China Radio International				5915na
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, HCJB Global	15525as			
2200	2300		Australia, Radio Australia	9660pa			12010as
			12040as	13630pa	15230pa		15240as
			15515pa	15560pa			
2200	2300		Bahrain, Radio Bahrain	6010me			9745al
2200	2300		Belarus, Radio Belarus	6155eu			7360as
			7390eu				
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 John's NF	6160na			
2200	2300		Canada, CKZU Vancouver BC	6160na			
2200	2300	DRM	Canada, Radio Canada International				9800na
2200	2300		Equatorial Guinea, Radio Africa				7190af
			15190af				
2200	2300		Malaysia, RTM/Traxx FM	7295do			
2200	2300		Palau, T8WH/WHRI/Sound of Hope Radio				
			12040as				
2200	2300	Sat/Sun	Spain, Radio Exterior de Espana				6125eu
2200	2300		Uganda, UBC Radio	4976do			
2200	2300		UK, BBC World Service	3915as			5875as
			5910af	6135as	6195as		9740as
			9915af	12095af			
2200	2300	DRM	UK, BBC World Service	3995eu			
2200	2300		Ukraine, Radio Ukraine International				5830eu
2200	2300		USA, American Forces Network				4319usb
			5446usb	5765usb	6350usb		7812usb
			10320usb	12133usb	12759usb		13362usb
2200	2300		USA, EWTN/WEWN Vandiver AL				15610af
2200	2300		USA, Voice of America	5895va			6070va
			7220va	7405as	7425va		7480va
			9490va	11560va			
2200	2300		USA, WBCQ Monticello ME	5110am			7415am
			9955am				
2200	2300		USA, WHRI Cypress Creek SC	9615af			
2200	2300		USA, WINB Red Lion PA	9265ca			
2200	2300		USA, WJHR International Milton FL				15550usb
2200	2300	vl	USA, WRMI Miami FL	9955ca			
2200	2300		USA, WTJC Newport NC	9370na			
2200	2300		USA, WTWW Lebanon TN	9480na			
2200	2300		USA, WWCR Nashville TN	7465na			9980na
			12160na	13845na			
2200	2300		USA, WWRB Manchester TN	3215na			5050am
			5745af	9385am			
2200	2300		USA, WYFR/Family Radio Worldwide				5950na
			11740na	15440na			
2215	2230		Croatia, Croatian Radio	3985va			
2230	2257		Czech Republic, Radio Prague	7355af			
2230	2300		Guam, KSDA/ AWR	15320as			
2230	2300		USA, Voice of America/Special English				5890va
			7230va	9780va			
2236	2300		New Zealand, Radio NZ International				15720pa
2236	2300	DRM	New Zealand, Radio NZ International				17675pa
2245	2300		India, All India Radio	6055as			7305as
			9705as	11645as			

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

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, HCJB Global	15525as			
2300	0000		Australia, Radio Australia	9660pa			12010as
			12040as	13690pa	15230pa		15560pa
			17796pa				
2300	0000		Bahrain, Radio Bahrain	6010me			9745al
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 John's NF	6160na			
2300	0000		Canada, CKZU Vancouver BC	6160na			
2300	0000		Cuba, Radio Havana Cuba	13790sa			
2300	0000		Egypt, Radio Cairo7580na				
2300	0000		India, All India Radio	6055as			7305as
			9705as	11645as			
2300	0000		Malaysia, RTM/Traxx FM	7295do			
2300	0000		New Zealand, Radio NZ International				15720pa
2300	0000	DRM	New Zealand, Radio NZ International				17675pa

2300	0000		Palau, T8WH/WHRI/Sound of Hope Radio			
			12040as			
2300	0000		Russia, Voice of Russia		7250na	
2300	0000		UK, BBC World Service		3915as	5875as
			6135as	6195as	7385as	9740as
			11955as			
2300	0000		USA, American Forces Network			4319usb
			5446va	5765va	6350va	7812va
			10320va	12133va	12759va	13362va
2300	0000		USA, EWTN/WEWN Vandiver AL			15610af
2300	0000		USA, Voice of America		6070va	7220va
			7265va	7405va	7480va	9490va
			9580va	11560va		
2300	0000		USA, WBCQ Monticello ME		5110am	7415am
2300	0000		USA, WHRI Cypress Creek SC		5875na	
2300	0000		USA, WINB Red Lion PA		9265ca	
2300	0000		USA, WJHR International Milton FL			15550usb
2300	0000	vl	USA, WRMI Miami FL		9955ca	
2300	0000		USA, WTJC Newport NC		9370na	
2300	0000		USA, WTWW Lebanon TN		9480na	
2300	0000		USA, WWCR Nashville TN		5070na	7465na
			9980na	13845na		
2300	0000		USA, WWRB Manchester TN		3215na	5050am
			5745af	9385am		
2300	0000		USA, WYFR/Family Radio Worldwide			5950na
			9430ca	15400ca	15440na	
2300	2315	mtwhs	Moldova, (Transnistria) Radio PMR			6240na
2300	2330		Australia, Radio Australia		15240as	
2300	2330		USA, Voice of America/Special English			6180as
			7460va	11840va		
2300	2345		USA, WYFR/Family Radio Worldwide			9430sa
			11740na	15400sa	15440na	
2300	2345	DRM	Vatican City State, Vatican Radio			7370am
2300	2355		Turkey, Voice of Turkey		5960va	
2300	2356		Romania, Radio Romania International			5915as
			6015va	7220eu	7300as	
2300	2357		China, China Radio International			5915as
			5990na	6040na	6145na	7350as
			7415as	9610as	11790va	11970va
2315	2330		Croatia, Croatian Radio		7375va	
2330	0000		Australia, Radio Australia		15415as	17750as
2330	0000		UK, BBC World Service		6170as	
2330	0000		USA, Voice of America/Special English			6180as
			7460va	11655va	11840va	13640va
2330	0000		Vietnam, Voice of Vietnam		9840as	12020as
2330	2357		Czech Republic, Radio Prague		5930na	
2345	0000		Australia, HCJB Global		15400as	

MT SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana	http://rtsh.sil.at/
Angola, Radio Nacional de Angola	www.rna.ao/
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	www.hcjb.org/
Australia, Radio Australia	www.abc.net.au/ra/
Austria, AWR Europe	www.awr2.org/
Bahrain, Radio Bahrain	www.radiobahrain.net
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 John's 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, CPBS/CNR Business Radio	www.rcinet.ca/
China, Guangxi FBS/Beibu Bay Radio	www.gxradio.com/index/index.asp
China, Voice of the Strait	www.vos.com.cn
China, Xizang People's BC Station/ Tibet	
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.sis.gov.eg/
Ethiopia, Radio Ethiopia/External Service	www.erta.gov.et
France, Radio France International	http://rfienglish.com
Germany, AWR-Europe	www.awr2.org/
Germany, Blue Star Radio	www.mvbalticradio.de
Germany, CVC Intl-Christian Vision	www.christianvision.com/
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/
Guam, KSDA/ AWR	www.awr2.org/
Guam, KTWR/TWR	www.twr.org/
India, All India Radio	www.allindiaradio.org/
Indonesia, Voice of Indonesia	www.voi.co.id
Iran, Voice of Islamic Rep. of Iran	www.irib.ir/English/
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
Libya, LJB/Voice of Africa	www.voiceofafrica.com.ly
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 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, PBS/ Radyo Pilipinas	www.pbs.gov.ph/
Poland, Polish Radio	www.polskieradio.pl
Romania, Radio Romania International	www.rri.ro/
Russia, Voice of Russia	www.ruvr.ru/
Rwanda, Radio Rwanda	www.orinfor.gov.rw/radiorwanda.eng.html
Saudi Arabia, BSKSA/Saudi Radio	www.saudiradio.net/
Serbia, International Radio of Serbia	www.glassrbije.org
Slovakia, IRRS/Euro Gospel Radio	www.nexus.org
Slovakia, IRRS/Radio City	www.nexus.org
Slovakia, IRRS/Radio Joystick	www.nexus.org
Slovakia, Radio Slovakia International	www.rsi.sk
South Africa, RTE Radio One	www.rte.ie/radio1/
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, TWR	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 Africa	www.twr.org.za
Sweden, Radio Sweden	www.sr.se/rs/english/
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	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, Eternal Good News	www.oldpaths.net/Works/Radio/Wilshire
USA, EWTN/WEWN Vandiver AL	www.ewtn.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/english/africa/zimbabwe
USA, WBCQ Monticello ME	www.wbcq.com/
USA, WHRI Cypress Creek SC	www.whr.org/
USA, WINB Red Lion PA	www.winb.com/
USA, WRMI Miami FL	www.wrmi.net/
USA, WRNO New Orleans LA	www.wrnoworldwide.org/
USA, WTJC Newport NC	www.fbnradio.com/
USA, WTWW Lebanon TN	www.wtww.us
USA, WWCR Nashville TN	www.wwcr.com
USA, WWRB Manchester TN	www.wwrb.org/
USA, WYFR/Family Radio Worldwide	www.worldwide.familyradio.org
Uzbekistan, CVC Intl/ The Voice Asia	www.christianvision.com/
Vatican City State, Vatican Radio	www.vaticanradio.org
Vietnam, Voice of Vietnam	www.vov.org.vn
Zambia, 1 Africa Radio/CVC	www.1africa.tv
Zambia, ZNBC (Radio Two)	www.znbc.co.zm

THE QSL REPORT

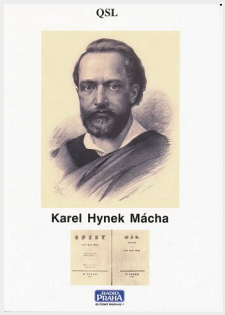
VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Radio Prague ... still going strong

By the end of 2009, shortwave enthusiasts were speculating from earlier press reports that Radio Prague would join the growing list of inactive broadcasters. Thankfully, that did not occur, although they have reduced their presence to one frequency per broadcast session.

This year Radio Prague is offering an eight-card QSL series for 2010 featuring *Czech Writers*. Each author has been a major influence in Czech literature, including philosophy, novels, plays, politics, poetry and the absurd.



The current English schedule is available in the *MT SW Guide*, while non-English is available via *MT Express*. Additional information on the series is available at **www.radio.cz/en/static/qsl-2010** Email reports may be sent to *cr@radio.cz* or postal address: Radio Prague, Vinohradská 12, 120 99 Prague 2, Czech Republic. Streaming audio, on-demand audio, RSS, Podcasting and *Become a Fan of Radio Prague on Facebook* are available from **www.radio.cz/en.**

RFE/RL adds Radio Mashaal to schedule

Radio Free Europe/Radio Liberty followers can add Radio Mashaal ("Torch" in Pashto) as a new station launched earlier this year. Radio Mashaal is broadcasting in local Pashto dialects to the border regions between Afghanistan and Pakistan. Programming is 1100-1300 UTC on 9395, 11605, 13700 kHz. Send details to RFE/RL Headquarters: Vinohradská 1, 110 00 Prague 1, Czech Republic (or) corporate office: 1201 Connecticut Avenue NW, Washington, DC 20036 USA Streaming audio: **www.rferl.org**

CQ Côn Có Island

An international group of amateur radio operators will be active as 3W6C from Côn Có Island (AS-185) Vietnam, April 10-18. During their stay they plan to have four stations on the air to make as many contacts as possible, including on 80 meters and 160 meters. Hailed by operators as *the 2nd most wanted island group of the IOTA program in Asia*, the remote island is located off the central coast of Vietnam in the Gulf of Tonkin. For additional information consult the website at **www.3w6c.qrv.ch/home/**

You asked for Unusual Entertainment

Pirate radio operators continue to keep the pirate fans tuning the dials for the unexpected. Here's where to email for those unique QSL cards: Voice of Next Thursday yellow logo card for 6915 AM *voiceofnextthursdsy@gmx.de*; Barnyard Radio 6930 USB Donkey card *barnyardradio@gmail.com*; Outhouse Radio, 6925 USB *Freedom Arms* card *outhouseradio@gmail.com*; Somebody's Gotta Say It Radio 6915 USB microphone logo card *somebodyradio@gmail.com;* KUSA 6925 USB E-QSL *kusanorthamerica@gmail.com;* Radio Ga Ga 6925 AM logo card *rgaga@gmail.com;* MAC Shortwave 6925.5 AM *macshortwave@yahoo.com;* Euro pirate, Electric Blues Radio 4095 AM *electricblesradio@hotmail.com;* Radio Free Euphoria 6925 USB Hemphy New Years Evil Show card *radioeuphoria@yahoo.com* ; and WHYP, E-QSL *whypradio@gmail.com* (Radnar/FRW).

ALBANIA

Radio Tirana, 6130 kHz. Full data woman in native dress card unsigned. Received in 32 days for an English report and two IRCs. Station address: English Section, Rruga Ismail Demail Nr. 11, Tirana, Albania (Bill Wilkins, Springfield, MO). Web: **http://rtsh.sil.at/**

BRAZIL

Rádio Brasil Central 4985 kHz. Full data verification letter by email. Received in two days for Portuguese/English details to: ***rbc.agecom@gmail.com*** Postal address: Caixa Postal 330, 74001-970 Goiânia GO, Brazil (or) Rua SC-1 No. 299, Parque Santa Cruz, 74860-270 Goiânia GO, Brazil (Sam Wright, Biloxi, MS). Streaming audio **www.agecom.go.gov.br/index**

CANADA

CKZN St John's Newfoundland, 6160 kHz. Full data card signed by Terry Brett, plus schedule and stickers. Received in 515 days after numerous follow-up reports. Station address: Canadian Broadcasting Corporation, Transmission Distribution Department, P.O. Box 12010, Station A, St John's NF A1B 3T8 Canada (Joe Wood, Greenback, TN).

Radio Canada International, 9610 kHz. Full data card signed by Bill Westhaven and schedule. Received in 21 days for an applause card and English report (Wood). Streaming audio: **www.rcinet.ca/**

GERMANY

Hamburger Lokalradio, 6045 kHz. Full data QSL card. Received in 456 days for report and Euros. Station address: c/o Kulturzentrum LOLA, Lohbrugger Landstrasse 8, D-21031 Hamburg, Germany (Robert Pavanello, Italy). Non-commercial station broadcast the first Sunday of the month 1000-1100 UTC on 6045 kHz. On-demand audio **http://hhlr.homepage.t-online.de/index-e.htm**

GREENLAND

Kalaalit Nuaata Radioa-KNR, 3815 kHz. Verification letter signed by Nauja Brons. Received for email report to ***info@knr.gl*** Station address: Kissarneqqortunnguaq 15, P.O. Box 1007, DK-3900 Nuuk, Greenland (Mauro Giroletti, Italy/playdx2003). Streaming audio **www.knr.gl**

MEDIUM WAVE

WPLN , 1430 AM kHz. ***Nashville Public Radio***. Partial data letter on Nashville Public Radio letterhead, signed by Chrissy Wold-Listener Services, plus bumper sticker. Received in nine days for an AM report, $1.00US (returned) and address label (used for reply). Station address: 630 Mainstream Dr., Nashville, TN 37228-1204 (Wilkins). On demand audio **http://wpln.org/home.php**

WYLL, 1160 AM kHz ***Chicago's Christian Talk***. Full data E-QSL from Paul Easter-Chief Engineer. Received in 12 hours for report to ***pauleaster@pobox.com***. Postal address: 25 NW Point B1 # 400, Elk Grove Village, IL 60007 USA (Patrick, Martin, OR). Streaming audio: **www.wyll.com/**

NEW ZEALAND

Radio New Zealand International, 13660 kHz. Full data E-QSL. Received in three days for report details to: ***info@rnzi.com*** (Frank Hillton, Charleston, SC). Online ***Web Report*** form available for postal address route. Please include complete program details and two IRCs or $2.00US to: P.O. Box 123, Wellington, New Zealand Streaming/on demand audio and podcasting at: **www.rnzi.com/**

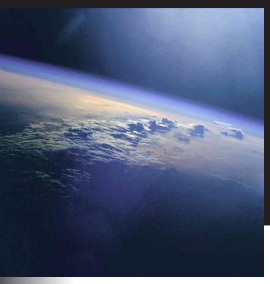
UTILITY

Canada-Trenton Military, Military Aeronautical Communication System (MACS) 15034 kHz. Verification letter signed by Cpl. Anthony Moyer MACS Op C Shift, plus photos of the site. Received in two months. QSL address: 8 Wing Trenton, WITSS (MAC Site), Hwy. N. 33, 21124 Loyalist Pkwy, Varrying Place, Ontario K0K1L0 (Francesco, Anagni, Italy/playdx2003).

Guam-USCG Sector NRV 8422, 12,579, 12,585 kHz. Full data verification letter signed by OS2 Ryan S. Tolentino. Received in 2-1/2 months for utility report and SASE. QSL address: United States Coast Guard, Sector Guam Command Center, Communications Unit, PSC 455, Box 176, FPO-AP 96540-1056 (Martin Foltz, CA/UDXF).

South Africa-ZSJ South Africa Naval Radio/NAVCOMCEN CAPE, 18238 kHz FAX. Verification letter signed by R. Lotter-Officer-in-Charge. Received in 100 days. Station address: NAVCOMCEN Cape-Silvermine Private Bag X1, Simonstown 7995, Republic of South Africa (Giroletti).

USA-USCG Group North Bend, Oregon, NOE 2670 kHz. Full data prepared QSL card verified by Lorraine K.-OSCS. Received in 23 days for utility report with CD and a SASE. QSL address: Commander, USCG Group, 2000 Connecticut Avenue, North Bend, OR 97459-2399 USA (Foltz).



MTXtra
Shortwave Broadcast Guide

PORTUGUESE/ARABIC

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	2129	fas	Canada, Radio Canada International 17765sa		15305sa
2100	2145		USA, WYFR/Family Radio Worldwide		11565eu
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	4905do	
2100	2200		Brazil, Radio Difusora Acerana		4885do
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 11804do
2100	2200		Brazil, Radio Guaiba	6000do	11785do
2100	2200		Brazil, Radio Guaruja/Florianpolis		5980do
2100	2200		Brazil, Radio Guaruja/Paulista	3235do	9715do
2100	2200		Brazil, Radio Imaculada Conceicao		4755do
2100	2200		Brazil, Radio Inconfidencia	6010do	15190do
2100	2200		Brazil, Radio Itatiaia	5969do	
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 Verdas Florestas	4865do	
2100	2200		Brazil, Radio Voz Missionaria	9665do	
2100	2200		Brazil, Super Radio Deus e Amour		6060do 9565do 11765do
2100	2200		Brazil, Super Rede Boa Vontade		4860do
2100	2200		Portugal, RDP International	9795eu	11960af
2100	2200	mtwhf	Spain, Radio Exterior de Espana		11680sa
2100	2200		USA, WYFR/Family Radio Worldwide		17690af
2130	2159	fas	Canada, Radio Canada International 17765sa		15305sa

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

2200	2229	fas	Canada, Radio Canada International 15305sa		11990sa
2200	2230		Cuba, Radio Havana Cuba	17705sa	
2200	2300		Brazil, Novas de Paz	6080do	9515do 11725do
2200	2300		Brazil, Radio Alvorada/Londrina		4865do
2200	2300		Brazil, Radio Alvorada/Parintins		4965do
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	4905do	
2200	2300		Brazil, Radio Difusora Acerana		4885do
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 11804do
2200	2300		Brazil, Radio Guaiba	6000do	11785do
2200	2300		Brazil, Radio Guaruja/Florianpolis		5980do
2200	2300		Brazil, Radio Guaruja/Paulista	3235do	9715do
2200	2300		Brazil, Radio Imaculada Conceicao		4755do
2200	2300		Brazil, Radio Inconfidencia	6010do	15190do
2200	2300		Brazil, Radio Itatiaia	5969do	
2200	2300		Brazil, Radio Marumby	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 Verdas Florestas	4865do	
2200	2300		Brazil, Radio Voz Missionaria	9665do	
2200	2300		Brazil, Super Radio Deus e Amour		6060do 9565do 11765do
2200	2300		Brazil, Super Rede Boa Vontade		4860do
2200	2300		China, China Radio International		7260af 9410sa 9685sa
2200	2300		Portugal, RDP International	9795eu	11825af 11960af 12040na
2200	2300		Russia, Voice of Russia	5920eu	5940eu 6090eu 6120eu 7340eu
2200	2300		USA, WYFR/Family Radio Worldwide		7360sa 9690as 17575sa
2215	2300		Egypt, Radio Cairo	9390sa	
2230	2259	fas	Canada, Radio Canada International 15305sa		11990sa

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

2300	0000		Brazil, Novas de Paz 11725do	6080do	9515do
2300	0000		Brazil, Radio Alvorada/Londrina		4865do
2300	0000		Brazil, Radio Alvorada/Parintins		4965do
2300	0000		Brazil, Radio Aparecida 9630al	5035do 11855al	6135al
2300	0000		Brazil, Radio Bandeirantes 11925do	6090do	9645do
2300	0000		Brazil, Radio Boa Vontade 11895do	6160do	9550do
2300	0000		Brazil, Radio Brasil	4785do	
2300	0000		Brazil, Radio Brasil Central	4985do	11815do
2300	0000		Brazil, Radio Cancao Nova	6105do	
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 17815do		9615do
2300	0000		Brazil, Radio Cultura/Araraquara		3365do
2300	0000		Brazil, Radio Daqui	4905do	
2300	0000		Brazil, Radio Difusora Acerana		4885do
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 9685do	15325al	5955do
2300	0000		Brazil, Radio Globo 11804do	6120do	9585do
2300	0000		Brazil, Radio Guaiba	6000do	11785do
2300	0000		Brazil, Radio Guaruja/Florianpolis		5980do
2300	0000		Brazil, Radio Guaruja/Paulista	3235do	9715do
2300	0000		Brazil, Radio Imaculada Conceicao		4755do
2300	0000		Brazil, Radio Inconfidencia	6010do	15190do
2300	0000		Brazil, Radio Itatiaia	5969do	
2300	0000		Brazil, Radio Marumby	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 11780do		6185do
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 Verdas Florestas	4865do	
2300	0000		Brazil, Radio Voz Missionaria	9665do	
2300	0000		Brazil, Super Radio Deus e Amour 9565do	11765do	6060do
2300	0000		Brazil, Super Rede Boa Vontade		4860do
2300	0000		China, China Radio International 13650sa		9560sa
2300	0000		Cuba, Radio Havana Cuba	13770sa	
2300	0000		Ecuador, HCJB Global	11920sa	
2300	0000		Portugal, RDP International 11825af	7285eu 11960af	9795eu 12040af
2300	0000		USA, WYFR/Family Radio Worldwide 9690sa	17575sa	7360sa
2300	2330		Cuba, Radio Havana Cuba	17705sa	
2300	2330		Egypt, Radio Cairo	9390sa	

MT ARABIC SHORTWAVE BROADCAST GUIDE

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

0000	0010		Tunisia, RDTV Tunisienne	7345af	
0000	0030		Egypt, Radio Cairo/Voice of the Arabs		11925af
0000	0045		Egypt, Radio Cairo	9250ca	9360sa
0000	0100		Bahrain, Radio Bahrain	9745me	
0000	0100		Iran, VOIRI/ IRIB	3985as	6065as
0000	0100	DRM	Kuwait, Radio Kuwait	11675va	
0030	0100		Egypt, Radio Cairo	7580na	

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

0100	0200		Bahrain, Radio Bahrain	9745me	
0100	0200		Egypt, Radio Cairo	6290na	7580na
0100	0200		Iran, VOIRI/ IRIB	3985as	6065as
0100	0200	DRM	Kuwait, Radio Kuwait	11675va	

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

0200	0227		Iran, VOIRI/ IRIB	3985as	6065as
0200	0300		Bahrain, Radio Bahrain	9745me	
0200	0300		Egypt, Radio Cairo	6290na	7580na
0200	0300		Kuwait, Radio Kuwait	6055me	13650af
0200	0300		Oman, Radio Sultanate of Oman		15355af
0230	0300		Iran, VOIRI/ IRIB	6065as	7350as 9895as
0230	0300		Sudan, Rep of Sudan Radio/Omdurman		7200do

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

0300	0330		USA, Voice of America 11855af	7275af	9845af
0300	0359		Canada, Radio Canada International 6025me		5840me
0300	0400		Bahrain, Radio Bahrain	9745me	
0300	0400		Egypt, Radio Cairo	6290na	7580na
0300	0400		Iran, VOIRI/ IRIB	6065as	7350as 9895as
0300	0400		Kuwait, Radio Kuwait	6055me	11675af
0300	0400		Saudi Arabia, BSKSA/General Program		9675me
0300	0400		Saudi Arabia, BSKSA/Program 2		9580va
0300	0400		Saudi Arabia, BSKSA/Qu'ran Program 17895as		9715me
0300	0400		Sudan, Rep of Sudan Radio/Omdurman		7200do
0300	0400		UK, BBC World Service 6155me	5790me 7390me	5940me
0330	0400		Iran, VOIRI/ IRIB	7250as	

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

0400	0427		Iran, VOIRI/ IRIB	7250as	
0400	0430		Egypt, Radio Cairo	7580na	
0400	0430		Germany, AWR Europe	7425me	
0400	0430		Japan, NHK World/ Radio Japan		6035me
0400	0457		Algeria, Radio Algerienne	5865af	
0400	0459		Canada, Radio Canada International 7265me		5995me
0400	0500		Bahrain, Radio Bahrain	9745me	
0400	0500		Clandestine, Sudan Radio Service/ SRS		7280af
0400	0500		Egypt, Radio Cairo	6290na	
0400	0500		Iran, VOIRI/ IRIB	6065as	7350as 9895as
0400	0500		Kuwait, Radio Kuwait	6055me	13650af
0400	0500		Oman, Radio Sultanate of Oman		17590af
0400	0500		Saudi Arabia, BSKSA/General Program		9675me
0400	0500		Saudi Arabia, BSKSA/Program 2		9580va
0400	0500		Saudi Arabia, BSKSA/Qu'ran Program 17895as		9715me
0400	0500		Sudan, Rep of Sudan Radio/Omdurman		7200do
0400	0500		Tunisia, RDTV Tunisienne	9725af	12005me
0400	0500		UK, BBC World Service 7325af	6110me 7390af	6155me 13660me
0430	0500		Clandestine, Radio Dabanga	7315af	13800af
0430	0500		India, All India Radio	15210me	15770me
0430	0500	mtwhf	UK, Bible Voice Broadcasting	11865me	
0445	0500		Jordan, Radio Jordan	11810va	

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

0500	0527		Iran, VOIRI/ IRIB	6065as	7350as 9895as
0500	0530		Clandestine, Radio Dabanga	7315af	13800af
0500	0530		UK, BBC World Service	9440me	11865me
0500	0530		Vatican City State, Vatican Radio 11715va		9645va
0500	0545	f	UK, Bible Voice Broadcasting	11865me	
0500	0557		Algeria, Radio Algerienne	5865af	7295af
0500	0600		Bahrain, Radio Bahrain	9745me	
0500	0600		China, China Radio International 7210va	9590va	5985va 17485as
0500	0600		Egypt, Radio Cairo	6290na	
0500	0600		India, All India Radio	15210me	15770me
0500	0600		Jordan, Radio Jordan	11810va	
0500	0600		Kuwait, Radio Kuwait	6055me	13650af
0500	0600		Oman, Radio Sultanate of Oman		17590af
0500	0600		Saudi Arabia, BSKSA/General Program		9675me
0500	0600		Saudi Arabia, BSKSA/Program 2		9580va
0500	0600		Saudi Arabia, BSKSA/Qu'ran Program 17895as		9715me
0500	0600		Tajikistan, Voice of Tajik/External Svc		7245me
0500	0600		Tunisia, RDTV Tunisienne 12005me	7275eu	9725eu

0500	0600		UK, BBC World Service	5905me	6110me	
			7325me	9915me	15790me	11820me
0500	0600		USA, WYFR/Family Radio Worldwide		7520eu	
			11580af			
0500	0600		Yemen, Republic of Yemen Radio		6135me	
0530	0600		Iran, VOIRI/ IRIB	13790as	13800as	15545as

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

0600	0625		Tunisia, RDTV Tunisienne	9725eu	12005me	
0600	0657		Algeria, Radio Algerienne	5865af	7295af	
0600	0700		Bahrain, Radio Bahrain	9745me		
0600	0700		China, China Radio International		5985va	
			7210va	9590va	17485as	
0600	0700		Egypt, Radio Cairo	6290na		
0600	0700		Iran, VOIRI/ IRIB	13790as	13800as	15545as
0600	0700		Jordan, Radio Jordan	11810va	11900eu	
0600	0700		Kuwait, Radio Kuwait	6055me	13650af	
0600	0700		Saudi Arabia, BSKSA/General Program		9675me	
			17740eu			
0600	0700		Saudi Arabia, BSKSA/Program 2		11855va	
0600	0700		Saudi Arabia, BSKSA/Qu'ran Program		9715me	
			15380me	17895as		
0600	0700		Tunisia, RDTV Tunisienne	7275af		
0600	0700		UK, BBC World Service	5905me	6110me	
			7325me	9915va	11820me	13660me
			15790me			
0600	0700		Yemen, Republic of Yemen Radio		6135me	

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

0700	0730		Japan, NHK World/ Radio Japan		11905me	
0700	0730		Tunisia, RDTV Tunisienne	7275af		
0700	0756		Romania, Radio Romania International		11710me	
			11905af	15155af	15330me	
0700	0800		Bahrain, Radio Bahrain	9745me		
0700	0800		Clandestine, Radio Nacional De La RASD			
			6297af			
0700	0800		Egypt, Radio Cairo	15800af		
0700	0800		Germany, AWR Europe	11975af		
0700	0800		Iran, VOIRI/ IRIB	13790as	15545as	
0700	0800		Jordan, Radio Jordan	11810va	11900eu	
0700	0800		Kuwait, Radio Kuwait	6055me	13650af	
0700	0800		Saudi Arabia, BSKSA/General Program		9675me	
			17740eu			
0700	0800		Saudi Arabia, BSKSA/Qu'ran Program		9715me	
			15380me	17895as		
0700	0800		Tunisia, RDTV Tunisienne	7335af		
0700	0800		UK, BBC World Service	5905me	9915af	
			11680af	11820me	13660me	15790me
0700	0800		USA, WYFR/Family Radio Worldwide		9985va	
0700	0800		Yemen, Republic of Yemen Radio		6135me	
0745	0800		Vatican City State, Vatican Radio		5965eu	
			7250eu	9645eu	15595as	

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

0800	0815		Jordan, Radio Jordan	11810as	11900eu	
0800	0827		Iran, VOIRI/ IRIB	13790as	13800as	15545as
0800	0830		Austria, FEBA Radio	15220me		
0800	0900		Bahrain, Radio Bahrain	9745me		
0800	0900		Clandestine, Radio Nacional De La RASD			
			6297af			
0800	0900		Egypt, Radio Cairo	15800af		
0800	0900		Kuwait, Radio Kuwait	13650af		
0800	0900		Saudi Arabia, BSKSA/General Program		9675me	
			17740eu			
0800	0900		Saudi Arabia, BSKSA/Program 2		11855va	
0800	0900		Saudi Arabia, BSKSA/Qu'ran Program		9715me	
			15380me			
0800	0900		Tunisia, RDTV Tunisienne	7335af		
0800	0900		UK, BBC World Service	5905me	11680af	
			15180af			
0800	0900		Yemen, Republic of Yemen Radio		6135me	
0830	0900		Iran, VOIRI/ IRIB	9885as	13790as	15545as
			15545as			

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

0900	0910		Tunisia, RDTV Tunisienne	7335af		
0900	1000		Bahrain, Radio Bahrain	9745me		
0900	1000		Egypt, Radio Cairo	15800af		
0900	1000		Iran, VOIRI/ IRIB	9885as	13790as	13800as
			15545as			
0900	1000		Kuwait, Radio Kuwait	13650af		
0900	1000		Morocco, RDTV Marocaine	15340af		
0900	1000		Morocco, RDTV Marocaine	15340af		
0900	1000		Saudi Arabia, BSKSA/General Program		17805af	
			21705eu			
0900	1000		Saudi Arabia, BSKSA/Program 2		11855va	
0900	1000		Saudi Arabia, BSKSA/Qu'ran Program		9715me	
			11935me	17615as	21495as	
0900	1000		UK, BBC World Service	11680af	15180af	
0900	1000	f	UK, Bible Voice Broadcasting	17535af		
0900	1000		Yemen, Republic of Yemen Radio		6135me	

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

1000	1027		Iran, VOIRI/ IRIB	9885as	13790as	13800as
			15545as			
1000	1055		Turkey, Voice of Turkey	11955va	13690eu	
1000	1100		Bahrain, Radio Bahrain	9745me		
1000	1100		Egypt, Radio Cairo	15800af		
1000	1100		Kuwait, Radio Kuwait	11630af	13650af	
1000	1100		Morocco, RDTV Marocaine	15340af		
1000	1100		Saudi Arabia, BSKSA/General Program		17805af	
			21705eu			
1000	1100		Saudi Arabia, BSKSA/Program 2		11855va	
1000	1100		Saudi Arabia, BSKSA/Qu'ran Program		11785me	
			11915me	17615as	21495as	
1000	1100		UK, BBC World Service	5905me		
1000	1100		Yemen, Republic of Yemen Radio		6135me	
1015	1100		Egypt, Radio Cairo	13860me		
1030	1100		Iran, VOIRI/ IRIB	13790me	13800as	15545as

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

1100	1200		Bahrain, Radio Bahrain	9745me		
1100	1200		Egypt, Radio Cairo	13860me		
1100	1200		Iran, VOIRI/ IRIB	13790me	13800as	15545as
1100	1200		Morocco, RDTV Marocaine	15340af		
1100	1200		Saudi Arabia, BSKSA/General Program		17805af	
			21705eu			
1100	1200		Saudi Arabia, BSKSA/Program 2		11855va	
1100	1200		Saudi Arabia, BSKSA/Qu'ran Program		11785me	
			11915me	17615as	21495as	
1100	1200		UK, BBC World Service	5905me		
1100	1200		Yemen, Republic of Yemen Radio		6135me	
1130	1200		Jordan, Radio Jordan	15290va		
1145	1200		Jordan, Radio Jordan	11810va		

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

1200	1215		Egypt, Radio Cairo	13860me		
1200	1230		Jordan, Radio Jordan	15290va		
1200	1300		Bahrain, Radio Bahrain	9745me		
1200	1300		Iran, VOIRI/ IRIB	13790me	13800as	15545as
1200	1300		Jordan, Radio Jordan	11810va		
1200	1300		Morocco, RDTV Marocaine	15340af		
1200	1300		Saudi Arabia, BSKSA/General Program		21505af	
			21640eu			
1200	1300		Saudi Arabia, BSKSA/Program 2		11855va	
1200	1300		Saudi Arabia, BSKSA/Qu'ran Program		11785me	
			15380me	17895af	21600as	
1200	1300		UK, BBC World Service	5905me		
1200	1300		Yemen, Republic of Yemen Radio		6135me	
			9780me			
1205	1300		Canada, Radio Canada International		7310na	

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

1300	1304		Canada, Radio Canada International		7310na	
1300	1400		Bahrain, Radio Bahrain	9745me		
1300	1400		Egypt, Radio Cairo	15080af		
1300	1400		Iran, VOIRI/ IRIB	13790me	13800as	15545as
1300	1400		Jordan, Radio Jordan	11810va		
1300	1400		Kuwait, Radio Kuwait	11630af	15110as	
1300	1400		Kuwait, Radio Kuwait	13650af	15110as	
1300	1400		Morocco, RDTV Marocaine	15340af		
1300	1400		Saudi Arabia, BSKSA/General Program		21505af	
			21640eu			
1300	1400		Saudi Arabia, BSKSA/Program 2		11855va	
1300	1400		Saudi Arabia, BSKSA/Qu'ran Program		11785me	
			15380me	17895af	21460af	21600as
1300	1400		Tajikistan, Voice of Tajik/External Svc		7245me	
1300	1400		UK, BBC World Service	5905me		
1300	1400		Yemen, Republic of Yemen Radio		6135me	
			9780me			

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

1400	1427		Iran, VOIRI/ IRIB	13790me	13800as
1400	1500		Bahrain, Radio Bahrain	9745me	
1400	1500		Egypt, Radio Cairo	15080af	
1400	1500		Ethiopia, Radio Ethiopia/External Service	7165af	
			9560af		
1400	1500		Greece, Voice of Greece	12105va	
1400	1500		Jordan, Radio Jordan	11810va	
1400	1500		Kuwait, Radio Kuwait	11630af	15110as
1400	1500		Morocco, RDTV Marocaine	15340af	
1400	1500		Saudi Arabia, BSKSA/General Program	21505af	
			21640eu		
1400	1500		Saudi Arabia, BSKSA/Program 2	11855va	
1400	1500		Saudi Arabia, BSKSA/Qu'ran Program	11785me	
			17895af	21460af	
1400	1500		UK, BBC World Service	5875me	5905me
			9915me	15790me	
1400	1500		Yemen, Republic of Yemen Radio	6135me	
			9780me		
1430	1500		Iran, VOIRI/ IRIB	9830as	15545as

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

1500	1530	mwfs	Clandestine, Voice of Democratic Alliance	7165af	
			9560af		
1500	1556		Romania, Radio Romania International	9655me	
			11730me	11880af	15235af
1500	1600		Bahrain, Radio Bahrain	9745me	
1500	1600	mtwhf	Clandestine, Sudan Radio Service/ SRS	17745af	
1500	1600		Egypt, Radio Cairo	15080af	
1500	1600		Iran, VOIRI/ IRIB	9830as	15545as
1500	1600		Kuwait, Radio Kuwait	11630af	15110as
1500	1600		Morocco, RDTV Marocaine	15345af	
1500	1600		North Korea, Voice of Korea	9990va	11545va
1500	1600		Oman, Radio Sultanate of Oman	15140va	
1500	1600		Saudi Arabia, BSKSA/Call of Islam	15225af	
			15435eu		
1500	1600		Saudi Arabia, BSKSA/Program 2	11855va	
1500	1600		Saudi Arabia, BSKSA/Qu'ran Program	11785me	
			13710af	21460af	
1500	1600		Sudan, Rep of Sudan Radio/Omdurman	7200do	
1500	1600		Turkey, Voice of Turkey	9665eu	11660eu
1500	1600		UK, BBC World Service	5875me	5905me
			9915me	11680af	13660af	15790me
1530	1600		Clandestine, Radio Dabanga	13740eu	13800af
1530	1600	Sat/Sun	Clandestine, Sudan Radio Service/ SRS	17745af	
1545	1600	mw	UK, Bible Voice Broadcasting	9430me	

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

1600	1627		Iran, VOIRI/ IRIB	9830as	15545as
1600	1630		Bangladesh, Bangladesh Betar	7250me	
1600	1630		Clandestine, Radio Dabanga	13740eu	
1600	1630	Sun	Germany, Pan American Broadcasting	11900me	
1600	1645		USA, WYFR/Family Radio Worldwide	15785eu	
1600	1655		Turkey, Voice of Turkey	9665eu	
1600	1700		Bahrain, Radio Bahrain	9745me	
1600	1700		China, China Radio International	7205me	
			7300va	9555va	15125af	17880af
1600	1700	asmtwh	Clandestine, S Sudan Interactive R Instruction		
			11785af		
1600	1700	mtwhf	Clandestine, Sudan Radio Service/ SRS	17745af	
1600	1700	mtwhas	Clandestine, Sudan Radio Service/ SRS	11785af	
1600	1700		Indonesia, Voice of Indonesia	9526va	11785al
1600	1700		Kuwait, Radio Kuwait	11630af	15110as
1600	1700		Morocco, RDTV Marocaine	15345af	
1600	1700		Oman, Radio Sultanate of Oman	15140va	
1600	1700		Russia, Voice of Russia	5920va	5925va
			7215af	11795af	12030af	
1600	1700		Saudi Arabia, BSKSA/Call of Islam	15225af	
			15435eu		
1600	1700		Saudi Arabia, BSKSA/Program 2	11855va	
1600	1700		Saudi Arabia, BSKSA/Qu'ran Program	11785me	
			13710af	15205eu	17560af	
1600	1700		Sudan, Rep of Sudan Radio/Omdurman	7200do	
1600	1700		UK, BBC World Service	6030me	7375me
			9915af	11680me	
1600	1700	mw	UK, Bible Voice Broadcasting	9430me	
1600	1700		USA, WYFR/Family Radio Worldwide	9430va	
			15785va		
1615	1630	f	UK, Bible Voice Broadcasting	9430me	
1625	1700	mtwh	UK, Bible Voice Broadcasting	13580me	
1630	1700		Clandestine, Radio Dabanga	11655af	
1630	1700		Iran, VOIRI/ IRIB	6065va	9830as
1630	1700		Nigeria, Voice of Nigeria/External Service	15120me	
1630	1700		Vatican City State, Vatican Radio	7290va	
			9635va		

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

1700	1715	f	UK, Bible Voice Broadcasting	13580me	
1700	1727		Iran, VOIRI/ IRIB	9830me	
1700	1730		Clandestine, Radio Dabanga	11655eu	13800af
1700	1730	Sat/Sun	Clandestine, Sudan Radio Service/ SRS	9840af	
1700	1730		Germany, AWR Europe	9445me	
1700	1730		Kuwait, Radio Kuwait	11630af	
1700	1730	w	UK, Bible Voice Broadcasting	13580me	
1700	1800		Bahrain, Radio Bahrain	9745me	
1700	1800		China, China Radio International	7300va	
			9555va	11725va	
1700	1800		Clandestine, Radio Nacional De La RASD		
			6297af		
1700	1800		Egypt, Radio Cairo/Waadi El Nile	9250af	
1700	1800		Iran, VOIRI/ IRIB	6065va	
1700	1800		Morocco, RDTV Marocaine	15345af	
1700	1800		North Korea, Voice of Korea	9990va	11545va
1700	1800		Oman, Radio Sultanate of Oman	15140va	
1700	1800		Russia, Voice of Russia	5850va	7305eu
			7400va	11795af	
1700	1800		Saudi Arabia, BSKSA/Program 2	9580va	
			15225af	15435eu	
1700	1800		Saudi Arabia, BSKSA/Qu'ran Program	13710af	
			15205eu	17560af	
1700	1800		Spain, Radio Exterior de Espana	11765me	
1700	1800		Sudan, Rep of Sudan Radio/Omdurman	7200do	
1700	1800		Tunisia, RDTV Tunisienne	9725af	12005me
1700	1800		UK, BBC World Service	5790va	6195me
			7375me	9915af	
1700	1800		USA, WYFR/Family Radio Worldwide	9530va	
1700	1800		Yemen, Republic of Yemen Radio	6135me	
			9780me		
1730	1800	f	Clandestine, Voice of Asena	9605af	
1730	1800	h	Clandestine, Voice of Democratic Eritrea Intl		
			11830af		
1730	1800		India, All India Radio	6280me	7305me
			9905me		
1730	1800		Sweden, IBRA Radio	5910me	9615me
1730	1800	mtwhf	Sweden, Radio Sweden	7465me	

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

1800	1857		Algeria, Radio Algerienne	9390af	
1800	1900		Bahrain, Radio Bahrain	9745me	
1800	1900		Clandestine, Radio Nacional De La RASD		
			6297af		
1800	1900		Egypt, Radio Cairo/Waadi El Nile	9250af	
1800	1900		India, All India Radio	6280me	7305me
			9905me		
1800	1900		Iran, VOIRI/ IRIB	6065va	
1800	1900		Kuwait, Radio Kuwait	15495af	
1800	1900		Morocco, RDTV Marocaine	15345af	
1800	1900		Oman, Radio Sultanate of Oman	15140va	
1800	1900		Russia, Voice of Russia	5850me	5945me
			5965eu	6020va	6060va	7345va
			7400va	11795af	
1800	1900		Saudi Arabia, BSKSA/General Program	9555af	
			9870eu		
1800	1900		Saudi Arabia, BSKSA/Program 2	9580va	
1800	1900		Saudi Arabia, BSKSA/Qu'ran Program	11820eu	
			11915af	11930af	
1800	1900		Spain, Radio Exterior de Espana	11765me	
1800	1900		Sudan, Rep of Sudan Radio/Omdurman	7200do	
1800	1900		Sweden, IBRA Radio	9635af	
1800	1900		Tunisia, RDTV Tunisienne	7225af	9725eu
			12005me		
1800	1900		UK, BBC World Service	5790va	6195me
			7375me		
1800	1900		USA, WYFR/Family Radio Worldwide	7220va	
			9660va	9845va	
1830	1900		Austria, AWR Europe	9605af	

WANT MORE?

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Brian Wood, W0DZ
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Making a Better Mousetrap?

In our last column, we looked at the various forms of rig control. This time we'd like to explore a little more about how you can do some simple rig control yourself, without having to buy or use the complex programs that are out there, that may have way more features than you need.

Simple programming of a rig does not have to be daunting. But there are obstacles you may still have to overcome. Perhaps the rig's documentation doesn't match reality and you spin your wheels trying to figure out just what the rig is trying to tell you. Or you don't have an RS-232 port anymore and wonder how hard it is to use a USB port instead. But let's ignore those problems for now and delve into one pretty easy way to create your own program using free software.

CS101

Your first thought might be, "Software, you say? But I'm not a programmer!" Well, it's really not that hard. Most programming languages are very similar. If you know how to program in one language, or even if you've never programmed but can think logically, a working example program is often all you need to figure out how to write a computer program. For all you non-programmers out there, here's a crash course:

All computer languages provide ways to do the following things:

- Allocate memory for arrays of numbers (e.g., allow a command to be 5 bytes)
- Create variables and constants (e.g., A is an integer between –32768 and +32767, B is a real number with a certain precision, C is a text string like "abc")
- Assign values (e.g., Pi=3.1416)
- Test variables conditionally (e.g., if X is greater than or equal to Pi then Y = 1, otherwise Y=0)
  (This is where you are thinking to yourself, "Guess I should have paid more attention in algebra." But bear with me, it's just commonsense stuff.)
- Execute common snippets of code from more than one place (e.g., call a subroutine)
- Force execution to go somewhere else (e.g., goto x)
- Loop on sections of code until some condition is met (repeat until Z=true)
- Create comments so others (including you about a year from when you wrote the code) can understand what you are trying to do.

It's only how you write these things (i.e., the "syntax") that's different from language to language. And with a few exceptions, computer programs execute one statement after another.

There. You're now a programmer. That wasn't so hard was it? Go ask for a raise.

Writing the program to do something useful is only part of the problem, though. You also want to be able to make it easy to use. Someone dreamed up the idea of adding visual tools to the most simple of computer languages, BASIC (an acronym for "Beginner's All-purpose Symbolic Instruction Code"), that would allow you to create control panels that were graphical in nature, and to respond to "events" like input from a COM port, or the user pushing a button or moving a mouse.

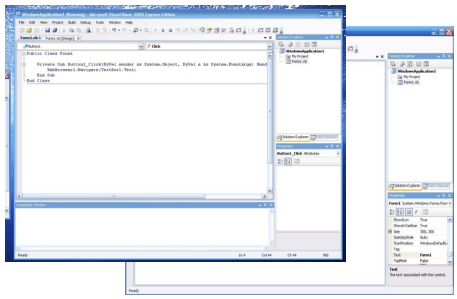
Originally, programmers had to do these things themselves, but over the years, vast libraries of re-usable code have been created by thousands of programmers, and now you get to take advantage of them.

Visual BASIC

Microsoft's implementation of BASIC that includes a way to develop a control panel is called "Visual Basic" (often called "VB"). They now make a FREE version, called "Visual Basic 2008 Express." (A 2010 Beta version is also available.) It can be downloaded from **www.microsoft.com/express/Downloads/#2008-Visual-Basic**. It's a pretty big download, so be prepared to wait a while, and you must create Windows Live ID in the process, but that's also free.

The Express version is a scaled back version of full VB Professional, which is pretty pricey. But for casual use, the Express version is just fine. After you download it, you'll be able to follow a step-by-step tutorial that walks you through the creation of a very simple web browser that lets you type in a web site address, press a "go" button, and display that page.

There's only one line of user-added code in that entire program, and the example tells you what it is, so you can cut and paste it when so instructed. I tried it, and the results are shown in Figures1 and 2. It took me about 5 minutes to "write" this program.



If you've read to this point, you should know that unless you're a seasoned VB programmer, you should go download the app and do the example. Go ahead. I'll wait…

Rig Control

All right, we've created a program. Now we need to make it do something more useful to us. Let's say we want to communicate with a Yaesu FT-1000MP, a fairly popular ham transceiver. We look in the manual to see what kind of commands it takes. Here's what the manual says for the method that is required to read the frequency:

```
Send: 5 bytes: 00 00 00 02 10
(hexadecimal format)
Read: 16 bytes (frequency starts
in byte 2, 4 bytes long, encoded
in weighted binary)
```

So, here's the code that we need to use to write and read binary data to a serial port:

```
Dim cmd(5) As Byte
Dim response(16) As Byte
Dim frequency As Double

cmd(0) = 0
cmd(1) = 0
cmd(2) = 0
cmd(3) = 2
cmd(4) = 16

SerialPort1.Open()
SerialPort1.Write(cmd, 0, 5)
SerialPort1.Read(response, 0, 16)
SerialPort1.Close()

frequency = response(1) * 256 + response(2)
frequency = frequency * 256 + response(3)
frequency = frequency * 256 + response(4)
frequency = frequency / (16 * 10 ^ 5)
TextBox1.Text = frequency
```

Since we know that we need to output 5 bytes, we declare a variable called "cmd" and make it an array of five bytes – cmd(5). The "Dim" statement says to create enough memory to hold 5 bytes. Similarly, we are expecting 16 bytes to come back, so we dimension another 16 bytes as the "response" array.

We eventually want to output a real number, so we declare "frequency" as a double precision real number and compute it from the binary data. Note that even though "Textbox1" uses a data type of "String", meaning ASCII text, VB will automatically convert the double precision real number into a string for us.

Once we have all the variables declared, we

can use them, so we put the 5 bytes into the cmd array. Then we write them to the serial port. Here, you may wonder how we knew to use a statement starting "SerialPort1". Turns out that this is one of the "Common Controls" that you will find in the Toolbox that you used to create the web browser example.

You simply drag and drop the SerialPort control into your control panel form. The first time you do this, it will be called SerialPort1. If you were to bring another such control into your project, it would be called SerialPort2, and so on.

Controls are things that have both properties, which you set in the Properties box mentioned in the description of Figure 1 (also accessible from your program code) and functions (kind of like "subroutines") that you can use in your program. There are usually many such functions available in a typical control. The SerialPort control has 41 such functions, such as "Open", "Close", "Read" and "Write". When you type the name of the control and then a dot, the list of available functions pops up.

VB walks you through creation of the appropriate statement, even showing you what variables the function takes and what kind of data they use. For example, "Write" requires three variables: the array of data (in this case "cmd"), the starting offset in the array (you don't have to start at 0), and the number of bytes to output.

If you've ever used a serial port before, you have probably seen a message from time to time that says "Port is already in use" or something equivalent. This means that some application has "opened" the port.

Well, we need to do the same thing, so we use the "Open" function to open the port. When we're done, we close the port, allowing other programs access to it. Between those two statements, we can use the port, so we write the cmd array and read the response. (We don't really need to be opening and closing the port every time we want to read to it, and there are ways to make such things only happen once, but we won't get into that here.)

Once we have the response, we can then convert the binary data to a real number that we can put in the text box that we created.

To set the baud rate, parity, number of start and stop bits, etc., all you need to do is to go to the form tab, click the "SerialPort" icon, and then find those variables in the Properties box. You can also use functions to set these parameters in your code if you so choose.

❖ Controlling Different Rigs

Several years ago, I wrote an article for another ham radio magazine in which I described the above procedure for a Yaesu FT-1000MP. Many people wrote to me, asking how to modify the program for an ICOM, Kenwood and many other radios.

One kind soul was helpful enough to create an Excel spreadsheet, showing many of the command and response parameters for a variety of rigs. I have put this spreadsheet on my web site, and you can download it free at **www.dzkit.com/catalog.htm/#Software**. Following is a sampling of the data in that file.

The table actually contains much more than this. It includes commands to read and set the mode and frequency, and indicates the data format (forward/backward, hex/ASCII, number of bytes, etc.).

Rig	Read freq command
Yaesu FT-1000MP	1002000000
Yaesu FT-736R	
Yaesu FT-747GX	1000000000
Yaesu FT-757	1000000000
Yaesu FT-767	0000000000
Icom IC-706	FEFE48E003FD
Icom IC-706G	FEFE58E003FD
Icom IC-706 II	FEFE4EE003FD
Icom IC-746	FEFE56E003FD
Icom IC-751A	FEFE1CE003FD
Icom IC-756	FEFE50E003FD
Icom IC-756 Pro	FEFE5CE003FD
Kenwood	"IF;"
Ten-Tec Omni-V	55
Ten-Tec Omni VI	FEFE04E003FD
Ten-Tec Paragon	5C
Heath SB-1400	1000000000

As you can see, there are many styles of command. Perhaps the easiest and most intuitive is the Kenwood command set. Several companies have adopted it because it requires no special binary or hexadecimal conversion, just simple ASCII commands. How could we modify the above code to work with an ASCII command set? Like this:

```
Dim response As String
SerialPort1.Open()
SerialPort1.Newline = ";"
SerialPort1.WriteLine("FA")
Response = SerialPort1.ReadLine()
SerialPort1.Close()
```

Note that since the Kenwood command set uses a semicolon as a terminator, not the more common carriage return and/or linefeed (usually called "newline"), we need to tell the read and write functions what to send and what to look for in response. That's why we had to add the line **SerialPort1.Newline = ";"**.

The frequency of VFO A is returned as a string, prefaced by the command (FA). The semicolon will not be included in the response since we told the Readline routine to use it as an end-of-line indicator. So, to display the frequency, all we have to do is put the string in the textbox:

```
TextBox1.Text = Mid(Response,6)
```

The "Mid" function is one of several handy library functions that allow you to get portions of strings. In this case, we told it we only wanted the characters from the 6th position to the end, so that we didn't have to see the "FA000" that comes before the actual frequency.

Once you can successfully communicate with a rig, the trick in VB is to know where to find useful routines to manipulate data. Often, a simple online query via any search engine will turn up many similar questions being asked and answered by others. You can also find complete snippets of code that can be cut and pasted into your application. Going completely through Microsoft's tutorial will also help.

❖ USB to RS-232 Adapters

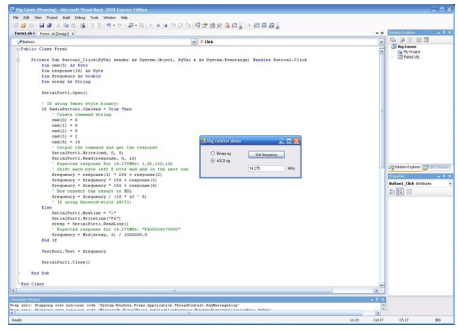
I mentioned earlier that you may need to use a USB port if you have a PC that was released recently. Many no longer offer RS-232 ports. However, you can use the USB port just like an RS-232 port. All you need is a USB to RS-232 adapter. These are available at most electronic superstores. As soon as you plug one into your PC, the self-discovery process will identify and install it. You will then have an RS-232 connector (typically a DB-9 male) ready to connect to the rig's RS-232 port, usually a DB-9 female.

Typical problems that come up when connecting an RS-232 port are:

1. The transmitted and received data (and a few other control signals) are on the same pins at the transmitting and receiving end, and you must swap them. This requires a "gender-changer." Gender changers come in the form of simple adapters and also complete cables, and are pretty common things. If you're unsure, you can try one without worrying about hurting the electronics if you have trouble connecting.
2. Parameters are wrong. Baud rate (9600-115200), parity (usually set to "none"), number of data bits (usually 8), number of stop bits (usually 1), and handshake (usually none, but sometimes "hardware," which involves use of the CTS and RTS signals, or "Xon/Xoff," which is a totally software-based method only usable with ASCII command sets) are the typical problem areas.

You can use a program called "Hyperterm" to give you a simple terminal emulator program that will send textual commands and receive responses from a rig. This is most useful if the rig uses an ASCII command set. Hyperterm is no longer being provided in Windows, but you can still download it from several Internet sites. (Search for Hyperterm, and download the dll and the executable into any directory, and run it from there.)

Figure 3 shows how the example program looks after the modifications shown above.



If you do the tutorial, you will learn much more about how to make fancier graphics, and how to find and use the many library routines that are available. Once you get comfortable doing the simple things – setting a frequency and mode – you can get more creative: add memories; add drop-down lists of common shortwave stations, select one, and go there with the click of your mouse. The sky's the limit (well, at least until the sunspots return enough to give us an ionosphere again). Let's see what you can create!

MILCOM
MONITORING MILITARY COMMUNICATIONS

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The Military Weather Channel

When the weather turns nasty, who do the military pilots turn to for weather information? How does a military pilot file a weather report while airborne?

They will talk with ground stations on the "Military Weather Channels," the Department of Defense (DoD) Pilot to Metro Service (PMSV).

PMSV stations are used to relay meteorological information between airfield weather offices and aircraft pilots. Military weather units operate PMSV stations at selected Air Force, Army, and Navy airfields to provide aircrews a direct contact with weather forecasters or observers. The primary purpose of PMSV is for communicating various types of weather information to pilots and to receive pilot weather reports (PIREPS) of significant or hazardous weather phenomena, which are entered into weather telecommunications networks for dissemination.

PMSV facilities manned by forecasters are listed as "Full Service," while PMSV facilities manned by weather observers are listed as "Limited Service." When an observer responds to a call, they will identify themselves as an observer, state that no forecaster is available, and relay only surface observations, radar observations, terminal forecasts and military weather advisories. If additional forecast information is necessary, the observer will refer the aircrew to a full service PMSV facility where a forecaster is on duty. The radio call for PMSV stations is "METRO," (e.g., Travis METRO).

The Pilot Report (PIREP) is the most common transmission heard by monitors from military aircraft on PMSV frequencies. The PIREP is an aircrew report of weather conditions at altitude. PIREPs are extremely important to operations.

You can find more detailed information on PMSV stations including their operations and their lingo in the *Milcom* column in the June 2006 issue of *Monitoring Times*.

❖ PMSV Frequencies

Also as noted in that June 2006 *Milcom* column, the frequencies used by DoD PMSV stations are slowly changing. In years past, monitors found the bulk of the PMSV/Metro station activity on 239.800, 344.600 and 375.200 MHz. But thanks to the new 380-400 MHz Land Mobile subband and other changes being made to the 225-400 MHz band, Metro station frequencies are on the move. While 239.800 MHz will remain a nationwide allocation, stations on the main frequency 344.600 MHz are being moved to other frequencies. In fact, since our 2006 column, five stations have left 344.600 MHz for other frequencies and more than two dozen frequency changes have been noted.

Also as our Table One shows, 375.200 MHz, another formerly nationwide frequency, only has two stations left on it and these stations will probably change frequency in the near future.

Our Metro list shows you where to tune in PMSV communications no matter where you are located. If you are using an outdoor antenna and one of the bases on our list is within 200-250 miles from your location, plug in those frequencies. You may not be able to hear the ground station, but you should be able to monitor aircraft communicating with these ground stations.

TABLE 1: CONTINENTAL US PMSV STATIONS

120.700	USMC Yuma MCAS/Yuma International, AZ
134.100	USA Cairns AAF, AL and Felker AAF, VA
139.650	USA Godman AAF, KY
227.400	USAF Offutt AFB, NE
228.450	USAF Buckley AFB, CO
239.800	USAF Little Rock AFB, AR; Davis Monthan AFB, AZ; Beale AFB, CA; March ARB, CA; Scott AFB/ MidAmerica, IL; Malmstrom AFHP, MT; Joint Base McGuire-Dix-Lakehurst, NJ; Altus AFB, OK; Lackland AFB Kelley Field Annex, TX: Randolph AFB, TX; and Langley AFB, VA
244.775	USMC MCAS New River, NC
261.025	USAF Tinker AFB, OK
263.450	USAF Moody AFB, GA
264.500	USMC MCAS Beaufort, SC
265.600	USA Simmons AAF, NC
265.800	USN NAS JRB New Orleans, LA
267.400	USAF Luke AFB, AZ
269.200	USAF Travis AFB, CA
271.600	USN Norfolk NS, VA
274.750	USAF Reserve Westover ARB/Metropolitan, MA and Dobbins ARB/NAS Atlanta, GA
289.950	USN NS Mayport, FL
290.625	USAF Tyndall AFB, FL
304.300	USA Wheeler Sack AAF, NY
306.500	USA Henry Post AAF, OK and Robert Gray AAF, TX
308.300	USMC RAF Twentynine Palms, CA
309.000	USA Hunter AAF, GA
312.400	USN NAS Meridian, MS
317.000	USN NAS Lemoore, CA and Whiting Field/NAS North, FL
323.900	USAF Creech AFB (Indian Springs AF Auxiliary Field)/Nellis AFB, NV
323.925	USAF Seymour-Johnson AFB, NC
327.400	USN NAS Fallon, NV
339.650	USAF Sheppard AFB/Wichita Falls Muni, TX
342.000	USAF Dover AFB, DE
342.200	USAF Eglin AFB, FL
342.300	USAF Maxwell AFB, AL; Albuquerque International Sunport/Kirtland AFB, NM and Hill AFB, UT
342.350	USN NAS North Island, CA
342.400	USAF Edwards AFB, CA and Vandenberg AFB, CA; USMC MCAS Camp Pendleton, CA and MCAS Miramar, CA
342.500	USA Polk AAF, LA; USAF Mountain Home AFB, ID; Selfridge ANGB, MI; Minot AFB, ND; Shaw AFB, SC; and McChord AFB, WA
342.550	USAF Vance AFB, OK and USN NAS JRB Fort Worth, TX
343.150	USN China Lake NAWS, CA
343.300	USA Campbell AAF, KY
343.400	USN NAS Whidbey Island, WA
343.500	USA Lawson AAF, GA; USMC MCAS Cherry Point, NC; USN NAS Jacksonville, FL and NAS Corpus Christi, TX
344.600	USAF Andrews AFB/Washington NAF, DC; Homestead ARB, FL; MacDill AFB, FL; Patrick AFB, FL; Robins AFB, GA; Grissom AFB, IN; Whiteman AFB, MO; Keesler AFB, MS; Pope AFB, NC; Grand Forks AFB, ND; Cannon AFB, NM; Wright-Patterson AFB, OH; Charleston AFB/International, SC; and Dyess AFB, TX; USN NAS Key West (Boca Chica), FL; Willow Grove NAS/JRB, PA; and NAS Kingsville, TX
346.550	USAF Holloman AFB, NM
348.300	USN NAF El Centro, CA
348.800	USA Fort Rucker/Cairns AAF, AL
349.200	USAF City of Colorado Springs Muni/ Peterson AFB, CO
349.750	USMC Yuma MCAS/Yuma International, AZ (ex-349.900)
354.600	USAF Columbus AFB, MS and Laughlin AFB, TX
355.300	USMC Quantico MCB/MCAF (Turner Field), VA
356.200	USN Patuxent River NAS (Trapnell Field), MD
359.600	USN Pensacola NAS (Forrest Sherman Field), FL
373.100	USAF Barksdale AFB, LA
375.200	USAF McConnell AFB, KS and Fairchild AFB, WA
375.775	USAF Ellsworth AFB, SD
387.400	USN Oceana NAS (Apollo Soucek Field), VA
390.750	USAF Hurlburt Field, FL

❖ MARS Changes Name and Fine Tunes Mission

The Department of Defense (DoD) has issued an Instruction concerning MARS. This Instruction gives the three MARS services – Army, Air Force and Navy/Marine Corps – a new focus

on homeland security and a new name – Military Auxiliary Radio System (previously "Affiliate"). The Instruction is the first major revision to MARS Instruction since January 26, 1988.

DoD defines a "military auxiliary" as "an organized body of volunteers prepared to supplement the uniformed services or any designated civilian authorities by provision of specialized autonomous services when called upon or when situations warrant," and gives the Civil Air Patrol and Coast Guard Auxiliary organizations as examples of auxiliaries.

The Secretaries of the Army, Air Force and Navy are to encourage participation in MARS, the Instruction states, saying this may be accomplished "by establishing and funding an active MARS program within each Military Department, which shall then assign a MARS-licensed staff representative to manage operations, readiness, planning, procedural and technical development, documentation, standards, training, equipment, program and membership administration, and other matters necessary for mission accomplishment."

This revision also keeps the Navy/Marine Corps MARS intact; until now, members of this MARS service were concerned that their part of MARS might be terminated by Navy commanders.

The Instruction, however, does not mention which of the three MARS services will take the lead when responding to events. According to sources, this has been seen as a critical issue in conforming to the National Incident Management System (NIMS) that calls for "unity of command." As now constituted, the three separate MARS services are supposed to "interoperate," but each operates under independent command.

In the past, MARS had focused primarily on emergency communications and health and welfare support. The DoD's Instruction now directs the three MARS services to provide "contingency radio communications" to support US government operations, DoD components and "civil authorities at all levels," providing for national security and emergency preparedness events.

The Instruction also dictates that MARS leaders will now report to three DoD officials; before this revision, they only reported to one person.

MARS units will still continue to provide health and welfare communications support "to military members, civilian employees and contractors of DoD Components, and civil agency employees and contractors, when in remote or isolated areas, in contingencies or whenever appropriate." MARS must also be capable of operation in "radio only" modes – without land lines or the Internet – and sustainable on emergency power (when public utility power has failed); some MARS stations must be transportable for timely deployment.

❖ U.S. Navy/Marine Corps MARS Net Designators

Over the last few years we have observed some major changes in the structure of the three MARS services as they realign their organization to better serve the Department of Homeland Security.

For instance, the Navy/Marine Corps MARS (NMCM) realigned their command structure to mirror the Federal Emergency Management Agency (FEMA) region structure. This resulted in a major change in how their net designators are formed.

This month we present in Table Two a complete guide to the new Navy-Marine Corps MARS net designators. This will aid monitors in determining where they are hearing the various nets that operate in the HF spectrum.

And that does it for this month. I will have more MARS information in a future *Milcom* column. Until next time, 73 and good hunting.

TABLE TWO: NAVY MARS NET DESIGNATORS

Examples of Net Designators

4D1E	The first ECOM net in the state of Georgia, fourth NMCM region
5X1B	The first traffic net in the fifth NMCM mars region
8U3C	The third training net in the state of Utah, eighth NMCM mars region;
PA1A	The first Pacific area administrative net
UZ1Z	The first nationwide MARS data system net

Net Designators, Method of Assigning

The first character of the net designator (a numeral or letter) will denote the MARS area or region in which the net is located. Regions will be identified by figures 0 through 9 for the respective region. Areas are identified as follows:

- C Central Area
- N Northeast Area
- P Pacific Area
- S South Area

The second character of the net designator (a letter) will indicate the state in which the net is located based on the list below. This letter is assigned by the cognizant region director.

Northeast Area (Regions 1/2/3)
Headquarters in Groton, CT

Region 1
States: CT MA ME NH RI VT and Iceland
- M Southern New England (SNE)
- V Northern New England (NNE)

Region 2
States: NJ NY
- G New Jersey
- J Northern New York (NNY)
- K Southern New York (SNY)

Region 3
States: DC DE MD PA VA WV
- B Virginia
- D West Virginia
- P Pennsylvania
- W Maryland-DC-Delaware (MDE)

Central Area (Regions 4/5)
Headquarters Great Lakes, IL

Region 4
States: AL FL GA KY MS NC PR SC TN
- A Alabama
- C Florida
- D Georgia
- E Mississippi
- F North Carolina
- G South Carolina
- H Tennessee
- K Kentucky

Region 5
States: IL IN MI MN OH WI
- B Indiana
- G Minnesota
- I Illinois
- M Michigan
- N Ohio
- W Wisconsin

South Area (Regions 6/7)
Headquarters Corpus Christi, TX

Region 6
States: AR LA NM OK TX
- A Arkansas
- E East Texas (ETX)
- L Louisiana
- N New Mexico/West Texas (NMW)
- O Oklahoma
- S South Texas

Region 7
States: IA KS MO NE
- D Iowa
- H Missouri
- N Nebraska/Kansas (NEK)

Pacific Area (Regions 8/9/10)
Headquarters San Diego, CA

Region 8
States: CO MT ND SD UT WY
- C Colorado/Wyoming (CWY)
- M Montana
- S South Dakota/North Dakota (SND)
- U Utah

Region 9
States: AZ CA GU HI NV
- A Arizona
- H Hawaii
- N Northern California
- S Southern California
- V Nevada

Region 10 (0 on net list)
States: AK ID OR WA
- A Alaska
- I Idaho
- O Oregon
- W Washington

If the second designator does not represent a state net, then the 2nd letter will be assigned as follows:
- A Area Nets
- X Region Nets
- Z National Level Nets and/or nets under the cognizance of Chief NAVMARCORMARS

The third character of the net designator (a numeral) will denote the first, second, third, etc., net within the region or state (regardless of its purpose or mode of operation). (The third digit in designators for nets under the cognizance of Chief, NAVMARCORMARS will denote the first, second, third, etc., net within each specialty network.)

The fourth character of the net designator (a letter) will denote the type of net as follows:
- A Administrative Net
- B Traffic Net
- C Training Net
- E ECOM Net
- V Radio Telephone
- W Radio teletypewriter
- X Slow Scan TV
- Y Single Channel Data (SCD) see note below
- Z Other

Note: Single Channel Data (SCD) includes Baudot, ASCII, Packet, AMTOR, ARQ (FEC), tor, Clover or other digital modes.

AM BANDSCAN

THE WORLD OF DOMESTIC BROADCASTING

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http://americanbandscan.blogspot.com

Going, going, gone...

I hope I didn't jinx them...

Last time, writing about high-powered Canadian Broadcasting Corporation stations that used to be nightly loggings in Wisconsin, I mentioned two Montreal stations. When I wrote, CBM-940 was operating as English-language oldies station CINW, and CBF-690 was French all-news station CINF.

About a week before deadline, in late January, both stations disappeared. One morning, they began broadcasting a tape loop indicating the stations were no longer viable, and the licences would be surrendered for cancellation. Late that night, sure enough, they disappeared.

So what happens next?

One possibility: the frequencies are taken over by other Montreal stations. There are ten AM stations still operating in Montreal; while most are powerful, none are as powerful as these two. We've already seen Montreal AMs interested in moving to better frequencies in recent years: CFMB from 1410 to 1280, and now CJWI from 1610 to the 1410 CFMB is abandoning.

Might the frequencies be reused elsewhere in Canada? It's been suggested that one or both of these frequencies could be reactivated in Ottawa, where three full-powered AM stations continue to operate. Moving one of these frequencies to Ottawa would require expensive engineering work. It's possible, but with the poor state of AM radio it's not likely.

I suppose it's always possible one or both frequencies will be granted to a *new* station. Four of the ten remaining Montreal AMs are new within the last few years. However, all four are low-powered (1,000 watts) stations with specialty formats. CHOU-1450, CJWI-1610, and CJRS-1650 are all ethnic stations; CJLO-1690 is a college station. It seems unlikely a specialty broadcaster could afford the electricity or other maintenance costs of a 50,000-watt transmitter.

Some DXers have asked whether the disappearance of the Canadian stations on 690 and 940 might allow U.S. stations on those frequencies to begin nighttime operation or increase nighttime power. That's not likely to happen. Under a multilateral treaty between the U.S., Canada, Mexico, and other American countries, these two frequencies are assigned for use by Canadian "Class A" stations. The U.S. is obliged to not authorize any station that would cause interference to reception of these frequencies in Canada. The need to protect 690 and 940 only goes away if the Canadian government notifies the U.S. government that they no longer require protection – that is not likely to happen.

So the interference-protection situation will not change. This is, by the way, not unusual. Canadian stations which have been off the air for years – like CKX-1150, CFNB-550, and CKBD-600 – are still "notified" to the U.S. This goes both ways; defunct U.S. stations are also notified. The continued "notification" of these frequencies to the U.S. of course also means we will not see new 50,000-watt U.S. stations on 690 or 940 in the Northeast.

The most likely possibility is also one that would have been unthinkable ten years ago – that both frequencies remain silent forever.

❖ What does this mean for the DXer?

It means a rare opportunity for the DXer, especially in the Northeast. Stations that normally dominated these frequencies are gone. When the CBC abandoned these frequencies, there was a gap of a few weeks before the new private owners took over, a gap during which both frequencies were silent.

During this gap, I logged KOAQ-690 in western Nebraska and another CBC station on 690, in Vancouver. Since the CBC failed in their attempt to silence the Vancouver station last year, I expect DXers will hear this one in the East. KOAQ will also be logged, with their oldies format. There is yet another Canadian station operating on 690. CBKF-1 is a French-language station in southern Saskatchewan. I'm pretty sure I heard this one last time, but wasn't able to get an ID.

Other likely targets on 690 include all-sports WSPZ Birmingham; news/talk outlets WOKV Jacksonville, Fla. and KGGF Coffeyville, Kans.; and nostalgia WIST New Orleans. 940 is a more crowded channel. Some of the stations I might expect to appear with Montreal off include all-sports WINZ Miami; news/talk WMAC Macon, Ga.; nostalgia WMIX Mt. Vernon, Ill.; religious KPSZ Des Moines; and country CJGX Yorkton, Saskatchewan.

❖ Other stations going away

Right at deadline, we received word of WHHO-1320 Hornell, NY losing its license. The Public Notice doesn't say why the license was lost. However, since I haven't read of any enforcement actions against this station, I think one can assume they surrendered the license voluntarily. The permit for a new station on 1450 at Battle Mountain, Nevada has also been voluntarily surrendered.

Two FM stations in Oregon have involuntarily lost their licenses, under rather interesting circumstances. From FCC release DA 09-2436: "On January 30, 2006, Wade *purportedly* filed an application for renewal of the KRAT(FM) license." (Emphasis mine.) The renewal was denied as the station owed regulatory fees, but the FCC's reason for using the word "purportedly" was that, in testimony in an Oregon court, KRAT licensee George J. Wade testified that he was "...unaware that a license for KRAT(FM) had been issued in his name..." until notified by the IRS. The Oregon court convicted KRAT's real owner of 17 felonies involving theft and illegally obtaining public assistance. In January of this year, the KBUG(FM) license was also lost for essentially the same reason.

One Canadian AM that *wanted* to go away will not be permitted to do so. CJOY-1460 Guelph, Ontario sought to move to 95.7 FM. Corus, CJOY's owners, already own CIMJ-FM Guelph and CJDV-FM in nearby Cambridge. Canadian Radio-television and Telecommunications Commission (CRTC) policy is to allow a single owner a maximum of two stations in the same language in the same market and frequency band. Moving CJOY to FM would give Corus three FMs in the Guelph market. (their CING-FM Hamilton also puts a strong signal across Guelph) CJOY's request was denied.

No, WLW Radio is still in Cincinnati. The WLW in Clarksville, Tenn. is a CPA firm...

❖ New AM Stations

Unfortunately, many stations in Haiti went off the air in January. The Pennsylvania National Guard's Commando Solo airborne broadcasting station again took to the air (in both senses) to provide information to the devastated country. One would hope the need for continued airborne broadcasting will be

long gone by the time you read this, but if you heard an unidentified station in Creole on 1030 kHz in January, this may be what you heard.

The Florida transmitter on 1180 normally used by Radio Marti's anti-Castro broadcasts was also repurposed for broadcasts to Haiti. One of the country's FM stations, Signal FM, was able to continue broadcasts after the quake. Numerous reports have praised the operations of this station.

We have one new AM station in the U.S. this month. KJCV-1450 has signed on the air from Jackson, Wyoming. KJCV is a member of the Bott Radio Network and broadcasts religious programming. (*Most* stations with "CV" – "Christian Voice" – in the call letters, are Bott affiliates.)

❖ New TV Stations

Last year, an interesting petition was filed with the FCC. A firm called "PMCM" notified the FCC of their willingness to allow their station KVNV channel 3 to be moved from Ely, Nevada to Middletown Township, New Jersey. They also were willing to allow their station KJWY channel 2 to be moved from Jackson, Wyoming to Wilmington, Delaware.

These moves proposed to take advantage of the "Tax Equity and Fiscal Responsibility Act of 1982." A provision of this law *required* the FCC to approve a request to reallocate a commercial VHF channel to a community in a state that didn't already have such a channel. In 1982, the only such states were New Jersey and Delaware.

In 1982, the owners of station WOR-TV channel 9, New York, were facing the revocation of their license. The Act allowed them to move their station to Secaucus, New Jersey and keep their license. Since New Jersey then had a commercial VHF station, no other station could take advantage of this law with regard to that state.

Last June, as you probably remember, analog TV was shut down. WOR-TV – long since changed to WWOR-TV – continued to operate on VHF channel 9, the only VHF commercial station in the state. However, WWOR's *digital* operation was, and remains, on UHF channel 38. When WWOR's analog operation closed last June... there was no longer a commercial VHF station in New Jersey.

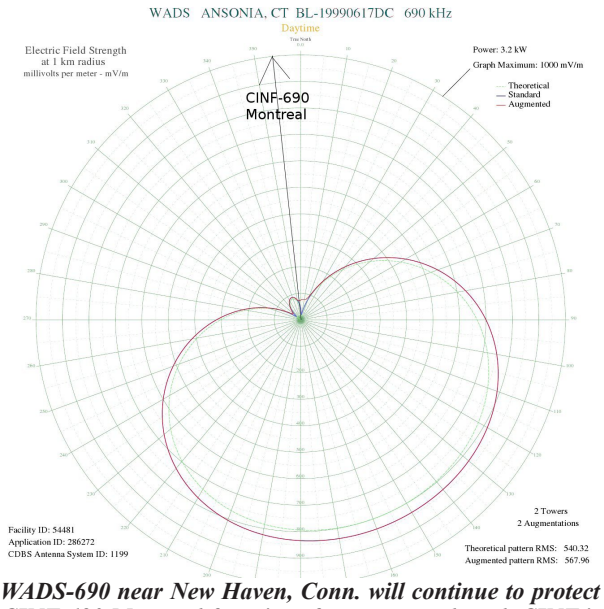
PMCM saw a loophole. They argue the Tax Equity Act *requires* the FCC to approve their petition to reallocate VHF channel 3 from Nevada to New Jersey. (And, as no station ever took advantage of the Act with regard to Delaware, PMCM also argues that the Act requires the petition to reallocate channel 2 from Wyoming to Delaware be approved.)

A quick look at the map shows what PMCM is trying to accomplish. The New Jersey station could locate its transmitter on Manhattan; the Delaware station could transmit from Philadelphia. I don't think any readers would be surprised to learn a TV station in New York City is a lot more valuable than one in Ely, Nevada!

The FCC disagrees with PMCM's assessment of the law. The Commission ruled that the definition of "reallocation," as required in the Act, is the move of a channel from one place to another *when that channel cannot be used in both places simultaneously*. Obviously, it is possible to use channel 3 in Nevada and NYC simultaneously! That said...

The 1982 Act also mandates that the FCC shall allocate at least one commercial VHF channel to each state, if it's technically feasible. In 1982, it was *not* feasible, unless an existing station consented to having its channel moved. Twenty-seven years later, when most stations decided not to use channels 2-6 for digital operation, it became feasible. A quick scan of the FCC Database suggests all VHF channels except 6 are suitable for assignment in New Jersey and Delaware.

To comply with the law, the Commission has, on its own motion, proposed to allocate channel 4 to Atlantic City, New Jersey and channel 5 to Seaford, Delaware. It appears unlikely either channel could be used from a Philadelphia or NYC transmitter site. I might expect to see counterproposals suggesting different communities closer to the larger cities. Once channels are allocated, it will still take years to hold auctions, issue construction permits, and build stations.



WADS-690 near New Haven, Conn. will continue to protect CINF-690 Montreal from interference even though CINF is off the air...

❖ IBOC/HD Power Increase

Last time, I reported that iBiquity and NPR had sent a joint proposal to the FCC, proposing a 6dB increase in FM IBOC/HD digital power. This proposal has now been approved. It will allow all FM HD stations to quadruple their digital power; hopefully this will provide a significant increase in digital coverage.

The iBiquity/NPR proposal also allowed case-by-case increases of more than 6dB – as much as 10dB – allowing some stations to increase digital power by a factor of 10. The new rules also establish a procedure for remediating interference resulting from the power increase. The entire increase can be revisited if serious interference results.

I should emphasize once again, that this increase applies *only* to FM HD. Digital power increases for AM are not on the table.

❖ 'Til next month

Have you tried targeting your old hometown for DX loggings? Have you had any success? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to *dougsmith@monitoringtimes.com*. Good DX!

REFERENCE URLs IN THIS COLUMN

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

Wikipedia page on Jayhaed Saade's pirate station - **http://en.wikipedia.org/wiki/Mix_FM_(Ottawa)**

FCC documents on HD FM power increase - **http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296079A1.pdf**

http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-10-208A1.pdf

Defense Department page on Commando Solo broadcasts for Haiti - **www.defense.gov/news/newsarticle.aspx?id=57563**

Signal FM 90.5 Haiti (in French) - **www.signalfm-haiti.com/**

FCC document on the loss of the KRAT(FM) license - **http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-09-2436A1.txt**

CJOY-1460 denied move to 95.7 FM - **www.crtc.gc.ca/eng/archive/2010/2010-42.htm**

AM BANDSCAN STATION REPORT

NEW:			
New stations on the air			
Jackson, WY	1450	KJCV	1,000/1,000 ND (religious)
CHANGES:			
Callsign changes:			
Lithonia, GA	1360	WHRH	(new station)
Savannah, GA	1520	WSHX	(new station)
Pleasantville, NJ	1490	WBSS	from WTAA
Concord, NC	1410	WTIX	from WEGO
Cramerton, NC	730	WZGV	from WOHS
Winston-Salem, NC	980	WEGO	from WTIX
Stations off the air:			
Battle Mountain, NV	1450	NEW	(permit surrendered)
Montreal, Quebec	690	CINF	(license surrendered)
Montreal, Quebec	940	CINW	(license surrendered)

BOATS, PLANES, AND TRAINS

BOATS

Ron Walsh VE3GO
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"The Times They Are a-Changin'!"

As I sat working ZP9NX, Peter in Paraguay, on 18 MHz CW, I realized that the quote in my article title was quite appropriate. CW has all but disappeared commercially and is not even an amateur requirement. Of course, when I started, radio amateurs didn't even have access to 18 MHz.

My built-in SWR meter and tuner on the 756 let me see that I had low SWR (standing wave ratio) at the push of a button. My manual antenna tuner sits quietly waiting for my next outdoor adventure or field day. On my shelf is an old Marconi AM Marine HF radiotelephone, which I first used in 1967 when I worked on the *Lady Kingston*. It reminded me of the change from AM to SSB and thus FM on the Great Lakes marine radio. My DSC (digital selective calling) marine radio now automatically alerts me of Mayday calls.

My Hallicrafters S-38 reminded me of the change from HF to VHF on the Lakes. The old marine radio stations like VBH Kingston, VBG Toronto, and VDQ Cardinal are all long gone and merged into the VBR Prescott station with remote transmitters. All that is left of VBH is a couple of ground rods buried on the hill where it stood. 2014 will mark 100 years since the station was established to provide radio service on Lake Ontario as a direct result of the use of radio in the *Titanic* disaster. Even the American stations like WBL Buffalo, WMI Lorraine with its evening weather bulletin, and lastly WLC Rogers City have all gone silent.

When I first started working on tour boats in the Thousand Islands, we had an AM HF radio and that was all. Now we have an AIS (automatic identification system) transponder showing every ship in range, DSC and even a GPS to show position on an electronic chart.

Before GPS, people used Loran for navigation. Loran A used the 1800 to 2000 kHz range and was the primary reason we used to have power and frequency restrictions on the 160 meter amateur band. It disappeared over 20 years ago. Loran C used a frequency of 100 kHz and had a chain of stations to provide the signal. According to notices, the United States Coast Guard was going to decommission the Loran stations at Seneca New York and Baudette Minnesota, in February of this year. I have no notice about the Loran master stations at Comfort Cove Newfoundland and Caribou Maine along with their accompanying slave stations.

❖ Amateur Radio Traffic

The earthquake disaster in Haiti had amateurs ready to handle traffic from the area. While monitoring the Maritime Mobile Service Net on 14,300 kHz, I heard HH2JR sign on shortly after the quake. W3ZU, Fred, in Miami, helped with some phone patches. Jean's comments told a story of vast devastation on the island. I monitored several frequencies but had no traffic to handle. I must applaud the amateurs who were there to help. The worldwide donations to the Haiti relief remind us that when help is needed, people pitch in. National boundaries don't matter in time of crisis!

❖ KSM

V V V CQ CQ CQ de KSM QSX 500/4/6/8/12 obs/amver Pse Ans 500/ Ch 3 HF K.

This repeated message announced the CW signal from KSM (the coast station operated by the Maritime Radio Historical Society). Again I managed to copy KSM on 4350.5 and 6474 kHz. (See **www. radiomarine.org** for additional frequencies.) Try as I might, the 426 kHz frequency transmissions have eluded me here. I will not give up and will try for a better LF antenna this summer.

❖ Seasonal Change

With the coming of spring, the VHF channels in this area spring back to life. The icebreakers were in the area to open up the Seaway channels. Late in March, the shipping season resumed, so the Seaway Control stations were back on the air. Like all port areas, channels 11, 12, 13 and 14 are used for ship traffic control. Channel 13 is usually restricted for bridge-to-bridge communications for commercial vessels, but there is a special exemption here to avoid channel overlap with other control regions. Channel 10 is a ship-to-ship channel, but as in Montreal, it is often used for ship traffic control in port areas. As the season progresses and the pleasure craft begin to move, do not forget channel 9, which is the calling channel for pleasure craft in the United States.

It was interesting to watch the AIS receiver and see the plots of ships as they again entered the Great Lakes.

On the HF bands, the higher frequencies are now opening up sooner in the day and staying open later, due to the increased hours of daylight. Reception on these channels should improve significantly. I have also noted that the solar flux numbers are increasing, indicating better propagation on all frequencies. Look at the frequencies above 15 MHz during the daytime.

❖ Frequency Allocation Changes

I learned in *Monitoring Times* and in a notice forwarded by George Kennedy, VE3GHK, that over the next few years the United States will reduce the spacing between channels in the railway frequencies from 30 and 25 kHz to 15 and 12.5 kHz. I have no *official* notice about

Groupe Ocean tug, "Ocean Hercule" and others assisting the grounded freighter CSL Assiniboine

Mapleglen upbound at Iroquois Lock

potential marine frequency changes, but a local marina has told me they have applied for one of the new inter-channel frequencies. I would appreciate any information anyone has on this possible change.

❖ Radio Facsimile (FAX) Broadcasts:

I have been monitoring some fax broadcasts here as I try and modernize my approach to radio. I will give some frequencies here, but a list entitled Worldwide Radio Facsimile Broadcast schedule can be obtained at the website **www.nws.noaa.gov/om/maritime/rfax.pdf**.

Canadian Marine fax stations use 2300 Hz for white and 1500 Hz for black with 1800 Hz being the center frequency. When you are tuning use USB and tune 1.6 to 1.8 kHz above the given frequency. CFH Halifax and VCO Sydney radio are on all year and the two northern stations while VFF Iqaluit and VFA Inuvik will be back on the air by Mid June.

VCO transmits on 6915 kHz at 1121, 1142 and 1721 UTC and on 4416 kHz at 2200 UTC. VFF transmits on 3251.1 and 7708.1 kHz at 0100, 0200, 0600, 0700, 1100 and 2200 UTC. VFA transmits on 8456 kHz at 0200 and 1600UTC. CFH transmits at many times on 4271, 6496.4, 10536, and 13510 kHz. They also are listed at 122.5 kHz in the LF band.

The USCG has many stations that broadcast Fax signals. NMC Point Reyes California broadcasts on 4346 kHz at night and 22527 kHz during the day. They are continuously on 8682, 12786 and 17151.2 kHz. NOJ Kodiak Alaska can be heard continuously on 4098 AND 8459 kHz. They use 2054 kHz from 0950 to 1200 UTC and from 1600 to 1748 UTC. 12412.5 kHz can be heard from 0400 to 0548 and 2150 to 0018 UTC. KUM70 Honolulu shows 11090 and 16135 kHz in constant use. 9982.5 kHz from 1030 to 1630 UTC and 2331.5 kHz from 2230 to 0354 UTC are also listed.

There are many stations listed all over the world listed at the above URL. One example is Northwood in the UK. They transmit for the North Atlantic and the Mediterranean all day on 2618.5, 4610, 8040 and 11086.5 kHz.

❖ Radiotelephone

Another interesting URL for frequency information is **www.yachtcom.info/Frequencies.htm**. They have an extensive listing of European weather broadcast frequencies as well as emergency frequencies. As examples, 2226, 1883 and 1743 kHz are listed for the UK. Table One is their chart for the Mediterranean area coast guards.

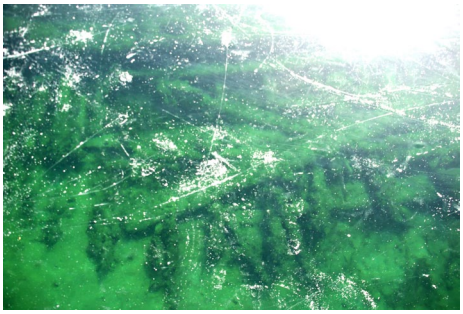
Former MacKenzie River tug, Radium Yellowknife, now working on the Great Lakes.

I have also heard the Bahamas Defense Force on 8156 kHz USB.

❖ Personal Happenings

I have been busy here with phone calls from people wanting radio licenses. I have already done four courses for the Restricted Operator's Certificate-Maritime with DSC endorsement. I expect to do several more before the summer arrives. Canadian authorities are checking for operator certificates when they check vessels for the proper documents they have to carry. Several of these people are planning to take a yacht off shore and are installing HF Marine equipment as well. I was pleased to see that several people were taking their amateur license as well. I hope to hear them on 14,300 kHz USB.

I recently had a phone call from Dave Vrooman who lives on Amherst Island near here. He was excited as he was skating on the ice near the island. There was about 8 inches of ice and it was like looking at the bottom through a window. Dave and his family took me out to the site. It is a bit unnerving to walk on such clear ice but 8 inch thick ice will support a half ton truck. There below me were the remains of the *B. W. Folger*, an 84 foot long schooner, which sank in 1894. Keel, ribs, planking, mast step and other remains were clearly visible in over 10 feet of water. I took several pictures as this was a rare event.



When this column is printed in April, I will have returned from a month in South Carolina and a short visit to Florida. I hope to have some frequencies and other information for the column. Now I am going to my old S-38 and at least listen to CHU's time signal as I have for over 50 years! In the meantime, I wish all readers improved propagation on all frequencies!

TABLE ONE: MF COASTGUARDS (MRCC) FREQUENCIES

Daytime range 100 to 150 miles, nighttime range up to 1000 miles.

Station	Frequency USB	UK Coastguards in local time
Aberdeen Coastguard, UK	2226 kHz	0730 & 1930
Clyde Coastguard, UK	1883 kHz	0810 & 2010
Falmouth Coastguard, UK	2226 kHz	0710 & 1910
Humber Coastguard, UK	2226 kHz	0750 & 1950
Shetland Coastguard, UK	2226 kHz	0710 & 1910
Stornoway Coastguard, UK	1743 kHz	0710 & 1910
		Below in GMT times
Malin Head , Ireland	1677 kHz	0033, 0433, 0833, 1233, 1633, 2033
Valentia Radio, Ireland	1752 kHz	0233, 0633, 1033, 1433, 1833, 2233
Oostende Radio, Belgium	2761 kHz	0233, 0633, 1033 1433, 1833, 2233
Netherlands Coastguard	3673 kHz	0333, 0733, 1133, 1533, 1933, 2333
Gris-Nez, France	1650 kHz	0650 & 1850
Corsen, France	1650 & 2677 kHz	0815 & 2015
La Garde, Frence		
Mediterranean Coast	1696 & 2677 kHz	0650, 0833, 1433, 1603, 1850
Machichaco, Spain	1707 kHz	0703, 1303, 1903
Cabo de Penas, Spain	1677 kHz	0703, 1303, 1903
Coruna, Spain	1698 kHz	0703, 1303, 1903
Finisterre, Spain	1764 kHz	0703, 1303, 1903
Chipiona, Spain	1656 kHz	0733, 1233, 1933
Tarifa, Spain	1704 kHz	0733, 1233, 1933
Cado de Gata, Spain	1767 kHz	0750, 1303, 1950
Palma, Spain	1755 kHz	0750, 1303, 1950
Arrecife, Canary Isles	1644 kHz	0803, 1233, 1903
Las Palma, Canary Isles	1689 kHz	0803, 1233, 1903
Alges, Horta, Monsanto - Portugal		
Ponta Delgada - The Azores		
Porto Santo - Maderia	2657 kHz	
Ancona, Italy	2656 kHz	0133, 0433, 0733, 0933, 1333, 1733, 1933, 2133
Rome, Italy	1888 kHz	
Haifa, Israel	2649 kHz	0303, 0703, 1103, 1503, 1903, 2303
US Coastguard	2670 kHz	

BELOW 500 kHz

DXING THE BASEMENT BAND

Kevin Carey, WB2QMY
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Favorite Bookmarks

Today, it's hard to imagine how we ever got along without the Internet. I can't remember the last time I wrote a column that *didn't* have some mention of a website or e-mail address.

Do you recall when you first got on the Internet? I remember hearing about it in the late 1980s when it was still run by the Department of Defense. Later, I heard that some companies and large universities had access to it, but it remained largely a mystery to me, and I certainly did not grasp the role it would play later on in the radio hobby. Sometime in 1994 I finally got an e-mail account at work, followed closely by web access, and I haven't looked back since.

This month, we'll explore some of the web sites that I use on a regular basis for LF information. The web can be a goldmine of information, helping you to get much more out of your radio hobby. It also levels the playing field with the transmitting side of our hobby (Ham radio) by allowing listeners to "talk back" with other hobbyists in near real-time fashion. Gone are the days of thinking the web would outmode our hobby; It has only enhanced it!

❖ Not Online?

I want to say a quick word to our readers who are not online. Be assured that we will not abandon you here at *Below 500 kHz*! I understand that some folks have little or no interest in computers, or do not have the ability to get online for one reason or another. While we do make frequent use of web resources and e-mail, we will always welcome your traditional postal mail, and respect the fact that not everyone is online.

If you have the slightest interest in exploring the World Wide Web, I would ask you to try one thing. Take this issue to your local library, where you can get online for free, and try visiting a few of the websites listed below in bold letters. If you're a complete novice with computers, don't worry. Library staff will be glad to assist you, and show you how to enter the addresses below.

Who knows, you might discover a new horizon once you're there, and if you don't like it, at least you can say that you gave the Internet a try! It's really much easier than you think. My father-in-law is 83 years old, and you should have seen him light up when I brought up some websites related to WWII aircraft – one of his favorite pastimes. He ended up showing *me* some of the special features on the planes we saw!

❖ Longwave Websites

Listed below, in no particular order, are many of my favorite sites related to the longwave hobby. Any list like this is subject to change as soon as it is printed. If you find that a link returns an error message, try entering some key words from the descriptions into your search engine. You may be able to find the site (or similar ones) in that way.

www.lwca.org/
The Longwave Club of America (LWCA) Home Page. If I could only pick a handful of sites to have in my "favorites" list, this would certainly be one of them. This site is maintained by John H. Davis, one of the columnists of the LWCA's monthly journal, the *Lowdown*. On this site, you will find links to reference data, a message board for posting questions and comments, and information on joining the LWCA.

www.beaconworld.org.uk/
The Beaconworld Website, maintained by Alan Gale, G4TMV is another "must have" in your arsenal. The site is packed with useful data, including articles on how to get the most out of your DXing efforts and a downloadable handbook on NDB listening. Alan is another contributor to the LWCA's *Lowdown* journal with his *News from the Old World* column. Whether you are in North America or elsewhere, there is something for you on the Beaconworld website.

www.ve3gop.com/
Alex Wiecek's website has an emphasis on Canadian Longwave stations. Alex maintains several aviation beacons in Ontario and brings a unique perspective to longwave monitoring. Be sure to check out the online database of Canadian longwave stations from 10 to 530 kHz, NDB photos, and his *WWSU* logging software, which you can download here.

www.g0akn.aerthgroup.org.uk/page10.html
Dedicated to John Taylor, GØAKN, and his VLF Earth Current Experiments. This site ties in well with our recent column about "Through-Ground Radio." You'll be amazed at the ranges achieved by transmitting through the Earth with VLF.

www.angelfire.com/space/proto57/rdf.html
This is a site devoted to self-contained Radio Direction Finding (RDF) receivers that were common on mid-sized boats before the advent of GPS. Nearly all of these operated on LF and MF frequencies.

www.radiosky.com/
Resources for Amateur Radio Astronomers, Teachers and Students. If natural radio is your thing, be sure to check out this site.

www.auroralchorus.com/
Famed site by Stephen P. McGreevy for learning about all aspects of natural radio reception and recording. The *VLF Story* here is "must read" for anyone interested in the subject of whistlers, tweaks, dawn chorus, and the like.

www.lfengineering.com/
Website of the LF Engineering Company of East Haven, CT, longtime manufacturers of Low Frequency Equipment for LF Communications, Natural Radio Research, AM Broadcast, Marine and Shortwave Radio.

http://500kc.com/
Home Page of the 500 KC Amateur Radio Experimental Group. This group operates under special FCC authority just above 500 kHz. Their work has been very successful, and may lead to a ham allocation in the vicinity of 500 kHz in the future. The website gives details of the experiment and provides a way for you to report any stations you hear.

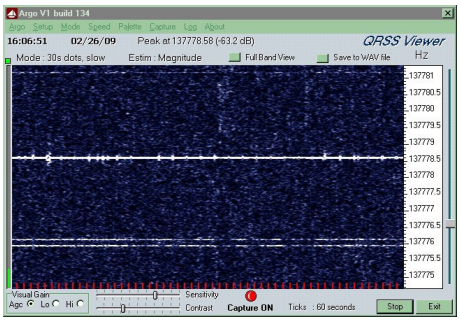
www.stormwise.com/
Stormwise Lightning Detectors, Ferrite Rods, variable capacitors, and VLF Radio Equipment. Stormwise also has a Longwave Listener's Club that seeks to have connectivity to receivers from many parts of the country that you can listen to.

www.alexander.n.se/
This website is home to a museum in Grimeton, Sweden which exhibits and operates the last working Alexanderson Alternator in the world. This unique transmitter uses no tubes or semiconductors, but operates by spinning an alternator at low RF frequencies (around 17 kHz). Click the British flag to view the site in English.

http://worldaerodata.com/
Website of the World Aeronautical Database. Here, you can look up almost any beacon or Navaid in the world. Very complete. Easy to use.

www.airnav.com/
AirNav provides free detailed aeronautical information on airports and navigation aids, and is completely searchable. Note: Does not include 2-letter "compass locator" beacons.

www.w3eee.com/
W3EEE Longwave website by Stephen Dove, featuring his unique *Grabulator* online re-



ceiver, which you can monitor. The receiver is located in Mt. Gretna, PA.

www.hermanboel.eu/radiohistory/index.htm
European LW/MW Broadcast History. Want to see what the LF broadcasting scene looked like in Europe from 1925 on? This is the place to find out.

www.w8ji.com/ndb beacon fish buoy net beacons.htm
Good overview on beacon transmitters, fish net beacons and causes of NDB harmonics and keying problems. (Note: The spaces in this web address are intentional.)

www.dxinfocentre.com/ndb.htm
Bill Hepburn's very comprehensive list of LF/MF aeronautical & marine beacon stations.

www.loran-history.info/
In February, most LORAN navigation stations (100 kHz) ceased operations. Still, there is a fascinating history behind the development of these stations. This ground-based system got the job done with an impressive accuracy, second only to today's GPS.

http://members.shaw.ca/ve7sl/burhans.html
In the mood for a project? This site describes a Shielded Loop for LF work that could be just the ticket to high performance, low noise reception of beacons and other longwave signals.

❖ Loggings

Our loggings this month are courtesy of John Wheaton, KI4VXU of Murfreesboro, TN. John uses a Ten Tec RX-350 receiver, an LF Engineering Preamp, and Folded Random Wire antennas, ranging in length from 250 feet to 600 feet in length. He notes that PBC/365 kHz was to be decommissioned in late February, per the Maury County Airport in Mt. Pleasant, TN. For several months, it had been IDing as "PBK" (Mis-keying).

Also after a long time trying, John finally received a New York State beacon: PYA/260 kHz! PYA happens to be very close to my location in the Finger Lakes region. Nice work, John, and keep up in touch with any future loggings.

Table 1. Selected NDB Loggings (from TN)

FREQ	ID	ST/PR/ITU	CITY	BY
147.3	DDH47	D	Oinneberg	J.W. (TN)
212	FIO	CTR	Fiora	J.W. (TN)
248	WG	MB	Winnipeg	J.W. (TN)
260	PYA	NY	Penn Yan	J.W. (TN)
268	VKN	VT	Montpelier	J.W. (TN)
338	PBT	CA	Red Bluff	J.W. (TN)
410	ECB	CLM	El Cabo	J.W. (TN)
440	PNR	CHE	Chitre	J.W. (TN)

❖ The Future of Beacons

We've grown accustomed to hearing about the imminent demise of non-directional beacons (NDBs) over the past 15 or so years. Thus far, it has not happened, in large part because the stations offer a simple and reliable way of performing navigation and positioning. Recent budget challenges are forcing many services to be examined for their continued effectiveness, cost and criticality. The LORAN shutdown was one example.

NDBs are clearly an area in which there is opportunity for cost savings. These factors, along with recent innovations in high accuracy differential GPS (DGPS) might mean that we will begin to see more NDB shut-downs in the not too distant future. This is *not* to say that they will go away overnight. Private beacons and those serving remote areas appear to be more secure and will likely be with us for some time to come.

Nevertheless, I wanted to go on record as saying that no matter what happens to traditional beacon service, *Below 500 kHz* will continue to provide full coverage of the many other activities happening on longwave. These include Experimental/Ham activity, Natural Radio signals, time stations, and other utilities. Ham operation, in particular has a very promising future on longwave, and we will be there to cover it!

ANTENNA TOPICS

BUYING, BUILDING AND UNDERSTANDING ANTENNAS

Dan Farber, AC0LW
danfarber@monitoringtimes.com

The Humble Dipole

We've come a long way since Mr. Marconi put up his first crude antenna. Through years of research, engineering, and good old-fashioned experimentation, a myriad of antennas have been discovered and developed. The art has reached a high degree of sophistication, with antennas that enable communication with spacecraft on Mars and in deep space. We've gotten really good at concealing antennas, too, as I discussed in earlier columns. And, if you've got the money and the real estate, huge towers and beams of all sorts allow the ham operator to reach out to the entire world, spacecraft in Earth orbit, even the face of the moon, with impunity.

❖ The Many Faces of Dipole

What might not be immediately apparent is how fundamental the *dipole* is in the development of so many antennas. It's one of the great foundational discoveries of radio: a half wavelength of wire or other metal, cut exactly in half and balanced-fed at the cut, is an excellent antenna.

At first, of course, they were strictly made of wire, hung as high in the air as feasible and (hopefully) oriented so as to take advantage of the dipole's broadside "figure-8" radiation pattern. At some point the *folded dipole* – a full wavelength of wire – was stumbled upon, making a much better match to open wire feeders (See Figure 1).

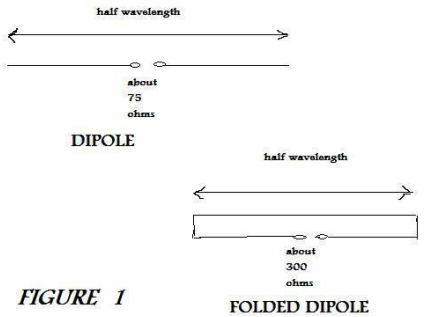


FIGURE 1

Meanwhile, in Japan, Mr. Yagi and his associates had come upon the principle of the *parasitic element,* which is a fancy name for the reflector and the directors (if any) of what most of us call a "beam" antenna. Simply put, a dipole is augmented by a slightly longer, uncut element – a *reflector* – at the proper spacing, and sometimes shorter, uncut elements – *directors* – are added at the proper spacing on the other side. With the dipole and parasitic elements made of rigid material, such as metal tubing, and mounted on a solid, rotatable spar – a *boom* – an incredibly directional, high-gain antenna was born (See Figure 2).

Combining these two concepts, the folded

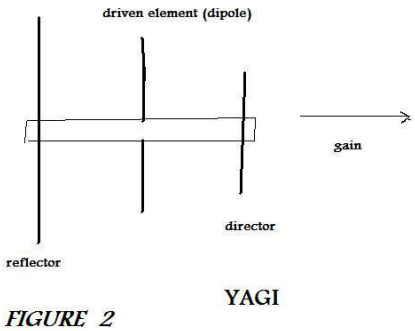


FIGURE 2

dipole was opened up into a loop, and parasitic elements added to it, creating the *quad* antenna. Alternately, the loop was greatly enlarged and laid out horizontally, and the *loop* antenna joined the ranks (See Figure 3).

Even the common quarter-wave vertical

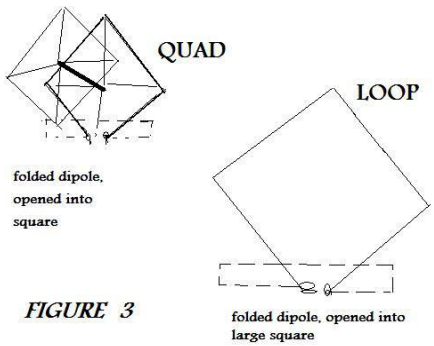


FIGURE 3

antenna can be seen as a dipole, turned vertical, and with the ground itself forming half of the dipole. This is the principle enabling all vertical antennas (See Figure 4).

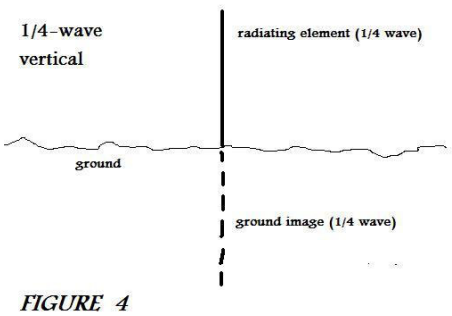


FIGURE 4

With all this in mind, we can readily see that the humble dipole is the mother of almost all that we hold true about antennas.

The basic dipole made of wire and hung as high as possible has always been a popular choice for many hams and listeners because it combines simplicity, low cost, and versatility. One of the great aspects of ladder line feed and a tuner with balanced output is that *the length of the dipole matters not at all.* Just put up the longest dipole you can, as high as you can, and, at all frequencies where the dipole is at least a quarter-wavelength long, a tuner can match it to your radio.

In other words, a dipole at least 135 feet long will work on every band from 160 meters on up – and even if all you can manage is a dipole 33 feet long, you've still got every band from 40 meters on up.

As you go higher in frequency, a given dipole becomes longer relative to wavelength, introducing gain and directivity – a very inexpensive beam antenna, indeed. On ten meters, for example, the 135 foot dipole is four wavelengths long and may have anywhere from five to nine dB of gain, depending on its height above ground! Not bad for a few dollars' worth of wire. And the fact that you can work every HF band with this one antenna is a huge bonus.

The versatility of the dipole doesn't stop there. Don't have two tall supports that far apart, you say? Do you have at least one? Consider putting up yet another form of the dipole, the *inverted V.* Basically, the center of a dipole is hauled up as high as possible, and the ends are brought down to – oh, let's keep them ten feet above the ground for safety's sake. Again, don't worry about length, just make it as long as you can, and yes, if you feed it with ladder line, it will work at every frequency where it is at least a quarter-wavelength long. It won't have the gain of the horizontal dipole, but it will be largely omnidirectional throughout the spectrum – a poor man's multiband vertical, so to speak (see Figure 5).

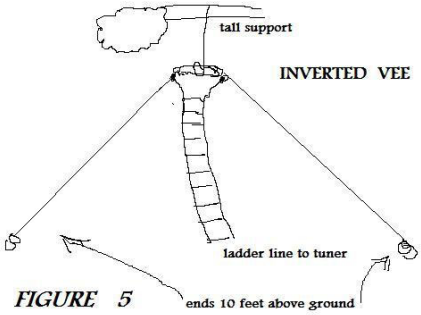


FIGURE 5

Also, don't overlook that the dipole can be installed vertically, sloping, with the ends dropped or otherwise deformed, or any other configuration you can come up with. And as I've said before, the indoor dipole, on a ceiling or in the attic, will get you on the air if you can't erect any outdoor antennas.

Yet another permutation is the *trap dipole.* Traps (resonant circuits) are inserted at certain points in the dipole wires to electrically isolate the outer lengths at higher frequencies. In effect, the one dipole becomes several resonant dipoles. This can be a good choice for the operator who wants to use coaxial cable to feed the antenna (see Figure 6). The big disadvantage with coax-fed dipoles is that they are only effective at or very near their resonant frequency; a short excursion up or down the dial and the SWR begins to climb fast, because the antenna is no longer resonant.

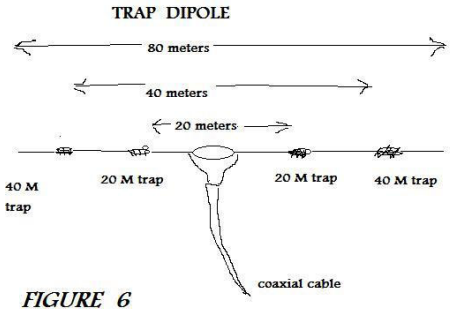


FIGURE 6

Down to Brass Tacks

That's why I have leaned so hard on the concept of the ladder line-fed dipole and a tuner with balanced output. To reiterate, the dipole length is completely unimportant – as long as it is at least a quarter-wavelength long at the lowest desired frequency – and the tuner will match it to your radio on all HF bands.

Think about that for a minute. You need erect only one antenna to cover all bands – a very inexpensive antenna made of some wire and a couple of insulators. And, as a bonus, the dipole will have noticeable gain and directivity on the higher frequencies.

If you must hide your antenna indoors, a 33 foot dipole, bent if necessary to fit in your attic, will get you on every band from 7MHz up. I can personally attest from working folks using just such an antenna that it is a proven and effective performer.

At my present location, I am lucky enough to be able to have a "large" outdoor dipole. It's 110 feet long (a length wholly determined by how far apart the two tall trees on my property are) and it's 35 feet above the ground. I used an E-Z-Hang to get my support ropes in the tops of these two trees – the whole process took me about 45 minutes, working alone. Ladder line runs from the center of this dipole down to my operating table, right below a basement window.

With it hooked to the BALANCED output of my trusty MFJ tuner, I routinely work the nation and the world on any HF bands that are open. The setup even works on 6 meters.

The dipole is too short to be effective on 160 meters, but – aha! – Here's yet another great advantage of the ladder line-fed dipole: To operate on 160 meters, I pull the two ladder line leads from the BALANCED output, tie them together, and hook them to the RANDOM output of the tuner. This effectively makes the ladder line a 35 foot vertical, top-loaded by the 110 feet of wire connected to the top of it (the dipole). It works quite well on 160 meters. Indeed, this "Tee Vertical" configuration loads up and works well on all the higher bands, too. Feel free to try it with any length of dipole you can erect (see Figure 7).

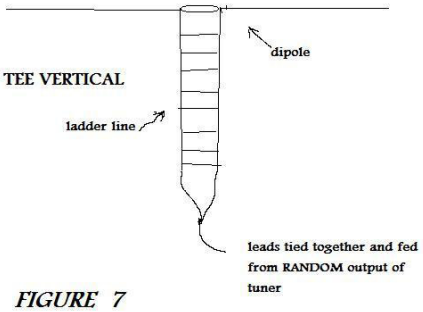


FIGURE 7

That's all for this month. Next issue we'll delve ever deeper into the world of HF antennas. Happy operating!

RADIO RESTORATIONS

BRINGING OLD RADIOS BACK TO LIFE

Marc Ellis, N9EWJ
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The BC-344 Fails an Unexpected Smoke Test

❖ Some Reader Tips

Before we get started on the BC-344 this month, I want to acknowledge a long and interesting e-mail I received from reader Bob Stoll. It contains a number of tips for the frugal antique radio restorer. I won't be able to do the whole communication justice in this issue – but let's see how it goes!

Deteriorating line cords are a frequent problem with restorers of vintage equipment. Extension cords at home center stores are usually more inexpensive than line cords sold as such, and are available in a variety of lengths and qualities. Just cut off the outlet and you're ready to go.

This next tip may seem not to belong in a list for frugal restorers. However, looking at it long term, it certainly does. Bob suggests that, if finances permit, buying kits of resistor and capacitor parts are a sound investment for the active restorer. Some typical prices at **www.radiodaze.com**: 240 600-volt ceramic caps, assorted values, $67.95; 95 assorted electrolytic caps, sizes for a.c.-d.c. sets, $67.95; 65 of same for transformer sets, $67.95; 5 each of 99 values of 1/2-watt resistors, $92.45.

Yes, it's expensive – especially the resistors – which would perhaps require shopping elsewhere for a smaller assortment. In any case, these assortments could be purchased over a period of time, and there are savings both in price and postage over buying in small lots. The assortments make it possible to restore a great many sets without purchasing additional small components – with the convenience of having the needed part right at your fingertips. And for critical applications where spot-on values are needed, you will have the advantage of being able to test several units of a given size to get exactly the value you need.

Speaking of expenses, modestly priced tubes are getting harder to find. But John searches e-Bay for smaller electronics dealers that aren't necessarily tube specialists. They are apt to be less pricy. He looks for dealers that have – if possible – several of his needed types. That way he can save on shipping. Bob tries to buy only NOS/NIB types, except for perfectly good rectifier tubes with broken keys – which are marked way down.

Finally, don't hesitate to rescue defective high-end electronic equipment being discarded by your company, club, or neighbor (we inelegantly call the last type of acquisition "garbage picking"). It's true that the surface-mounted printed board components won't be too useful, but you may well be able to acquire such valuable items as transformers, electrolytics, and precision capacitors.

Many of John's other tips involve test equipment, and we'll look at some of those next month.

❖ A Speaker for the BC-344

I've had my eye out for the proper military speaker (Loudspeaker LS-3) to use with the BC-344. I finally saw one offered as a "Buy it Now" on e-Bay for $62.50 plus shipping. This is a World War II version with crackle finish – mint condition and in original government repackaging.

It arrived as I am writing this and is truly a thing of beauty. I don't know what makes a perfectly applied crackle finish on a piece of military gear so attractive – but I'm keeping mine on my desk to admire until it's ready to hook up with the receiver. This vender has more of the same as of now (try 370265329989 on e-Bay). Right now he also has a Korean War model with a flat black finish, mint as well, for $50.00 plus shipping.

Actually, there is more advantage to having the proper military speaker than pure satisfaction. The audio output transformer of the BC-344 (and its d.c. powered equivalent the BC-314) is designed to match an impedance of 3,000 ohms. This is also the case with the more common medium-frequency sister radio, the BC-312/BC-342.

Obviously one can't connect this radio, as is, to a common 8- or 16-ohm speaker. One approach, sometimes used, was to remove the original output transformer and replace it with a standard unit designed to match the 6F6 second audio output to an 8- or 16-ohm voice coil. However, it does take a bit of shopping to find a replacement unit that would fit in the space vacated by the very compact original transformer.

The military LS-3 speaker (from the vendor's e-bay announcement).

An easier fix is to mount a 3,000 ohm to 8- or 16-ohm (depending on the speaker voice coil impedance) matching transformer on the speaker frame or in the speaker enclosure. Connect the high-impedance winding to the radio and the low-impedance winding to the speaker and you're in business.

However, the LS-3 speaker already incorporates the required matching transformer, so it can be connected directly to the speaker output jack of the BC-344. And this brings up the matter of the required plugs. To access the speaker output jack of this radio (and the input jack of the LS-3), one needs an uncommon 3-circuit plug (military PL-68) rather than the more common 1/4-inch phone jack (military PL-55).

Of course, the military had connecting cables with a PL-68 on each end, but these are not easy to find on the surplus market. The PL-68s are around, though, and can be obtained through surplus outlets or at radio meets (you might have to look at the miscellaneous boxes under the tables). I'm pretty sure I have a couple of PL-68s in my junk box.

❖ The Unexpected: A Failed Smoke Test

This month's work session began with a scrutiny of the remaining resistors and capacitors – those associated with the i.f., audio, and cw oscillator stages. They are located above the BC-344's power supply. One turns the set upside down and swings the power supply aside on its hinge to get a look.

I saw no sign of burned resistors or wiring and was pleased to see that there were very few capacitors. Although there was one "black beauty" that will have to go, the remainder are well-sealed metal-cased jobs. Now, as it happens, only one section of the three 3-sectioned metal-cased capacitors previously removed from the r.f. deck had proven to be leaky. I wish there had been a way to test them other than destructively removing them from the equipment (see last month's column).

In view of that, and because there were so few, I decided not to tear up the wiring

and replace the metal capacitors in this area. It would be easy to isolate defective ones by troubleshooting methods should any turn up later.

Before anchoring the power supply unit back in position, I removed its bottom cover and took a peek inside. What met my eye was a very compact arrangement of power transformer, filter choke, electrolytic capacitors and a terminal board. The components looked practically poured in.

The large dual 8-uf electrolytic was going to be very difficult to remove, so I decided to try to re-form rather than replace it. Re-forming is a process by which you apply a low voltage (of the proper polarity) to the capacitor and slowly raise it until the rated working voltage is reached. If the capacitor survives this treatment without shorting, it means that the insulating chemical coating on the capacitor plates has been electrolytically restored and the capacitor will be good to go.

And here is where I ran into my problem. With the tubes still out of the set, I applied a.c. voltage to the power supply through a variable transformer while monitoring the d.c. output. When I reached about 50 volts out, my nose detected the tell-tale small of burning insulation, and a very artistic tendril of thin smoke issued from the radio.

Quickly shutting down the power supply, I disconnected the B plus connection to the radio so that I could at least continue with the electrolytic re-forming without causing more damage. That, at least, went well and I was able to reach the capacitors' 450-volt rating without further incident.

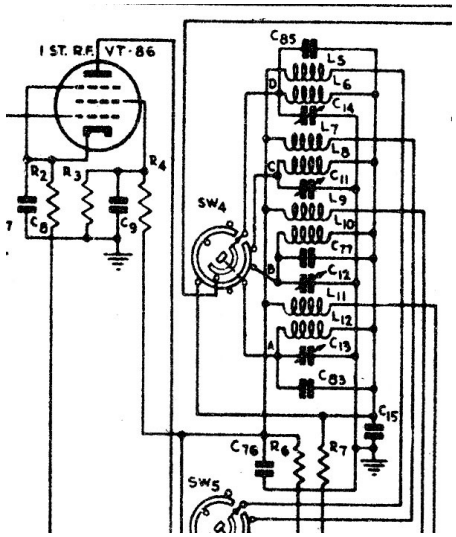
❖ Troubleshooting

This was definitely a setback but, if it had to happen, I was glad it happened while I was still working on the radio rather than after the set was all buttoned up and ready for its first actual trial. Since there was obviously a short in the B Plus line, I started by measuring the resistance from the receiver's B plus connection to ground. It read 1000 ohms instead of an expected value in the tens of thousands. Without doubt, there was a short someplace.

The technical manual for this receiver provides a very complete set of resistance readings to ground for diagnostic purposes. That made it possible to test the radio without power – a good thing considering the short in the B plus! Many manuals provide only voltage readings for troubleshooting purposes.

I decided to test for the typical resistance values to be expected at the cathode, plate and screen grid pin connections at the sockets of all tubes, as well as at the control grid pin or top cap connections. With the exception of the cathode of the second detector/first audio tube – which tested open when a value of 750 ohms was to be expected, only the plate pin readings were off.

Though the c.w. oscillator plate pin reading was the expected 300k, all of the other plate readings were way off. Most were in the 1-2k range with 20k required. The one glaring exception was the first r.f. plate pin, which measured at about 6 ohms – practically a dead



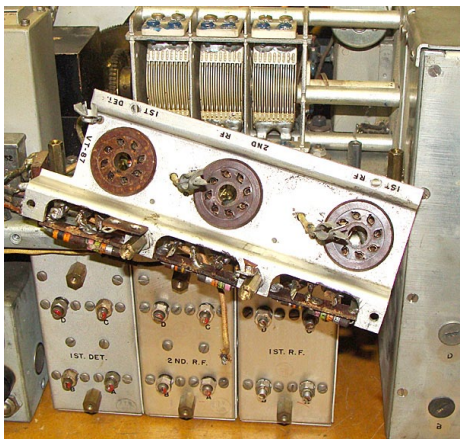
Junction of C76 and R6 (just above switch SW-5 at bottom of picture) was disconnected from 2nd r.f. can circuitry above, isolating the short circuit (see text).

short. This had to be close to the location of the short that was pulling down the entire B plus line.

Strongly suspecting that the short was somewhere between the first r.f. tube and second r.f. can, I disconnected the lead between the can and the junction of C76 and R6 (see schematic) – which had also displayed a reading of 6 ohms to ground. Sure enough, the 6-ohm "short" stayed on the can side of the disconnection and the tube side was relieved of it.

Re-testing the resistance to ground of all plate pins, I found that the ones that had tested too low were now in the expected 20k range, as was the receiver's B plus connection. However, though I had isolated the location of the short to the second detector can or its associated outside wiring, I was hardly out of the woods.

Putting aside, for the time being, the problem of the open second detector cathode pin, I looked at the two exposed connections at the top front of the can. One was showing the unwanted ground; the other looked ok. I now had to dismount the r.f. tube shelf I had so carefully put back together in the last session



The r.f. tube shelf is swung aside once more – awaiting a second removal of the 2nd r.f. can (center, below).

so I could expose the connections at the top of the can for checking.

I was glad, at least, that I hadn't yet gotten around to installing replacement capacitors on the shelf – which would have complicated the problem. Removing the tube shelf mounting screws, I once more moved the shelf out of the way, being careful not to disturb its wiring. Unfortunately, none of the connections at the top of the can proved to be shorted to ground except the one intended to be grounded.

To explore the problem further, I would have to disconnect and remove the can once more in order to check for trouble inside. As you can imagine, this is not something I really wanted to do and I put it off until the next work session, when I would start fresh. Having gone through the disconnection and removal once, the next time should be easier!

❖ The 6R7 Open Cathode

Before closing up shop, I wanted to take a look at the problem of the open cathode pin at the second detector (6R7) tube socket. It was supposed to read 750 ohms and, indeed, the schematic shows that the pin is shunted to ground through a 750-ohm resistor paralleled by a 0.1 uf capacitor. However, my initial test showed an open circuit to ground.

Checking at the pin again with my multimeter at the highest resistance range, it was still open, but I noticed a slight bump in the meter needle at the initial connection. Obviously the resistor was defective, allowing the small capacitor to take a slight charge through the ohmmeter circuit. (By the way, effects like this could never be observed with a digital meter, though digital meters have their place and I definitely keep one on my workbench.)

I'm sure I will find that the resistor is either broken or burned up, though I doubt that this problem had anything to do with the short circuit in the second r.f. can. I wanted to get right to the bottom of the 6R7 tube socket and check, but I would have to turn the set upside down, which I was reluctant to do with the r.f. tube shelf dismounted. Also the power supply, now temporarily anchored back in position, would be in the way.

And so, the resolving of this problem, which shouldn't be difficult, will also have to wait until next time. And I'll see you then!

"Sky-Wires & Inhalers"

Part 7: What's a Decibel?

By Walter Lindenbach

Last time, Bill and Chuck made a transformer to couple Chuck's 12-foot random wire antenna to a shielded cable lead-in, and to his receiver. When Bill told him that the transformer would increase signal strength at his receiver by 12 dB, Chuck could hardly wait to connect and try it.

"But," began Chuck, "first tell me how the transformer increases signal strength."

"Okay. But then, you need to know about decibels – dB.

"The original unit was named after Alexander Graham Bell and was called a Bel. It was too big for engineering use, so the standard unit became a decibel, which is one tenth of a Bel.

"The decibel is a unit of *difference*. This is a very important distinction. The decibel is different from volts or amps which specify a quantity without reference to anything else. If you see a number with 'dB' after it, the proper question to ask is ' dB difference from *what*?'"

"But," interrupted Chuck, "differences in what? Size, shape, carrots, turnips –?"

"Oh, ha ha! Cute! No, no: differences in power. The power quantity differences represented by decibels can apply to light, heat, radiation – radio signals or otherwise – sound, or any power form that produces psychological effects in us. The response of our ears to changes in volume of sound is logarithmic, and that's why decibel differences are related as logarithms.

"Think about increasing audio power to a loudspeaker by two – from 1 watt to 2 watts. Here's how we figure out how many decibels that is:

number of decibels difference = 10log P2/P1 when P1 and P2 are in watts, or

number of decibels difference = 20log V2/V1 if the difference is defined in volts. V1 and V2 are in volts.

So, if P2 is 2 watts and P1 is 1 watt,

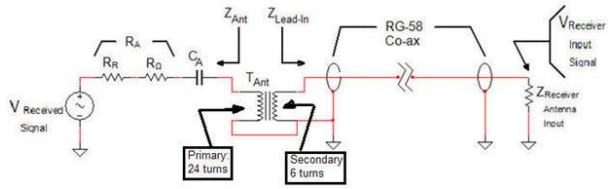
number of decibels difference = 10log 2/1 = 10(0.301) =3.01 dB

"That means that a 100% power increase produces a sound level increase of about 3 dB. That sound volume difference is close to the *minimum difference that the human ear can detect!* Which is tiresome, because increasing amplifier power output by a factor of two takes quite a bit of bother and expense, and what do you get for it? A volume increase that is just noticeable! It's not fair.

"Now, your antenna: This time, we are considering a voltage ratio, primary to secondary, of 4 to 1. So,

number of decibels difference = 20log 4/1=20(0.601)=12.04 dB

"Which is nice. But remember, this increase is in signal strength only, not signal-to-noise ratio."



What about the Alphabet Soup?

"Good. Thank you," replied Chuck, "but I'm still wondering what all those extra little letters after 'dB' are for. I've seen dBm, dBv, dBi, dBk – that's all I can remember right now."

"Yes, and you could add dBa, dBrn, dBrnc0 – oh, there are lots.

"The whole point in the extra letters is to tell you what the number of decibels is *different from.* They indicate a reference from which you can add or subtract the number of decibels. 'dBm' says 'decibels from 1 mW'. So, 10 dB above 1 mW is +10 dBm.

"But we usually measure voltage, not watts. So now we have to know the impedance in which we are making the measurement. 0 dBm – 1 mW – in a 50-ohm circuit will give a voltage reading of 0.224 V. In a 600-ohm circuit, it is 0.775 V.

"Suppose you read 22.4 mV across a 50 ohm load. What would that be in dBm?"

"Well, let's see," said Chuck, "V2 is 22.4 mV and V1 is 0.224 V, because that's 0 dBm across 50 ohms. So, dividing one by the other gets us 0.1. Now, we take the log of 0.1 and multiply by 20, and that's -20 dBm. How's that?"

"Good stuff! Now, I'll just mention the others, and we can go into more detail if we need them. 'dBi' means 'dB isotropic', or 'decibels with reference to an isotropic antenna', ' dBk' means decibels above or below 1 kW, 'dBa' refers to a standard SPL – sound pressure level – and represents sound volume levels, 'dBrn' is 'decibels referred to reference noise'. In telephone circuits, 0 dBrn is -90 dBm, and dBrnc0 means 'reference noise, C-message weighting at 0 TLP – test level point."

"Ahem!" Chuck coughed politely, "yes, well – um – maybe we should get back to my antenna and transformer. Would that be okay?"

"Sure enough! Let's look again at that sketch of your antenna. Then we'll know where the transformer goes. Do you have it along?"

"Right here," replied Chuck, reaching into his notes folder.

"Remember, everything to the left of the "Z_{ANT}" arrow represents the antenna.

"When we wound the transformer, the six-turn winding was labeled 'P' for primary, and the 24-turn winding, 'S'. The correct connections for your antenna are: 24-turn winding to the antenna and to ground; six-turn winding to the center conductor of the RG-58 co-ax and to ground.

Where Will the Transformer Live?

"The transformer should be put into a box with terminals. Do you remember the little doodads that came with TVs, rabbit ear antennas, VCRs and such things? They were called 'baluns'."

Bill reached for a parts box and took out some baluns. They looked like this:

"They come with what's called a Type F connector. It is a stud fitted into the plastic with a metal shell around it. These pieces can be removed – carefully – and a 3/8 inch hole drilled for a female BNC connector – also done carefully. If the drill goes too fast, the plastic will melt, the drill bit will stick, and the whole caboodle will turn into a bunch of little pieces."

Chuck was grinning. "How did you learn all this?"

"How do you think? Don't do likewise!"

"Then," Bill continued, "connect the 6-turn winding to the BNC connector, connect one end of the 24-turn winding to the BNC connector ground and the other end to one of the screw terminals. That's where the antenna is connected.

"Now, your RG-58 lead-in cable needs a male BNC connector, the transformer can be

mounted at the end of your antenna and connected, and then the fun begins."

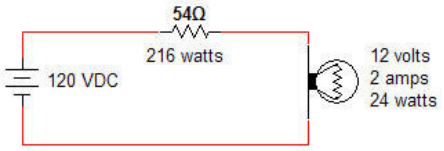
"What will I hear?" Chuck wanted to know.

"It will sound as if you had turned up the volume. Your Collins R390 has a very good noise figure but, with weak stations, receiver noise can intrude. If atmospheric noise – QRN – and man-made interference – QRM – are not much greater than receiver noise (but they almost always are) the more efficient coupling provided by your transformer will make weak stations easier to hear.

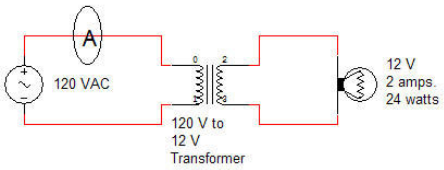
What's Efficient Coupling?

Chuck looked thoughtful. "'More efficient coupling.' Hmmm. What does that mean, Bill, and how does the transformer do it?"

"Aha! Good question. The whole object is to get more of the energy from the antenna to the receiver. Here is another way to look at it." Bill took a pad of paper and drew a diagram. It is Figure 3.



And then he drew Figure 4.



"Connecting a 12 V lightbulb to a 120 VDC supply can be done with a resistor, but most of the power is dissipated by the resistor. If the source is 120 VAC, we can use a transformer, in which case almost all of the power is applied directly to the lightbulb. In the DC case, the supply current would be equal to the lightbulb current, or 2 amps. In the AC case, the supply current – indicated on the ammeter, the 'A' symbol – will be about 0.2 amps.

"This is the main reason why George Westinghouse fought Thomas Edison and his DC system. If Edison had won – and he came much closer than we like to think – elevators would not be able to go above the fourth floor.

"Anyhow, for our purposes, this shows why a transformer gets more of the received signal power to the lead-in than a direct connection."

TV and FM Stations on the Shortwave Band

"But – and this is a big 'but'– there will be other stuff. You have a TV station near your place, don't you?"

"Oh sure!" Chuck made a face. "More than one. And a bunch of FM stations, too."

"Thought so." Bill nodded. "Each of them is a high-power VHF source, and they can interact with each other to put signals into the HF band.

"Let's say there are two FM stations close to each other and close to your place. One is at 95 MHz and the other is at 105 MHz. The signal from one gets right into the antenna system of the other, mixes with it, and provides you with a 10 MHz signal that can sound as if both stations are broadcasting at 10 MHz. If there is a TV station involved, you will hear an FM station signal and the TV station sync buzz with it.

"That sounds unhappily familiar," Chuck agreed. "What's to do about it?"

"Nothing!" replied Bill, looking like a thunder cloud. "But you can get this effect by another mechanism, too, even with your very good R390 receiver. If the mixing takes place not in the FM station – or TV station – antennas but rather in the RF stages of your receiver, it can be eliminated by reducing the VHF energy from your antenna."

"And," observed Chuck, "it will get there through the transformer, because our measurements showed that it reduced antenna signals at 130 MHz by only 6 dB.

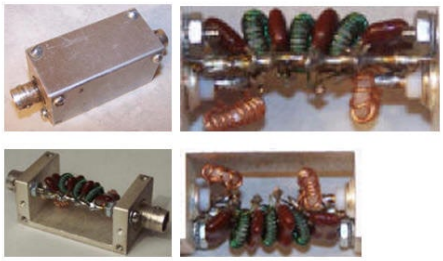
Ya' Cut 'em Off at the Pass-Band

"Say, Bill, are you thinking of a Low-Pass Filter?"

"Right on the money! Good for you! Shall we make one?"

"Yeah man! That would be neat! But they are pretty complicated, aren't they?"

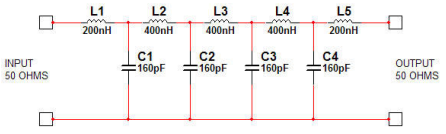
"Well, the calculations can give you a headache, but Walt – y'know, the guy who writes this thing – did it and made two Low Pass Filters. He loaned them to me. This is what they look like."



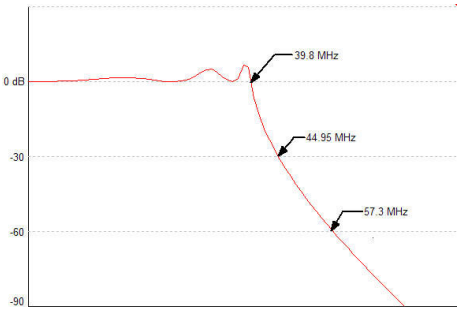
"Those little boxes with the BNCs on the ends look like the very cat's meow," Chuck enthused. "I wonder where Walt got them."

"He told me: Fair Radio Sales Co. Their website address is **www.fairradio.com**. These little cases are accessories for the Type URM-25D RF generator. (1)

"Now here is the schematic drawing."



"The filter should not attenuate up to 30 MHz but should attenuate strongly throughout the TV broadcast range, which begins with the Channel 2 video carrier at 55.25 MHz. The FM broadcast band begins at 88 MHz, so, if the LPF adequately attenuates the Channel 2 signal, it will take care of the FM band also. Here is the theoretical – simulated – frequency response. If you measure the response of the finished filter (and you don't have to), it will not look like this. But that doesn't matter. It will work."



"200 nH? 400 nH?" said Chuck querulously, looking back at the schematic diagram, "wherever do we get things like that?"

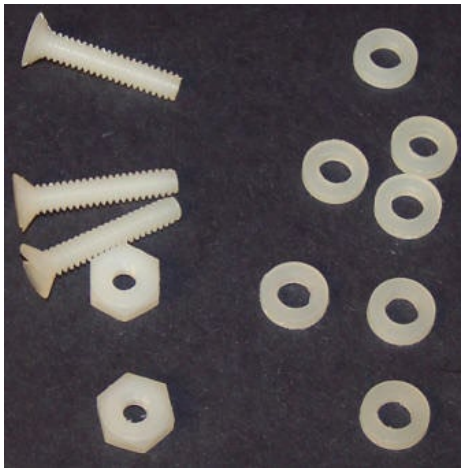
"Simple. We make them."

"Oh, really?! Okay, let's go. What about the capacitors? Somehow, I don't think just any old capacitors will do for this circuit."

"You're right," replied Bill, "they are mica 5%-tolerance capacitors."

"Uh huh, and what do we need to make the coils?"

"No. 28 enamel-insulated magnet wire and size 6-32 teflon washers. This is size 6-32 teflon hardware. The washers are on the right side."



"Good. Well, considering the time, maybe I should run away and collect these parts so that we can assemble the filter next time. Is there anything else we need?"

"Oh well, solder, soldering iron, bright light, magnifying glass – oh and aspirins."

"Well, you have those things, and I'll bring the aspirins. G'nite."

"G'nite, Chuck. Go straight home now!"

1. The cases to be used for the low-pass filter are Type CN223, available from Fair Radio Sales Co. (**www.fairradio.com;** 2395 St Johns RD, Lima, OH 45804; 419-223-2196) for $9.50 each.

2. Walter Lindenbach can be reached at ***lindenbachw@shaw.ca***. If you have questions about making transformers or other subjects that Bill and Chuck are talking about, send me a note. I will reply.

Logitech Squeezebox Radio

By Loyd Van Horn, W4LVH

Ahhh, the WiFi radio. Truly a marvel of modern technology and design, this simple device allows users to tune in radio stations from around the world – regardless of propagation conditions.

In recent months, with the explosion of Internet Radio – led mainly by the efforts of services such as Pandora and Slacker – we have seen an equally impressive explosion in the WiFi radio market. With so many choices, one can become blinded to the standout trees in the forest of offerings.

But, mark my words: the Logitech Squeezebox Radio is one of those standouts.

This device combines beauty and functionality in a way that few WiFi radios can claim. Simple, intuitive and effective, the Squeezebox Radio has certainly raised the bar for all other WiFi radio developers to strive for in their own efforts.

Most striking upon first glance is the full color LCD display. This enables stations that are packing graphics with their stream to display station logo, photos of DJs, etc.

But the beauty isn't only skin deep: the Squeezebox Radio packs plenty of features to give it functionality and an impressive sound from its single speaker. Digging into this radio was a definite delight.

❖ Out of the Box

The second you take the Squeezebox Radio out of its packaging, you know you are dealing with something a bit different. Its sleek, black styling and intuitive button layout makes it an attractive unit, whether bedside, in the office, or even in your living room. The Squeezebox also comes in red, for those who want something a little bolder.

The Squeezebox comes from the factory well packaged. The box includes the radio, AC adapter, a cable for connecting devices to the auxiliary input and a brief bit of documentation to help with set-up, although those with any experience with WiFi radios likely won't need it. If you are new to WiFi, it could be worth a glance.

A quick run-through of the buttons will give you an idea of what can be done with the Squeezebox. The main control you will be working with is the large push-button knob that allows for scrolling when entering WiFi encryption keys, browsing through menus and more. It does require a little bit of a push when using the knob to make selections, so you may want to use your other hand to stabilize the radio.

Secondly, you will notice six silver buttons, three on each side of the LCD screen. These are for storing presets, which are really the easiest way to navigate through your favorite stations. I was surprised to find only six stations could be saved as presets, but there is a way to store your favorite stations through the Squeezebox web site, which I will cover later.

A note about using the preset buttons for Internet radio: In order for the radio to tune in those stations, you must be in the Internet Radio mode. Otherwise, it won't attempt to tune in those streams.

You will also find several other buttons that are helpful when navigating. The 'home' button (conveniently decorated with a graphic of a house) will take you back to the main menu screen. This can be helpful upon start-up to quickly change modes from Internet Radio, to auxiliary, to any applications you have installed on your radio. You will also find two buttons (one on each side of the main scrolling knob) which will allow you to either backtrack one screen (the button on the left) or to resume paused streams (the play button, to the right of the knob).

The included AC adapter is not a large wall-wart, but as with most WiFi radios, it is a transformer nonetheless. I did like how the plug for the outlet was on a separate, removable adapter, which means that when traveling overseas, you can easily match the outlets with other adapters from Logitech.

The included documentation is a simple fold-out that shows button layout, how to connect the radio to a WiFi network, and a trouble-shooter (which I found handy later).

❖ Performance Test

Looks are nice, but how does the Squeezebox perform? After turning the radio on the first time, it required me to install a few updates. It took about 5-10 minutes, so I grabbed a cup of coffee and returned to find it was ready to go.

The Squeezebox had no trouble finding my Linksys Wireless-G router. When reviewing WiFi radios I will go to the opposite end of my apartment (through several concrete walls) to see if there is any signal loss. Amazingly, the Squeezebox seems to have the strongest reception of any radio I have tried to date. The documentation included with the radio says it is also compatible with 802.11n and 802.11b networks.

No wireless router? No problem. The Squeezebox includes a 10/100 mbps Ethernet interface as well with Auto MDX.

I found that entering data on this unit was a bit easier than on other WiFi radios I have tried. The knob seems to be easier to control when scrolling quickly and if you make a mistake, the back button just to the left of the knob makes it easy to correct it. I have seen other WiFi radios where the backspace is actually another selection that you have to scroll to, which can be time consuming if you are as clumsy as I am entering WEP keys.

The first station I tuned in was WWL-870 AM in New Orleans, LA. After a short buffering period (maybe 5 seconds, tops) I was listening to rich, full audio from the Big Easy. Adjusting the volume on the Squeezebox is handled by a separate knob just to the left and below the main knob.

One feature of the volume control I absolutely loved was the push-button mute. Rather than a separate button or a key found only on a remote control, pushing the volume button mutes the audio on the Squeezebox. This is particularly handy when you get a phone call or an irritating commercial comes up.

Searching for stations is relatively painless. The menus on the Squeezebox are unlike most of those found on WiFi radios; those who use Reciva-based systems will find it familiar, but with a different interface from what you are used to.

There is even a selection on the Internet Radio menu that will bring up every local radio station that streams online. Upon finding this, it no longer mattered to me that the Squeezebox didn't include an FM receiver for normal listening purposes – although I would still suggest this should be a required feature on all WiFi radios. This way, even when the power goes out or the net goes down, users can still use their WiFi radios as a means of obtaining local information. (Just a thought.)

In a short time, I had already set up my six preset stations. I switched over to a music station (RTE Chill, which would give me a good idea of this low end the unit can crank out) and was blown away. The unit comes with both a 3/4-inch soft-dome tweeter and a 3-inch woofer, for impressive response to both highs and lows. I was worried the audio would come out a bit boxy, but I was relieved when I heard true-to-sound highs, rumbling lows and even crisp mids. The audio reproduction from the tweeter and woofer were surprisingly authentic.

I found that turning the volume up halfway was more than adequate to fill my entire office-area with sound. I turned the volume to 100% and noticed little, if any, audio quality loss or distortion. The unit only has the one main speaker system, so audio is not in full-stereo, but this is a minor inconvenience, and one that only true audiophiles would notice.

Need to listen a bit more privately or trying not to disturb others? The Squeezebox has a 3.5 mm stereo headphone jack on the side. This also could be a handy way to hook your Squeezebox up to a larger stereo system for more audio punch.

To truly test the functionality of the unit, I decided to try it out over several weeks in various settings. These included in a home office for background music, bedside as an alarm and as a sleep aid, and in a living room as a featured entertainment device.

In the office, I put the radio about two arms-lengths away on a bookshelf and set the volume at about 30 percent. This seemed to be ideal for providing background music or for quietly listening to talk-radio content without disturbing others in the room and still enabling conversations at normal speaking volume.

Bedside, I have grown to love the Squeezebox even more. Not only is it a fantastic sleep aid, but a terrific alarm clock, too. It took me a bit of trial and error to find comfortable volume settings at night that wouldn't keep me awake. Once I did though, I was falling asleep each night to the sounds of George Noory and the nightly Coast-to-Coast AM audience. A built in sleep-timer can be used to turn the unit off after a specific amount of time. (After waking up in the middle of the night the first few nights because of loud commercials, I realized how helpful this feature was.)

My favorite feature of the Squeezebox for bedtime use is the auto-dimming display. Turn the lights on: the screen brightens for easier reading. Turn the lights off: the screen dims so that you don't have a night light keeping you awake. There are also a large assortment of preset alarms, including nature sounds, so you never have to awaken to an intrusive air-raid siren again.

In the living room, I tested the radio out for listening to sports programming in a room full of talkative people. The Squeezebox more than adequately provided clear audio without having to be turned to intrusive volume levels. It also has served as a great interface in the living room for my iPod when cleaning the house or just relaxing on a weekend and listening to some music.

Where other WiFi radios have come up short, the Squeezebox has come through with features that make this an indispensable unit in the home.

❖ Other Considerations

There is a compartment on the underside of the radio that allows for use of an optional rechargeable battery pack. This means the Squeezebox can be taken outdoors, and with weather warming in the Northern Hemisphere, the Squeezebox could be the perfect complement to outdoor barbecues, backyard football games and even near the pool. Mind you, the Squeezebox is NOT weather-proof, so just make sure you bring it indoors and keep it out of the water. A recessed handle in the top of the unit makes carrying the Squeezebox between the backyard and back inside a little more comfortable.

One thing I didn't like about the Squeezebox is that the remote control for the unit is a separate (and therefore additional cost) option. Almost every other WiFi radio on the market has made this a standard feature and would have made this the perfect radio, but for those who wouldn't use the remote control, this is a minor issue. Still, it is one feature I would have like to have seen included with the unit.

The expandability of the Squeezebox is another big plus for this unit. You can go to the Squeezebox web site and set up your favorite radio stations on your account, which is linked to your radio. That means, while you can only have six radio stations preset to the unit's buttons, you can have just about any other station you want just a few clicks away.

Another big feature of the Squeezebox is its applications integration. Yes, everything these days is jumping on the app bandwagon. You can download apps for Facebook, Rhapsody, Amazon and more.

You can also stream music directly from your home computer through your Squeezebox. This has become a standard feature on most WiFi radios these days, but it helps turn your entire home into a wireless jukebox.

❖ The Final Word

I love this radio. The audio is rich, full, and booming and doesn't require turning it to 100 percent to hear; it is perfect to have bedside, but equally holds its own in louder environments as well. It is attractive, has a great set of features, and it is easy to use.

This is a great introductory unit for those looking to get into WiFi radio, but those of us who are already experienced with it, can still find much to like about the Squeezebox.

Short of including the optional remote control with the unit from the factory, I cannot think of much else to improve upon in the design, the interface or in the electronics. If you have been holding out and waiting for the perfect WiFi radio to come along, wait no further: this is it.

The Squeezebox retails for $199.99 and can be ordered directly from Logitech as well as various Internet sources.

RATINGS

Audio Quality – 4.5 out of 5 stars (would love for the audio to have been in stereo)
Performance – 5 out of 5 stars
Features – 4 out of 5 stars (the optional remote would have been great included with the unit)
Design/Appearance – 5 out of 5 stars
Overall Rating – 4.5 out of 5 stars

WEB SITES

Logitech web site: **www.logitech.com**
Squeezebox: **www.mysqueezebox.com**

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GLOBALNET

Exploring the World of Internet Radio and Television

Loyd Van Horn, W4LVH
loydvanhorn@monitoringtimes.com

What *is* Internet Radio?

You have likely heard your friends talking about internet radio as they discuss listening to radio on their mobile phones. Or maybe they have a specific radio in their home that is devoted to pulling in radio stations over the Internet.

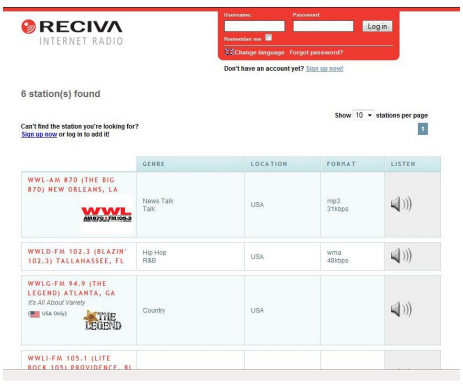
Whatever the situation, you have probably at least heard that Internet Radio is booming business these days. But what is it? How can you get involved? Is it really going to kill radio as we know it?

Internet radio comes in several different forms, but the basic way to break it down is into two types: streaming broadcasters and music services.

Streaming broadcasters are more familiar to radio hobbyists, because this is nothing more than terrestrial radio stations who take their on-air signal and make it available to various media devices via the Internet. Listening to these streams can be as easy as going to the station web site on a computer or mobile phone and clicking on a link to listen in real time, or it can involve special radios, equipped specifically for the task of listening to Internet Radio stations.

These station streams have all of the personalities, imaging and oftentimes advertising found in their traditional broadcasts. It enables listeners from around the world to tune into otherwise inaccessible stations or to hear a station not audible under certain atmospheric conditions.

Tuning in is a snap. If listening on your computer, just go to the website of your favorite station (a simple Google search can help find that) or you can go to some of the web sites that list many streams (Reciva, RadioTime, etc.) and find the actual stream there. There will be a brief "buffering" period when you initially load the stream. This basically loads a bit of the content ahead of time, so that the stream can play without interruption for a long period of time.



Certain software will be necessary to tune in the streams. RealPlayer, Windows Media Player and others can often play just about any stream on the Internet, but check the site that hosts the stream to see if any particular software needs to be downloaded first.

❖ WiFi Radios

For those who don't want to be tied to a computer but are interested in buying their own Internet Radio unit, the options are limitless.

There are a large number of WiFi radio players that allow you to access the streams of just about any radio station on the Internet, for free. There is no "best radio" for this purpose. The choice largely depends upon your personal preferences and budget, and there are plenty of options for you to choose from. A Google search for "WiFi radio" should turn up quite a few options, and you can even find some at Grove Enterprises!

If you are looking for a good starting unit to get into WiFi radio (listening to streams on a separate unit, rather than through your PC), check out this month's review of the Logitech Squeezebox Radio. This is a fantastic model that is priced competitively and is consumer-friendly enough that it isn't difficult to learn to use.

❖ On the Go Radio

Another place where you can experience streaming Internet Radio stations is on your mobile phone. Many of the smartphones like the iPhone and Blackberry have applications that you can download to allow you to stream radio stations right from your phone, without having to go to the station web site. Many of these applications come with a fee for downloading, and you would definitely need a data-plan from your wireless provider before using such applications. However, this can be a great way to take streaming with you, in the palm of your hand and even in your car!

❖ Music Services

The other type of Internet Radio content is that of the music service streams. This can be services like Pandora, Slacker, Last.fm and even iTunes that will allow you to experience uninterrupted music streaming. Some of these (like Pandora and Slacker) allow you to program your own radio station based upon the music you like, and will then introduce you to new music that is similar to your preferences. Others, like those found on iTunes, are pre-programmed radio stations that fall into certain genres.

Whatever your interest level might be in Internet Radio, there are plenty of options for you to find just what you are looking for, from music, to culture, to local advertising from the other side of the globe.

One thing is for sure, Internet radio is highly entertaining (and a bit addicting, too!) and can introduce even the most experienced radio hobbyist to a whole new world of programming content.

❖ Uh-oh, Pandora going local?

Terrestrial broadcasters, beware; the proverbial nail in your coffin might be looming just around the corner. As a former broadcaster and advertising executive myself, I can see the writing on the wall.

Word is out from the Internet music service, Pandora, that they are looking into bringing local advertising into their content. With advertising spending down and the economy already hurting traditional broadcasters, Pandora's sudden interest in the advertising dollars of local mom and pop stores has to have broadcasters shaking their heads.

The silver lining for broadcasters is that so far, this is not a full-on attack of local ad dollars by the mighty Pandora. Pandora is limiting its local advertising to banner ads as of now, but it is only a matter of time before full-audio advertising makes its way to Pandora as well.

Pandora executives have said that the move is a result of their national sales staff being bombarded with requests from local advertisers to get in on the Pandora movement. How long before those same advertisers ask, "Hey, you couldn't stick a few spots in the rotation for us, could you?"

But again, so far, Pandora has only opened the door for banner advertising, and this is where terrestrial radio should be thanking their lucky stars.

During my days as a "sales weasel," we used Internet radio advertising sparingly and almost as a give-away to help make advertisers feel like we were reaching out to help them. Mind you, this was about five to six years ago, when Internet radio was really just beginning to spread its wings. But from all indications, most of the broadcasting world hasn't taken advantage of the surge in Internet radio popularity by strengthening their advertising efforts online.

True, it is a tricky sell to advertisers, but it

is becoming increasingly easy with the success of services like Pandora and others. The boom in Internet radio has been covered extensively in this column. If terrestrial broadcasters don't want to see their advertising revenues take a hit due to the Pandoras of the world, they will have to beat them to the punch.

Broadcasters need to get creative and create whole advertising campaigns that only happen on their streams, making it easier for advertisers to track where their new business is coming from. They need to incorporate online ads into more of their sales mix, and they must start charging rates that make online radio seem viable, not just filler.

This has a huge implication for you, the streaming enthusiasts. You are about to witness the first salvos of what could shape up to be the end battle for the life of broadcasters.

For those of you who have enjoyed Pandora and others for their "commercial-free" nature, it's not all doom-and-gloom for you. It will be a while before audio advertising comes to these types of services, and even when it does, it will likely only be for certain areas and for those setting up stations based around certain artists. It will be based largely on demographics, so that people who like music by the Black Eyed Peas would not hear the same advertising that someone who likes The Beatles would hear.

No matter how this turns out, it is only going to serve to increase the listening audience of Internet radio as a whole – both the "music services" like Pandora, and terrestrial streaming content from regular broadcasters.

❖ Internet Radio on the iPad

Apple finally did it: they released to much fanfare their long-awaited iPad. And while television, newspapers and book publishers are practically giddy with anticipation of how the iPad will help their bottom lines, radio's future on the iPad is a bit less clear.

Sure, the portability of the iPad makes it an ideal candidate for taking streaming radio on the road, and the promise of affordable 3G wireless options without contracts means that iPad users won't be chained to WiFi hotspots for their content. However, two things about the iPad's design have me concerned about how much of an advancement the iPad will be over the iPhone or iTouch.

First and most significant is the lack of support for multi-tasking with non-Apple apps. Those who use the iPhone or iTouch know that outside of Apple applications, you cannot run applications in the background. This is a huge setback for Internet radio apps, especially on a device like the iPad, as it means you can't stream radio stations in the background while working on other projects. The very nature of the iPad makes it ideal for productivity, so not being able to stream stations in the background while working on other tasks could be a hindrance in the development of the iPad as a serious Internet Radio device.

Secondly, battery life could be an issue. I know that streaming radio stations over a 3G network on my iPhone can tax the battery life, and I would assume this would be the same for the iPad. A bigger device requires a bigger battery by nature, but it can't be too big without becoming cumbersome. This could mean users constantly have to recharge their iPads after an extended listening session, increasing the "hassle factor" of using the iPad as a streaming radio device.

I am really hoping that Apple will allow non-native applications to multi-task in the near future, especially for the iPad. Imagine reading a book while streaming a classical music station in the background. Or how about streaming your favorite talk radio station while checking your email?

For the iPad to be a serious advancement for all media, including Internet radio, it has to incorporate the ability for non-Apple applications to run in the background. Otherwise, a large portion of potential Internet radio users will be stuck with their netbooks and laptops for true multi-tasking productivity.

❖ FiOs jumps on IR bandwagon

Everywhere you turn these days, developers of everything from TVs to cell phones and beyond are adding Internet Radio capability to meet growing demand.

Verizon's FiOS is the latest bandwagon jumper. Verizon recently announced they are launching an appliction to allow for Internet radio streaming in their TV and Internet services.

The application comes pre-stocked with more the 350 different station options, thanks to a partnering with Clear Channel's iHeartRadio application. But users can then fully customize their listening experience by adding the URLs of their favorite streams.

Verizon isn't making much fanfare over the announcement of this application, so it doesn't seem to be positioning itself in the growing Internet Radio industry as a major player, but it does show that in nearly every corner, people are lining up to jump on the Internet Radio bandwagon.

GLOBALNET LINKS

Pandora to begin local banner ads - www.audiographics.com/agd/020210-1.htm
iPad's effect on radio - www.radiosurvivor.com/2010/01/27/what-does-the-ipad-mean-for-radio/
iPad set to 'save' media - http://newstrendstoday.com/apple-ipad-breath-of-fresh-air-for-the-media/04094
Verizon FiOS Plugs Into Internet Radio - www.lightreading.com/document.asp?doc_id=187135&site=cdn&f_src=lightreading_gnews
RealPlayer website – www.real.com
Windows Media Player Website - www.microsoft.com/windows/windowsmedia/default.mspx
Reciva website – www.reciva.com
RadioTime website – http://radiotime.com

What's NEW

Tell them you saw it in Monitoring Times

Icom Releases a New Portable Receiver

In 2002, ICOM introduced the IC-R5, which transitioned to the IC-R5 Sport in 2008, and both quickly became time-proven winners! Now Icom is saying good-bye to the era of those great receivers to usher in the newest product to the ICOM portable receiver line-up – The IC-R6!

The IC-R6 receives a wide frequency range (100kHz–1309.995MHz*), the radio provides good sensitivity and receiver characteristics that are insusceptible to interference. Amateur stations, AM, FM, shortwave broadcasts, TV audio* and a variety of utility communications can be heard. (Note: * Frequency range depends on version. Analog TV audio signals only, it cannot decode digital TV audio.)

While retaining the basic feel and functionality of the R5, the IC-R6 introduces features never seen in a portable at this price. Key features of the Icom R6 include:

- 0.100 to 1309.995 MHz* wideband coverage with AM, FM, WFM modes.
- Computer controllable via ICOM's widely used CI-V protocol
- Optional drop-in trickle charger
- VSC (voice squelch control) function – The VSC opens the squelch only when a modulated signal is detected and ignores unmodulated beat noise. It is a handy feature for those listeners who are scanning for talk, news and music, but not data bursts or beacons.
- 100 channel/second high speed scan (VFO mode scanning)
- Multiple power choices – The IC-R6 can be powered by rechargeable Ni-MH cells, or with alkaline batteries. Run the IC-R6 using the AC adapter, BC-196S, or opt for a cigarette lighter cable, CP-18. When using the optional drop-in charger stand BC-194 with the AC adapter or cigarette lighter cable, you can easily start charging the Ni-MH cells, while eliminating the need to connect the power source to the DC power jack of the receiver. You have 15 hours of continuous receive capability with the supplied rechargeable cells (Ni-MH cells (1400mAh □2).
- 1300 Alphanumeric memory channels: 1300 regular channels with 22 memory banks, 50 scan edges and 200 auto memory write channels. You can use the bank link scan feature to choose from and connect any of the 22 memory banks.
- 150 mW audio output power: 50mW audio output with external speaker (8 ohms)
- Earphone cord antenna for AM aviation as well as FM broadcasts

Some of the other features of this new portable receiver include:

- Built-in audio low pass filter
- ±1.0ppm high frequency stability (at 25°C)
- Ferrite bar antenna for AM broadcast
- DTCS and CTCSS tone squelch and reverse tone squelch
- Priority watch function with priority beep function
- Optional CT-17, CI-V level converter for remote control
- PC programmable with optional CS-R6
- Receiver-to-receiver cloning (optional OPC-474 required)
- Auto power OFF (0.5–2 hours and end of busy signal)
- Compact, drip-resistant construction
- Duplex operation monitoring
- Automatic LCD backlight
- Dial speed acceleration
- Built-in RF attenuator
- Auto memory write scan stores the detected frequency, mode and tone into a specified memory
- Reversible up/down buttons and dial knob for volume, frequency, memory channel, scan direction and set mode settings
- Optional new tube earphone, SP-27
- Weather channel receive with weather alert (U.S version only)

The new Icom R6 retails for $246.95 and is available from Grove Enterprises, SCN34 for $199.95 plus shipping (ad on page 15 in this issue). You can get more details or order one from the company website **www.grove-ent.com** or by calling 1-800-438-8155.

AOR Introduces AR2300 "Black Box"

AOR USA has announced the availability of the AR2300, a new "Black Box" professional grade receiver with exceptional performance, state of the art specifications and a menu of optional additions that allow the operator to configure the receiver for specific custom applications or to control it via the internet.

The AR2300 is operated by a Windows XP or higher computer through a USB interface using a provided software package that controls all of the receiver's functions. The tuning range is from 40 kHz to 3.15 GHz (a U.S.A. "consumer" version with the required "blocked" cellular frequencies will soon be available).

The radio receives AM, wide and narrow FM, upper and lower sideband and CW modes; an optional adapter can be added that allows reception of conventional, unencrypted APCO-P25 digital transmissions. Up to 2000 memory channels (50 channels X 40 banks) can be stored in the receiver, with data for each channel that includes frequency, alpha-numeric channel labels, mode, selected antenna, a "hit counter" and more.

Fast Fourier Transform algorithms provide a very fast and high level of signal processing, allowing the receiver to scan through large frequency segments quickly and accurately. Depending upon operator-selected configuration, up to three frequencies can be received simultaneously. Additional standard features include an adjustable analog 45 MHz IF output with 15 MHz bandwidth, an SD memory card port that can be used to store recorded audio, analog composite video output connector, CTCSS and DCS squelch operation, two selectable Type N antenna input ports, an internal speaker along with a headset and external speaker port, and the professional (government) version is equipped with a standard voice-inversion monitoring feature.

An optional external IP control unit enables the AR2300 to be fully controlled from a remote location and send received signals to the control point via the internet.

In addition to the available APCO-25 adapter, other optional equipment choices include an I/Q output port that allows the user to capture up to 1 MHz of bandwidth onto a computer hard drive or external storage device. Optional AR-I/Q Windows software facilitates the easy storage and playback of transmissions captured within the selected spectrum in conventional modes, or, signals can be subjected to further analysis. An optional GPS board can be used for an accurate time base and for time stamping digital I/Q data.

The triple-conversion receiver exhibits excellent sensitivity across its tuning range. The unit is powered by 12 volts DC (AC Adapter included) and can be operated as a base or mobile unit.

"The AR 2300 is an advancement in the new generation of software controlled or 'black-box' receivers," said Takashi "Taka" Nakayama, Executive Vice President for AOR. "The AR2300 is designed to give monitoring operators amazing flexibility in configuring the receiver to their individual needs and applications, often with just the click of a mouse."

Some of the software-driven operating selections include IF bandwidth, frequency, mode, filters, a screen-displayed graphical "S-meter," memory inputs, volume and squelch settings and more.

AOR anticipates the AR2300 will have strong appeal to federal, state and local law enforcement agencies, the military, emergency managers, diplomatic service, news-gathering operations, and home monitoring enthusiasts.

The AR2300 consumer will be available from Grove Enterprises once the FCC has type accepted the unit. No pricing on the USA consumer version is available at presstime, but it is anticipated that it will be available by late spring. The government/professional version of the AR2300 is currently available and AOR has set a MSRP of $3,795 (USD).

The receiver can now be purchased from Grove Enterprises for $3299.95 plus $32.95 shipping.

Interactive Police Scanner iPhone App

iPhone developer Juicy Development recently released the first interactive police scanner for the iPhone and iPod Touch. The app, Police Scanner 2, allows users to alert others about emergency broadcast streams as they happen, using text messages. The text messages appear on a small ticker in the app, allowing users to tune into the stream being discussed.

"We found that there were a community of users that wanted to let each other know about exciting feeds being broadcast," said David Kyle, project manager. "And this feature allows everyone to share information as it happens."

Police Scanner 2 allows listeners to listen to police, fire, and EMS activities around the world. Unlike other emergency scanner applications, Police Scanner's adaptive technology allows updates to data streams to post "live" within a few hours of changes made. Because emergency data streams can change so quickly, Police Scanner is able to provide the updated information to its customers without waiting for slow version changes released in the iTunes store.

In addition to allowing users to share information, Police Scanner 2 allows users to record snippets of a stream and replay it later. The length of snippets recorded is limited only by the memory of the iPhone or other device.

With over 2300 national and international EMS streams, Police Scanner offers the largest selection of police, fire, and emergency services streams available for the iPhone in one application. Users can locate and listen to police dispatch frequencies worldwide. Police Scanner is the only iPhone emergency scanner application to provide streams from nine countries. New streams are added daily.

Police Scanner runs on wireless LANs, the 3G network, or on the Edge network, and is compatible with both 2.x and 3.0 devices.

Police Scanner 2 is a product of Juicy Development, which also produces the popular iPhone applications Talk Radio and FastTrac. The cost of the application for the iPhone is $4.99 in Apple's iTunes app store.

2010 Beacon Handbooks now available

Michael Oexner has just released the 2010 printed and CD versions of his annual non-directional beacon (NDB) guides for Europe/Africa and North/South America.

The new *European NDB Handbook* (*ENDBH*) 2010 contains the data of more than 6700 NDBs on 160+ spiral-bound pages in A4 format. This new handbook has listings for NDBs located throughout Europe, the Northern African countries, and the Near and Middle East. Many of the more frequently heard transatlantic NDBs have been included, as well as NDBs operating from offshore installations such as oil platforms. Moreover, the handbook lists widely reported unidentified beacons and irregular call signs which result from so-called "negative keying." Many a NDB mystery may be solved with this kind of information on hand.

The *North American NDB Handbook* (NANDBH) with its 130+ pages is aimed at DXers located in North and South America and contains data for more than 5800 NDBs located throughout North, Central and South America, the Caribbean and the Pacific.

The layout of these NDB handbooks is arranged for ease of use: Part 1 (the reference list) shows the entries sorted by alphabetical order of the call sign and lists the carrier frequency, the modulation frequency, the authority or company taking care of the NDB, name and location of the NDB, country in ITU code, geographical coordinates, distance, Great Circle bearing and Maidenhead grid locator. Part 2 of the handbook is sorted in frequency order, part 3 in country order and part 4 gives details of decommissioned NDBs.

The CD version of each respective handbook contains all chapters of the printed version in the popular PDF file format. Having the NDB data available on your PC will allow you to easily search for specific entries. The CD contains some additional "bonus tracks," which includes over 170 NDB pictures and more than 230 NDB sound clips plus some useful software packages to produce Great Circle maps or to calculate Great Circle distances and bearings.

The CD also contains a Google Earth compatible waypoint file so that you can "visit" NDB locations around the globe. To run the CD you'll need a standard PC with CD-ROM drive and Microsoft Windows operating system. As a special benefit to the users of these NDB handbooks, the distances and Great Circle bearings are computed for the individual listener's location. So, when ordering, don't forget to specify the geographic coordinates of your listening post (recommended format to be used: degrees/minutes/seconds). Please let the author know whether you prefer the distances shown either in kilometers or in miles.

Delivery of the CDs will be via download. In case you still want a physical copy of the CD, please indicate this when ordering.

You can get additional information on these two products, including ordering information at **www.beaconworld.org.uk/files/NDBpublications2010.pdf.** You can also use snail mail to the following address: Michael Oexner, Hainfelder Str. 1, D-76835 Roschbach, Germany or by email to *michael.oexner@web.de.*

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, *larryvanhorn@monitoringtimes.com.*

When ordering or inquiring about the products mentioned in this column, be sure to tell them that you saw it in the pages of *Monitoring Times* magazine.

LETTERS

editor@monitoringtimes.com

Rachel Baughn
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Future of Shortwave Radio

The following is from an email interchange between reader Christopher Boyd and Assistant Editor Larry Van Horn regarding the perennially debated topic of what the shortwave bands will look like in the future.

Boyd: Since the late 1990s/early 2000s, when major shortwave broadcasters started disappearing from the airwaves, I've wondered about the future of shortwave radio and the radio hobby in general. My concerns have centered around the mass exodus of shortwave broadcasters and, on another end of the spectrum, the decision by law enforcement and others to encrypt their scanner radio communications. It looks and sounds to me like shortwave broadcasting is going the way of the dinosaurs.

Van Horn: This has been a subject of hot debate during my nearly 44 years in the radio hobby. Every time the sunspot cycle takes a dip, I hear that radio – specifically HF/shortwave radio – is coming to an end as we know it. Yes, some major broadcasters have decided to leave the airwaves, mostly in favor of internet broadcast streaming to countries technologically advanced (far more financially viable than, say, a 500 kW transmitter. ;-)))

On the Internet today, the largest organization devoted to streaming radio audio (**www.reciva.com**) has as of this moment 18,236 radio stations beaming around the world and 21,242 on-demand audio streams. We own two internet radios in our household and will soon add two handheld devices. That is why I started the *MT GlobalNet* column a couple of years ago to expose the hobby to a new media platform for delivery of radio content.

While most country counting SWLs aren't happy with this situation, the bulk of the people who have purchased SWBC radios over these many years classify themselves as being more interested in content than QSLing and country counting. With the advent of the audio stream on the net, these listeners have gone over to internet radio. This has resulted in a decrease in mail to the station regarding their radio broadcasts; thus, the slow decline in shortwave broadcasts (especially to developed countries) via HF. Stations aren't going to run huge, power hungry and expensive transmitters to satisfy the occasional letter requesting a QSL card or schedule.

Bottom line: if shortwave broadcasting is going away completely, why did they (the broadcasters) fight ham radio in the last ITU radio conference over the 40 meter band expansion? In the final settlement, we were forced to still share with them the subband from 7.2-7.3 MHz and they wanted a 40 year phase in for the 7.1-7.2 MHz segment. Doesn't sound like a bunch ready to throw in the towel, does it?

While we do see less English to North America, foreign language broadcasts are skyrocketing. The largest broadcast entity in the world now is China Radio International. One look at our monthly MTXpress foreign language broadcast guide confirms that. Others continue to expand their broadcast to areas of the globe not served by easy internet access.

Why waste a high power transmitter to broadcast English to the US, when most of us can stream their audio in a device we hold in our hands? Radio Luxembourg, an old favorite of mine from days gone by, enjoys a lively and robust life on the internet streaming rock music like the old days. Crystal clear reception, no fades and in stereo. Couldn't pull that off on shortwave, even in today's technologically rich environment.

Boyd: Do you see utility stations still using shortwave in digital or some other format in the foreseeable future?

Van Horn: This has been the case now for several years. We see more and more digital comms in use in the HF ute spectrum than ever before. My personal HF ute database has almost 23,000 entries in it, mostly government and military comms. I am sure if I added the non-gov/mil stuff it would be well over 50k or more. And this is mostly lower frequency stuff since we are at sunspot minimum.

Nope, HF is far from dead. Every time we (hams) try to get more bandwidth, someone is always opposing it, regardless of where in the spectrum we ask for it. Just look at what we went through trying to get a full 60 meter ham band a few years ago. We ended up with four discrete frequencies instead of the original 100-500 kHz slice we asked for.

Boyd: Back to the higher frequencies, do you see a majority of police and fire agencies, as well as other utilities, going to encrypted, or do you think that many (like the Los Angeles Police Department – for now, anyway) will remain transparent?

Van Horn: I can see more going P25 digital in the future, as narrowbanding takes hold and older equipment needs replacing. Given that scenario, encryption adds extra delay to the transmission equation and most departments/agencies do not like the extra delay. It also costs more for equipment in these times of tight budgets to encrypt. Yes, a few will, because they are paranoid and uninformed and have been sold a bill of goods by a salesperson looking for extra commissions that the encrypt feature adds to the total price tag. But most will not.

A lot of departments rely on radio listeners to monitor their channels as an extra set of ears and eyes looking for bad guys. Heck, our one of our own departments up here has the sheriff's office dispatcher announce on their dispatch freq when schools are going to get out early, because they know so many people monitor their freqs.

Boyd: Seems to me hams will be around for a long time, and they are great fun to DX.

Van Horn: Ah yes, we are. I have over 200 countries, a 5-band worked all continent award, nearly done with a 200 island IOTA, 5-band worked all states, three bands with DXCC (worked over 100 countries), and working on a worked all county award from *CQ* magazine (have over 1000 of the over 3000 I need to finish). I have used the digital modes very effectively during the sunspot minimum to continue working DX and continue to enjoy

***Stan Reubenstein, Pres. Radio Club of America presents Carole Perry WB2MGP the 2009 President's Award at the RCA's Centennial celebration in November 2009 (photo courtesy: RCA). Carole wrote the** First Person Radio **column in the December 2009 issue of** MT.*

contesting, of which I have won more than my share. Ham radio is a gas.

Well, hope that helps. Thanks for the good questions. Larry Van Horn, N5FPW

Wullenweber Antennas

"I've been following the recent pieces in *MT* on CDAA/Wullenweber antennas (or antennae if you are into insects!) with a great deal of interest!

"Long, long ago in a previous career I had the opportunity to 'visit' the installations at Hanza, Okinawa, Misawa, Japan, and Udorn, Thailand. A couple of years later I found myself as a graduate student at the University of Illinois at Urbana with a research assistantship in the Radiolocation Research Lab, doing work on HF single-site radiolocation systems. One of the assets of the RRL was the CDAA … which I was also able to visit.

"The key point of interest about this particular Wullenweber is that, I was told, it was one of the original Nazi Wullenwebers captured by the US in Europe and removed to the US for study. It used the original German goniometer. This would have been the first CDAA built in the US.

"Here is an excerpt from the interesting history at **www.navycthistory.com/WullenweberArticle.txt**:

> Professor Edgar Hayden, then a young engineer in the University of Illinois Radio Direction Finding Research Group, led the reassembly of the Wullenweber, studied the design and performance of HFDF arrays and researched the physics of HF/DF under contract to the U.S. Navy from 1947 through 1960. His research was used to guide the design and site selection of HFDF arrays. Records of his research are available in the university's archives.
>
> Hayden led the design and development of a large Wullenweber array at the university's Bondville Road Field Station, a few miles southwest of Bondville, IL. The array consisted of a ring 120 vertical monopoles covering 2-20 MHz. Tall wood poles supported a 1000 foot diameter circular screen of vertical wires located within the ring of monopoles. Due to their immense size, the location of the Bondville array (40.0494° N 88.3807° W) and the other post-war Wullenweber arrays were clearly visible in high resolution aerial photography available on the internet. The University of Illinois' developmental Wullenweber antenna south of Bondville, IL was abandoned about 1980, partially dismantled in the 1990's, and in 2003, was completely dismantled.

"My first year at the U. of I. as a grad student I was lucky to get a tour of the research building and to see the goniometer which scanned all the elements. Not too exciting after seeing those in Thailand, Okinawa, and Misawa (Japan). The historical aspects of this antenna were sort of lost on me at the time!"

Kim Boyer, Kirkland, WA

An archival television interview with professor George Swenson at the site of the Bondville "Woodhenge" in 1993 can be viewed at **http://will.illinois.edu/prairiefire/segment/pf1993-09-09-c/**

Photo from TV show as it appeared in Resonance, News for ECE Alumni and Friends, Winter 2009-2010

IN MEMORIAM

We've received news this month of the loss of three men who were particularly gifted teachers and mentors to many in the radio hobby. We are grateful for their generosity in sharing of their lives and their skills. Hopefully, many of the "students" who learned from them will step up to inspire future generations as they were by these men.

Dave Ingram K4TWJ

CQ magazine reported that Dave Ingram, K4TWJ, became a Silent Key Jan. 20, as a result of complications from a massive heart attack he suffered on New Year's Eve. Dave had been a columnist for CQ since 1982, writing on the World of Ideas, as well as low power operation and "How it Works." On his blog (http://k4twj.blogspot.com/), Dave stated that "As of 2006, I have written over 800 articles/columns and 28 books on all aspects of amateur radio." His latest book was *QRP Romps.*

CQ Managing Editor Rich Moseson, W2VU spoke the simple truth when he said of Dave, "His enthusiasm for whatever caught his interest was contagious and spread widely through his informal yet educational writing style."

Amateur radio lost a very generous and passionate proponent of the hobby and he will be missed.

John Bryant

John Bryant, mediumwave DXer extraordinaire, fell from a ladder February 8 and died the following morning of his injuries. Bryant wrote *MT*'s September 2007 cover story on his mediumwave DXpedition to Easter Island, and also co-authored with Harold Cones the December 2007 feature on the unusual friendship between Commander MacDonald of Zenith Corporation and Amando Cespedes, owner of a small shortwave station in Costa Rica.

The tributes to John Bryant found in the *DX News* bulletin (and posted on line at **www.e-dxn.com/news/**) read like a "Who's Who" in the radio hobby worldwide. In the article written by the DX News editor, Paul Swearingen says, *"John not only loved to teach, he loved to learn. His adolescent hobby of shortwave radio listening led to a lifetime of radio study, and eventual expertise."*

"John had a great interest in the history of radio, as well. He co-authored four books on the history of the Zenith Radio Corporation with his dear friend, Harold Cones. He and Harold also co-authored the book Dangerous Crossings, an account of the first modern polar expedition in 1925, in which radios and airplanes were first used in the far north."

Walt Salmaniw of Victoria, B.C. added, "John had a true gift as a teacher and was always wearing that hat during the many Grayland, WA DXpeditions that we both attended … he was always a cutting edge DXer, and had a wonderful gift of explaining the very complex in a way that non-electronic savvy individuals such as myself could easily understand."

We extend our condolences to all who were on the receiving end of John Bryant's friendship, experience, and good-natured encouragement toward excellence.

Peter Cuffe - G0IEP

It is with great sadness that I have to report the passing of **Peter Cuffe**, on 28th January 2010, a true gentleman of the Amateur Radio world, at the age of 84.

Peter was born in Leenaun, on the lakeside border of counties Mayo and Galway and his working life was first on Merchant ships, then on the Fleetwood Fishing Fleet, sailing in Arctic waters. He later became a senior communications officer at sea with Shell Oil Tankers… He could send and receive Morse messages in several languages at commercial speed and eventually retired to Fleetwood, Lancashire, where he passed his RAE with ease. Peter had a passion for the erstwhile Fleetwood trawler fleet and he produced a remarkable sketch of trawler L.O.72 for his distinctive QSL card.

"He was a great encouragement to me when I 'reclaimed' my lapsed license and a patient mentor when I asked naive questions, catching-up with all I'd missed. He was active on all HF bands and also had an interest in packet radio.

"Peter died after a short illness ... His nostalgic contributions at the Thornton Cleveleys Amateur Radio Society meetings will be sorely missed, but his memory will stay with us fondly. The world is a poorer place for his loss."

Peter Mac Dougall MCIJ, EI/G7VEW
(Author of this month's tongue in cheek article on TCAS)

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

INDEX OF ADVERTISERS

Stock Exchange

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Canada Air*	❒ $35.95*	❒ $69.95*	❒ $125.95*	❒ $189.95*
Foreign International*	❒ $30.95*	❒ $58.95*	❒ $119.95*	❒ $179.95*
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Columnist Blogs and Web Sites

These blogs and web pages were created by some of our columnists to better serve their readers. While we highly recommend these resources, they are not official instruments of Monitoring Times.

AMERICAN BANDSCAN
http://americanbandscan.blogspot.com/ - by Doug Smith

FED FILES
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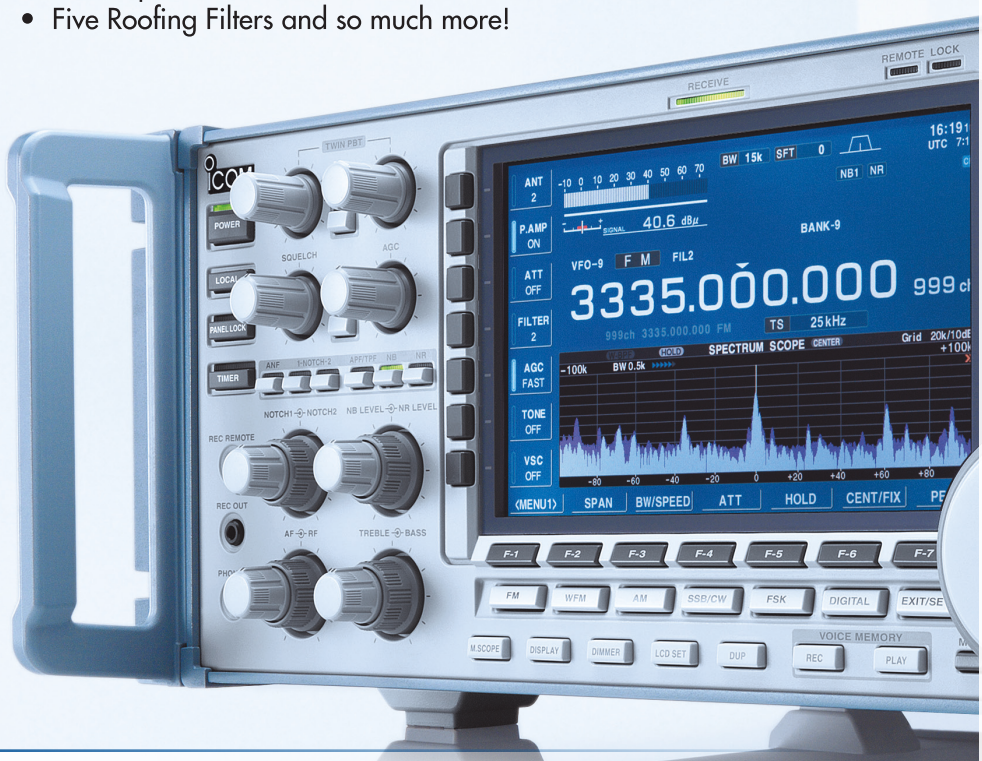

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